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**FORECASTS WITH QUARTERLY  
MACROECONOMETRIC MODELS**

NATIONAL BUREAU OF ECONOMIC RESEARCH  
Studies in Business Cycles No. 23

# FORECASTS WITH QUART MACROECON MODELS

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and Hebrew University, Jerusalem

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RESEARCH

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*(Resolution adopted October 25, 1926, and revised February 6, 1933,  
February 24, 1941, April 20, 1968, and September 17, 1973)*

## Preface

This monograph presents the work already given rise to a number of papers. Its purpose is to examine macroeconomic theory only to advance scientific inquiry and to develop techniques and further developments based primarily on models and methods. It is published in the *Proceedings of the Department of Economics of the Department of Finance and Commerce.*

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<sup>1</sup> See Michael K. Evans, Yoel Haitovsky, and Su, "An Analysis of the Forecasting Properties of *Models of Cyclical Behavior*, Bert G. Hickman, New York, NBER, 1972, pp. 949-1139; Haitovsky, "Econometric Models, Equation Adjustment, and Forecasting," *Review of Economics and Statistics*, 54(1), 1972, pp. 1-12; Haitovsky, Su, and Trez, "The Sources of Forecasting Errors in the *Business and Economic Statistics*," 492-497; Haitovsky and Trez, "The Accuracy of the *Business and Economic Statistics*," pp. 502-506; and Haitovsky and Trez, "The Accuracy of *Macroeconomic Forecasts*," CIRET Proceedings, European Econometric Society Meetings, Budapest, 1973.

<sup>2</sup> Under a reorganization effective January 1, 1973, the National Bureau of Economic Analysis in a new structure. However, for the sake of continuity, it is referred to as the National Bureau of Economic Research.

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## Preface

This monograph presents the end result of a research effort that has already given rise to a number of papers by its authors.<sup>1</sup> Here our purpose is to examine macroeconomic forecasts and models, not only to advance scientific inquiry per se but also to improve evaluation techniques and further development in this area. Our analysis is based primarily on models and forecasts from the Office of Business Economics of the Department of Commerce<sup>2</sup> and the Wharton School of Finance and Commerce.

<sup>1</sup> See Michael K. Evans, Yoel Haitovsky, and George Treyz, with the assistance of Vincent Su, "An Analysis of the Forecasting Properties of U.S. Econometric Models," in *Econometric Models of Cyclical Behavior*, Bert G. Hickman, ed., Studies in Income and Wealth 36, New York, NBER, 1972, pp. 949-1139; Haitovsky and Treyz, "Forecasts with Quarterly Macroeconomic Models, Equation Adjustments and Benchmark Predictions: The U.S. Experience," *Review of Economics and Statistics*, Vol. 54, No. 3, August 1972, pp. 317-325; Haitovsky, Su, and Treyz, "The Sources of Forecast Errors in an OBE Forecast," *1971 Proceedings of the Business and Economic Statistics Section*, American Statistical Association, pp. 492-497; Haitovsky and Treyz, "The Analysis of Econometric Forecast Error," *1970 Proceedings of the Business and Economic Statistics Section*, American Statistical Association, pp. 502-506; and Haitovsky and Treyz, "The Informational Value of Anticipations Data for Macroeconomic Forecasts," CIRET conference, Brussels, September 1971 and European Econometric Society Meetings, Budapest, September 1972.

<sup>2</sup> Under a reorganization effective January 1, 1972, the OBE has been redesignated the Bureau of Economic Analysis in a new Social and Economic Statistics Administration. However, for the sake of continuity, it is referred to as OBE throughout this volume.

In Part I we study econometric model forecasts based on observed rather than projected values for the exogenous variables (those determined outside of the model), when no subjective judgment is used to adjust the equations in the model. One of our aims is to see whether the average error in GNP forecasts is larger or smaller than one would expect on the basis of the average errors in the forecasts of GNP's components, and whether the errors in the one-year-ahead forecasts are larger than one would anticipate from the size of the errors in multiperiod quarterly forecasts. In this connection, we are asking whether forecast errors—for different components of GNP in the first case and for different quarters of the year in the second—offset each other or whether they cumulate. In another part of our analysis we compare the magnitudes of the errors in the sample period with those in the forecast period to determine the extent to which error is increased when the model builder does not have the advantage of hindsight in choosing his equations, and when the period of prediction is not the period over which the equations are fitted. We also test equation adjustments based on two formulas to see how these adjustments influence our findings. At the end of Part I we look at the changes in forecast error that result either from adding anticipations variables to the specification of some equations or from altering the statistical method of finding the coefficient values for a subset of equations. Here we are especially interested in the changes in the interrelationships of the model. How much of the variation in forecast accuracy can be attributed to changes in the size and interdependence of errors in the equations and how much to changes in the manner errors are propagated through the relationships in the model?

In Part II we examine econometric models as they are used by an econometrician in a forecasting situation. For each forecast we start with the exact model used for the forecast, and all of the adjustments and values for the exogenous variables used by the forecaster. We present a procedure for decomposing the forecast error for each variable into several components: error in the equation explaining the variable in question; error attributable to the rest of the system, including the feedback of error from the equation explaining the variable; error (or error reduction) due to the forecaster's adjustments of the equations in the model; error caused by the forecaster's incorrect guesses as to the future values for the exogenous variables; and error caused by a mistake in the internally generated values for lagged

variables in multiperiod forecasts available to study the nature of forecasters. Finally, we compare models with those derived in mechanical forecasting methods, a tradition associated with the Federal

We are deeply indebted to the Department of Commerce and Commerce for supplying us with records of past forecasts, our without much personal attention especially grateful to Michael Hisch, Lawrence R. Klein, Maurice Carthy for the time they devoted to Paul Taubman, Ta-Chung Bureau's Staff Reading Committee and Henri Theil of the NBER Board Moore for their helpful suggestions Juster for his encouragement in Robert E. Lipsey for his careful appreciate its thorough editing charts completed by H. Irving Alice and Glen Hazleton for help Balon, Carol Wilczynski, Alice Motyka of the University of Michigan the text and tables.

This study was financed by the Bureau of Economic Research.

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variables in multiperiod forecasts. We also use all of the evidence available to study the nature of the adjustments made by econometric forecasters. Finally, we compare forecasts derived from econometric models with those derived in other ways. These include various mechanical forecasting methods, as well as the simple forecasting equation associated with the Federal Reserve Bank of St. Louis.

We are deeply indebted to the Office of Business Economics of the Department of Commerce and the Wharton School of Finance and Commerce for supplying us with information that was vital to this project. Since we needed not only econometric models but also detailed records of past forecasts, our project would have been impossible without much personal attention from the model builders. We are especially grateful to Michael K. Evans, George R. Green, Albert A. Hirsch, Lawrence R. Klein, Maurice Liebenberg, and Michael D. McCarthy for the time they devoted to our project. Special thanks also go to Paul Taubman, Ta-Chung Liu, and An-loh Lin of the National Bureau's Staff Reading Committee, to David L. Grove, Charles B. Reeder, and Henri Theil of the NBER Board Reading Committee, and to Geoffrey Moore for their helpful suggestions. We are indebted to F. Thomas Juster for his encouragement in the early stages of this work and to Robert E. Lipsey for his careful reading of the manuscript, and greatly appreciate its thorough editing by Hedy D. Jellinek, as well as the charts completed by H. Irving Forman. We are also grateful to Mary Alice and Glen Hazleton for helping us compile the tables, and to Annia Balon, Carol Wilczynski, Alice Caldwell, Jennie Cashman, and Donna Motyka of the University of Massachusetts secretarial staff for typing the text and tables.

This study was financed from the general funds of the National Bureau of Economic Research.

*To Dalia, Sidney, and Josephine*

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To Dalia, Sidney, and Josephine

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**Part I**

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**MODELS AN**