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Statistical Methods of Econometrics. By E. MALINVAUD. Translated from the French by MRS. A. SILVEY. North-Holland Publishing Company, Amsterdam. 1966. xiv + 631 pp. 108s. The last four years have seen the appearance of a number of important, high quality works on the theory and methods of econometrics. Methodes statistiques de 1Yconzomeirie by E. Malinvaud, which was originally published by Dunod in 1964, has been foremost among these. Now, with an English translation, its influence and importance must become even greater. The book was written for French students and research workers who specialize in econometrics and have a good mathematical training. The serious reader is expected to refer to original papers and text-books on mathematical statistics. Also, the majority of the results presented are not accompanied by examples. This being the case, the reader who does not have a firm grasp of mathematical statistics must be content with a cursory reading of much of the book; however all will find even this beneficial. The volume is divided into five Parts, each about four chapters and 100 pages in length. These are: the Introduction, Linear Estimation, Two Important Stochastic Models, Fitting Time Series and Simultaneous Equation Models. The Introduction is unusual, among recent books on statistical methods, in its emphasis on the importance and usefulness of descriptive statistics, and the demonstration that a variety of non-trivial statistical techniques (such as multiple regression and principal components) can be viewed usefully in this light. Unfortunately the informal, descriptive attitude of this part frequently reverts to an authoritarian formalism in later chapters, depriving the reader of the flavour and intent of many of the techniques. Chapter 4 of the Introduction contains an exceedingly nice description of the econometric approach to the problem of the consumption fulnction. This chapter could well provide the best means presently at hand for introducing the problems and attitudes of econometrics to members of other disciplines. Linear Estimation begins with a co-ordinate free approach to the GaussMarkov theorem and linear models in general. The approach is quite interesting, and satisfactory in a variety of respects; however the presentation tends to make the results obscure to the non-mathematically sophisticated. Also in this part, the analyses of variance and covariance are presented in a manner more formal than that generally adopted, even by mathematical statisticians. It is hard to imagine a novice gaining any appreciation of the relevance and goals of these topics on the basis of the material provided. The subject of Part 3 is linear models with errors in variables and nonlinear models with additive errors. The author is here concerned with the estimation of parameters that appear in a non-linear manner and then demonstrating that, under regularity conditions, the estimates provided by linearizing the equations are consistent and asymptotically normal. The emphasis is usually on the analytic difficulties involved in the techniques, rather than on the source of the models. A parameter is here defined to be identifiable if a consistent estimate of it is available. This definition is indicative of the great emphasis that the author places throughout the book on the asymptotic justification of the techniques presented. Surely this emphasis is wrongly placed in that no econometrician is ever likely to come upon a sample of infinite size. Chapters 11 and 12, in Part 4, are to my mind the least successful and productive of the book. They are concerned with the theoretical and empirical analysis of discrete stationary time series and in particular the prediction of such series. Many of the statements made, are vague and incorrect. The author seems to have missed the importance of the distinction between one and two sided representations of stationary second-order processes. No empirical examples are given. There is a minimal

discussion of the problem of seasonal adjustment. The remaining chapters of Part 4 are of high quality. They are concerned with the immediate effects that non-temporally independent disturbances have on estimates and tests in linear and non-linear models. The final part is concerned with simultaneous equations-specifically the problems of reduced form, estimation of a battery of equations and the estimation of a single equation out of a model. A number of Monte Carlo studies are discussed, but no large-scale models that have actually been employed are presented and the impact that computers are having on this problem is not imparted. Throughout the book the author maintains a commendably high degree of concern for the sensitivity and robustness of the techniques presented and for the assumptions under which they were derived. However there are a variety of misprints, errors, mistakes in logic and clumsy discussions. For example, it is asserted, p. 97, that the regression coefficient estimates derived from a bivariate normal distribution are normal. The argument given in Proposition 15, p. 325, does not appear to generalize to the vector case as stated. On p. 373, for the sake of "simplicity" the complex nature of a process is ignored. The representation thus obtained is consequently incorrect and an interested reader must end up confused. On p. 375 it is stated that a process with continuous spectrum can not be predicted perfectly-the process with spectrum exp-W2 provides a counter-example to this assertion. It is frequently not clear whether the disturbances in an equation are being assumed normal (as on p. 524). Taylor series expansions are often used to obtain asymptotic distributions (as on p. 525) with no clear description or justification of the technique. "Convergence in probability" is frequently confusingly abbreviated to "convergence". The notion of sufficiency is credited to Darmois rather than Fisher (p. 88). A confidence interval of level oa for an unknown parameter a is described, p. 91, as an interval which covers the true value a? with probability a. The Schwarz Inequality is called the Schwartz Inequality. The subject index can only be described as poor. Many important words appearing in the text are omitted; for example, regression, elasticity, underidentified, maximum likelihood, cross-section, loss function, macro-economics, Monte Carlo, multiple correlation, bias, multiplier and hypothesis. In addition a number of technical mathematical terms and results are used with no indication of their source; for example, variety, regular (matrix), metric space, compact and limit point. In contrast, the list of References is excellent. It is virtually impossible to find a useful paper, written up until 1966, not included at a relevant place in the text. The book tends to be encyclopaedic including discussions of such things as bunch maps, Buys-Ballot Tables, analysis of variance with unequal numbers in the cells, ergodicity and fitting using joint cumulants. In later years this may however prove to be its major strength. I believe that the volume would have been improved had the many results on asymptotics and matrix theory, at present scattered throughout the text, been collected together in technical appendices and had a summary list of important definitions and results been provided. Despite the criticisms recorded above, my respect for this book is virtually unbounded. Given a class of mathematically knowledgeable graduate students in econometrics, the book has no peer. All others can not fail to learn many things even from a most casual perusal.

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