BOOK REVIEW

GERHARD TINTNER. *Econometrics.* John Wiley and Sons, N.Y., 1952, pp xiii + 370, $5.75.

Gerhard Tintner, fellow of the Econometric Society, the Institute of Mathematical Statistics, and the American Statistical Association, has completed the useful task of providing the first textbook on modern methods of econometrics. Other volumes in the field are not competitive with Professor Tintner's book, in that they do not cover the methodological contributions of the past decade.

Econometrics deals with a general discussion and illustration of the subject, the application of multivariate statistical methods to economic data, econometric model construction, and a study of time series analysis. In an appendix the author gives a brief discussion of matrices, determinants, and computational methods. Numerous examples are given throughout to illustrate the techniques developed. The subject matter is mathematical in nature and kept on a high plane without being made oppressively rigorous.

Two outstanding contributions of the book are the discussions of multivariate statistical methods and certain aspects of time series analysis. In the section on multivariate methods, Tintner introduces the reader to such topics as multiple regression, discriminant analysis, principal components, canonical correlation, and weighted regression. Economics students are not especially familiar with these methods and will find Tintner's exposition useful. Unfortunately, he did not choose a set of illustrative examples that will simultaneously be instructive to other social scientists. There is great need for the application of multivariate methods to the analysis of survey data involving large samples of individual respondents and numerous personal variables. Had he chosen examples from economic data collected in surveys, he would simultaneously have struck a note appealing to psychologists and sociologists.

A substantial portion of the section on time series analysis covers quite conventional material on the measurement of trend and of seasonal and cyclical variation in economic activity. These matters are discussed in most elementary texts on economic and business statistics, although in a less mathematical form. Well-known mathematical techniques of fitting orthogonal polynomials, logistic curves, and Fourier series; smoothing by moving averages; and periodogram analysis are included. The treatment of serial correlation, stochastic difference equations, autoregressive schemes, and correlogram analysis is more interesting and less familiar.

Cleavages exist among econometricians, and Tintner's approach to the subject is one that fails to capture what the reviewer regards as the singular contribution of econometrics to methods of social science research. A feature of econometric methods not found in psychometrics or empirical studies in other social sciences is the systematic blending of *a priori* information and empirical observation. Social science investigations often proceed by purely empirical methods of reasoning. Data are searched for regularities and high correlations. The alternative approach of some econometricians is to use *a priori* information such as economic theory, institutional practices, legal restrictions, and technological information to fashion a mathematical model of the economy. It is in the use of the economic theory of behavior to formulate testable hypotheses that other social scientists could possibly derive some benefit from a study of econometric methods. The *a priori* information of all types serves to define the class of variables being considered and many specifications about the mathematical form of the relationships used. The latter specifications are, however, seldom complete; hence simple functional forms are widely used to expedite computational and other analytical efforts. Econometric models

constructed on the basis of *a priori* reasoning are then confronted with statistical observations. The structural characteristics, the parameters, of the model are estimated from the data and identified with basic economic concepts.

Another outstanding characteristic of modern econometrics is that the stochastic properties of models are explicitly developed at the outset of analysis. Tintner fully presents this aspect but gives inadequate attention to the choice between two main alternative stochastic models. One model assumes that individual variables are subject to error, say measurement error, while another assumes that behavior is subject to error, say through the neglect of explicit treatment of minutiae, rare events, and nonmeasurable quantities. Tintner implicitly tells the reader that both errors in variables and errors in equations are present, that there are inherent statistical difficulties in using a stochastic model based on both types of error, and that therefore we must arbitrarily assume one model or the other. His preference visibly is for the error-in-variable model. He fails to emphasize for the reader that it is, *in principle*, possible to obtain accurate measurements, that we are moving in the direction of better and better statistical measurement of economic data; and that in systems involving large numbers of individuals making free choices, behavioral disturbances are inevitable. It is virtually inconceivable to imagine social behavior of individuals that could be described completely by a set of measurable variables that the human mind of an investigator can simultaneously manipulate. The reviewer has a distinct preference for models whose stochastic structure permits explicit disturbance of behavior (errors in equations) and feels that other social science studies should use a similar probability scheme. Tintner devotes a chapter to rather formal calculations with errors-in-equation models. In this respect his book is inadequate.

Tintner makes a happy use of examples to illustrate his methods, and this, in itself, adds greatly to the pedagogical contribution. The examples are not, however, well chosen to bring out the best of econometrics. The reader may get the impression that the subject is not to be taken too seriously, because Tintner frequently summarizes the results of an example by warning the reader to accept the findings only with the greatest of caution due to the fact that a number of assumptions are probably not fulfilled. There are actual empirical studies which are to be taken seriously and in which careful programming attempts to fulfill the underlying assumptions. Tintner's attitude is overly negativistic, but he could have made a better choice of examples by selecting those yielding results in which he could have some faith and about which he would not have to be apologetic. A smaller number of examples, elaborate enough and penetrating enough to show what econometrics can truly accomplish, would have been preferable. Students may wonder, after having worked through Tintner's text, what would be an acceptable econometric investigation. Is a subject mature enough to warrant a textbook if the accomplishments are no less subject to criticism than Tintner's examples? Surely Tintner cannot feel that empirical econometric studies are as weak as he leads one to believe his examples are; otherwise he would be in another profession.

Tintner has so many examples that he is forced to give each only a superficial analysis. Some of his numerical findings appear anomalous, and he gives off-hand explanations; whereas the reviewer would offer quite different explanations. This suggests that these examples need further econometric treatment than is given them in the book.

Tintner's style is not pleasing, in that his pages are cluttered with far too many references. Some of them seem to be purely superfluous or irrelevant. In a textbook it is less necessary than is ordinarily the case to give credit for independent research results on common subjects. An annoying feature is the occurrence of numerous misprints: some in equations, some in literary text, and some among the many references.

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