Nonparametric econometrics

by A. Pagan and A. Ullah

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The description "nonparametric" seems to be used in two different ways in the statistical and econometric literature. The older use of the word refers to tests (such as Wilcoxon, Mann-Whitney, etc.) which don't rely on classical normality assumptions, and which are often based on ranks rather than raw data. More recently, the term has been used to refer to smoothing techniques, especially in density estimation and regression. This book takes the more modern definition of "nonparametric" and covers a large range of smoothing methods which can be applied in econometrics.

It is a very welcome addition to the econometric literature, providing the first general survey of nonparametric smoothing methods designed specifically for econometricians. The wider statistical community has been using nonparametric smoothing methods for 15–20 years, and there are some excellent general surveys written for statisticians such as Simonoff (1996) and Loader (1999). There are also some excellent surveys focusing on kernel and local regression methods such as Azzalini and Bowman (1997), Wand and Jones (1995) and Fan and Gijbels (1996). But all of these omit some issues of key interest in econometrics. Pagan and Ullah have now filled this gap in the literature.

They mostly consider regression models and their variations, and describe how the models can be estimated so the functional relationships are non-linear and estimated nonparametrically. For example, they consider the relationship between income and age where the standard parametric approach in labor economics is to assume a quadratic relationship which is estimated using least squares regression. The nonparametric approach is to make no assumptions about the form of the relationship, and to estimate it by a smooth curve (which turns out to have a flatter peak than the quadratic curve).

The other surveys of the field concentrate on density estimation and nonparametric (single-equation) regression, and consider various statistical methods which aren't widely used in econometrics (such as generalized linear models, and methods used in survival analysis). A glance at the table of contents of this book reveals how it differs from the other surveys of the field, in covering a larger range of applications of particular interest to econometricians.

9 Semiparametric estimation of censored regression models
10 Retrospect and Prospect

There is also an appendix on statistical methods which is surprisingly detailed, and which will be a useful reference in its own right.

The flavour of the book is theoretical rather than practical. Each chapter surveys the range of methods that have been proposed, discusses finite sample and asymptotic properties including bias, variance, and consistency, when observations are iid and under some mixing conditions. Consequently, this book will be an invaluable reference for econometricians seeking to develop and adapt nonparametric and semiparametric techniques.

At times, the coverage is almost encyclopedic with thorough bibliographic summaries and reviews of the relevant literature, especially in pointers to econometric applications. In other places, the coverage is too brief to be of much use—for example, the sections on generalized additive models and neural networks. Surprisingly, loess is not even mentioned despite being one of the most popular smoothing methods available in statistics packages.

For someone seeking intuition about the methods, or practical advice on their application, this is not the best book with which to start. There are very few applications given, with just a short section at the end of some chapters providing one or two relatively simple examples. In fact, it might be better to read each example section first, before reading the rest of the chapter, as it provides some motivation and graphical intuition for what is discussed earlier. Books with greater emphasis on the application of the methods to real data include those of Azzalini and Bowman (1997), Simonoff (1996) and Loader (1999).

I was disappointed in the level of graphics the authors have employed to explain or demonstrate the methodology. Graphical techniques have developed in parallel with nonparametric smoothing (see, for example, Cleveland, 1993), and provide much useful understanding about their applicability and dangers. But there were only a handful of figures in the whole book, all in the examples sections, and every one is poorly produced.

The lack of exercises and relatively few examples will ensure the book is not immediately useful as a textbook for graduate courses. Instead, the book will be most useful to researchers in econometrics, including graduate students, who need a thorough survey of the vast nonparametric literature which is now available. Mostly, the book does this extremely well and I will use it as a useful reference tool when I need to check, for example, the conditions under which a particular technique will converge, or when I am looking to see what work has been done in developing nonparametric or semiparametric alternatives to well-known econometric techniques.

The authors original aim was to "produce a book that paralleled traditional econometric texts in the sense of explaining how one might perform the same analyses as was done parametrically in those books but in a nonparametric way." Although this aim was not able to be fully achieved, the authors have done a splendid job of producing a book which will make nonparametric smoothing methods much more widely known to the econometric community.

References

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