

Preface

Léopold Simar became Professor of Statistics at the Université catholique de Louvain (UCL) in 1992, after moving from the Faculté des Sciences Economiques Sociales et Politiques (FSESP) at Facultés Universitaires Saint-Louis in Brussels where he had served as Professor of Statistics since 1974 and as Dean of the FSESP from 1978 to 1990. He founded the Institute of Statistics at UCL in 1992, and chaired the Institute from its creation until 2004. During this period, the Institute became recognized as a leading center for research in mathematical statistics. Over his long and successful career, Léopold Simar has worked on a variety of topics in statistics, including count-data models, Bayesian estimation and inference, and frontier estimation. He is regarded as one of the world's leading experts on frontier estimation; his work in this area has found applications in a broad variety of fields, including efficiency studies in industry, air traffic control, research output of universities, insurance companies, etc. He has published over 100 refereed works in academic journals and books, and has given over 100 invited talks at conferences and universities around the world. Léopold Simar is also a gifted and inspirational teacher. He is very well appreciated by his students at all levels, especially by his Ph.D. students.

In May 2009, 60–70 statisticians, econometricians, students, and others gathered in Louvain-la-Neuve to honor our friend Léopold Simar at his retirement. The group included Léopold's colleagues, coauthors, and students, as well as university administrators and other academics who have over the years worked with Léopold, served on committees, organized conferences, or otherwise participated in academic life with Léopold. The sets of colleagues, coauthors, and students included both current and former members, and each of the possible intersections of these three sets are nonempty.

The celebration in Louvain-la-Neuve was organized around a small, 2-day research conference where researchers presented results from some of their current work. This volume contains the papers that followed from those presentations. Between presentations, there was much discussion and learning over coffee and other refreshments; in the evening, there was still more discussion (and still more

learning, and no less fun) over dinner. For many at the conference, there was the chance to see old friends; possibly for everyone except Léopold (who already knew everyone attending), there was the chance to meet new friends. As is common at academic gatherings such as this, the transition between organized presentations, coffee breaks, more presentations, lunch, still more presentations, and dinner was almost seamless. Conversations flowed smoothly, and the boundary between work and fun was not discrete but rather blurred. In fact, for us, there remain questions about the existence of such a boundary. We have not merely worked with our friend Léopold, but we have also had much fun together over the years. And, we have not finished.

To the outsider, statistics and econometrics might seem to be the same. Often in our professions, however, there is little discussion between statisticians and econometricians, and sometimes where there is discussion between the two, it is not polite. This is not the tradition in Louvain-la-Neuve. The Institute of Statistics founded by Léopold in 1992 at the Université catholique de Louvain in Louvain-la-Neuve has always been a place for the two groups to meet and learn from each other. Over the years in the Institute, both members and visitors, including both econometricians and statisticians, have benefited from each other with econometricians adopting the mathematical rigor that is more common among statisticians, and with statisticians appreciating the subtlety of estimation problems arising in economics.

The 11 papers in this volume are at the frontier of current research. Not coincidentally, ten of the papers are related (at least to some extent) to estimation of frontiers, a topic that Léopold has contributed much to over the past two decades. The eleventh paper deals with estimation of single index models, an area that Léopold has also contributed to. Both frontier estimation and single index models are important topics. In particular, frontier estimation is important in economics, management, management science, finance, and other fields for purposes of *benchmarking* and making relative comparisons. Some of the ideas in the papers collected here may also be useful for image resolution as well as other purposes. The chapters in this volume reflect the varied interests of their authors; some chapters are mostly theoretical, while others involve varied applications to real data to answer important questions; we expect that everyone in a very wide audience will find *something* useful in this collection.

Abdelaati Daouia, Laurent Gardes, and Stéphane Girard use extreme value theory to extend asymptotic results for (Nadaraya 1964) kernel estimators to estimation of extreme quantiles of univariate distributions. The results are then applied to derive the asymptotic distribution of smooth nonparametric estimators of monotone support curves. While estimation of efficiency in production has traditionally relied on linear programming techniques, the research in this chapter is a nice example of the new approaches that are currently being developed.

Alice Shiu and Valentin Zelenyuk examine the effect of ownership type on the efficiency of heavy and light industry in China. In recent years, a number of countries have attempted to reorganize their industry after turning away from direct central planning and state-owned enterprises. China is currently in the middle of

this process, and for the moment presents an opportunity to examine differences in ownership structure as reflected in operating efficiency. The results potentially provide guidance for future transitions in other countries.

Maik Schwarz, Sébastien Van Belleghem, and Jean-Pierre Florens consider an additive measurement error model in which the error on measured inputs is assumed to be normal, but with unknown variance. They study a new estimator of the production frontier under this model and establish conditions required for identification and the consistency of their estimator. Their estimator is a modified version of the order- m frontier considered earlier by [Cazals et al. \(2002\)](#), and as such involves estimation of a survivor function for inputs conditioned on output variables.

Irène Gijbels and Abdelaati Daouia propose a new class of robust estimators of the production frontier in a deterministic frontier model. The class is based on so-called extremiles, which include the family of expected minimum-input frontiers and parallels the class of quantile-type frontiers. The class is motivated from several viewpoints, revealing its specific merits and strengths.

Alois Kneip and Robin Sickles revisit the [\(Solow 1957\)](#) residual and discuss how it has been interpreted by both the neoclassical production literature and the literature on productive efficiency. Kneip and Sickles argue that panel data are needed to estimate productive efficiency and innovation, and in doing so attempt to link the two strands of literature.

Paul Wilson extends theoretical results obtained by [Kneip et al. \(1998\)](#) for input- and output-oriented distance function estimators to hyperbolic distance function estimators. Asymptotic properties of two different hyperbolic data envelopment analysis distance function estimators are derived, and computationally efficient algorithms for computing the estimators are given. In addition, asymptotic results obtained by [Cazals et al. \(2002\)](#) for the input- and output-oriented order- m estimator are extended to the corresponding estimators in the hyperbolic orientation. The hyperbolic orientation is particularly useful for making cross-period comparisons, as in the case of estimation of changes in productivity, etc. using Malmquist or other indices, where infeasibilities often arise when working in the input or output directions due to shifts in the frontier over time.

Luiza Bădin and Cinzia Daraio consider the problem of estimating productive efficiency conditionally on environmental variables, some of which may be discrete. [Bădin et al. \(2010\)](#) proposed a data-driven, cross-validation technique for choosing bandwidths when the environmental variables are continuous. In this chapter, Bădin and Daraio describe how conditional estimation can be carried out when some environmental variables are continuous while others are discrete. The work builds on the work of [Li and Racine \(2008\)](#) which considers a similar problem in a regression context. Here, Bădin and Daraio also propose an heterogeneous bootstrap that allows one to make inference about the influence of environmental variables.

Cédric Heuchenne and Ingrid Van Keilegom cast the problem of regressing a random variable Y on a covariate X in terms of a location functional (which might be a conditional mean function, but which can also be a quantile or some other feature of interest) by focusing on L -functionals. Censoring is a common problem

in such problems, and Heuchenne and Van Keilegom propose a new method for estimation that involves nonparametric imputation for the censored observations. The approach should be useful in a variety of applications, but particularly so in survival analysis.

Seok-Oh Jeong and Byeong Park consider the general problem of estimating a convex set as well as the upper boundary of that convex set. Estimation of a production set and its frontier function with multivariate covariates are examples of such estimation tasks. The developed methodology is applied to conical hull estimators and data envelopment analysis. In addition, Jeong and Park discuss practical considerations for bias-correction and interval estimation in the frontier context.

Pavlos Almanidis and Robin Sickles consider parametric frontier estimation. Simar and Wilson (2010) examined problems for inference in the (Aigner et al. 1977) model in finite samples situations where residuals are sometimes skewed in an unexpected direction, even if the (Aigner et al. 1977) model is the correct specification. Almanidis and Sickles extend the (Aigner et al. 1977) model to allow for skewness in either direction using a doubly truncated distribution for inefficiency.

Yingcun Xia, Wolfgang Härdle, and Oliver Linton consider the problem of estimating a single index regression model. The authors propose a refinement of the minimum average conditional variance estimation (MAVE) method involving a practical and easy-to-implement iterative algorithm that allows the MAVE estimator to be readily derived. The authors also discuss the difficult problem of how to select the bandwidth for estimating the index. In addition, they show that under appropriate assumptions, their estimator is asymptotically normal and most efficient in a semi-parametric sense.

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