Méthodes d'estimation de la frontière d'efficience : robustesse et application en microfinance

Mercredi 20 Février 2019
Manufacture des Tabacs, Toulouse

Organisation
François FALL, Frédéric FERRATY, Romain GUILLAUME, Pascal SARDA

Présentation
Dans le cadre du projet ERTEEP-M (Equipe de Recherche sur les Techniques d'Estimation de l'Efficience en Microfinance) soutenu par la Maison des Sciences de l'Homme et de la Société de Toulouse, une journée d'étude est organisée le 20 Février 2019. L'objet de cette journée est d'échanger sur les outils récents d'estimation de l'efficience et de discuter leur pertinence et leur application dans le champ particulier de la microfinance. L'estimation de l'efficience est un enjeu majeur dans le contexte actuel de la microfinance marqué par une commercialisation accrue, un retrait important des subventions, une intensification de la concurrence et un recours de plus en plus important aux capitaux privés. Ces mutations constituent une menace réelle pour la mission sociale de la microfinance. Préserver la double mission financière et sociale dans ce contexte nécessite une meilleure gestion des ressources en microfinance. C'est ce qui explique l'explosion récente des travaux sur ce sujet, travaux qui trouvent un écho favorable auprès des acteurs de la microfinance. Toutefois, les analyses, dans leur écrasante majorité, utilisent les outils classiques comme la méthode d'enveloppement des données (DEA), l'analyse des frontières stochastiques SFA, etc., dont la robustesse est largement remise en cause dans la littérature. Combinant les réflexions de chercheurs en économie, gestion, maths, statistiques et recherche opérationnelle, cette journée cherche à tracer les pistes à explorer pour les recherches futures sur l'estimation de l'efficience en microfinance.

Accès
Manufacture des tabacs
Salle MQ001(bât. Q)
21 allée de Brienne, 31015 Toulouse
Métro ligne B : station Compans-Caffarelli
Bus : L1, 31, 63 [arrêt Barcelone-Leclerc]

Programme :

09 :00 Accueil / café

09 :30 Introduction de la journée – François Seck Fall (LEREPS, Université Toulouse 2 Jean Jaurès)

09 :45 Jean Pierre Florens (TSE, Université de Toulouse 1 Capitole)
Topics on Non Parametric Estimation of Efficiency Frontiers: Robustness, Endogeneity, Stochastic Frontiers and Environmental Variables.

10 :30 Anne Vanhems ((TSE, Toulouse Business School)
Unobserved heterogeneity and endogeneity in nonparametric frontier estimation

11 :15 Pause

11 :45 Abdelaati Daouia (TSE, Université de Toulouse 1 Capitole)
Data envelope fitting with constrained polynomial splines

12 :30 Repas

14 :00 François Seck Fall (LEREPS, Université Toulouse 2 Jean Jaurès)
Estimation de l'efficience en microfinance : points sur les outils et pistes non encore explorées

14 :45 Hubert Tchakoute Tchouguia (*Kedge Business School, Talence, France)*
Ownership type and efficiency of microfinance institution: A pseudo-Panel Malmquist Index Approach

15 :30 Pause

16 :00 Fall S. F., Ferraty F., Romain G., Sarda P. (Equipe de recherche ERTEEP-M, LEREPS, IMT, IRIT, UT2J)
Social/Financial dilemma and global efficiency of microfinance: analysis through a DEA estimate guided by synthetic inputs-outputs

16 :45 Fin de la journée

Résumé des interventions

Jean Pierre Florens (TSE, Université de Toulouse 1 Capitole)
Topics on Non Parametric Estimation of Efficiency Frontiers: Robustness, Endogeneity, Stochastic Frontiers and Environmental Variables.

Let us consider a random vector (Y; X; Z) where Y is a real variable measuring the cost, X a vector of outputs and Z a vector of environmental variables. The cost frontiers '(x; z) is defined as the minimum value of Y given X x and Z = z . The non parametric estimation of ' has long history (DEA or FDH methods) but these methods generate numerous questions which have been considered in my previous researches. In this seminar I want to address four questions:
- Usual non parametric methods are very sensitive to outliers. More robust estimations are then considered.
- The level of the outputs is always exogenous. This assumption may be relaxed in an instrumental variable framework.
- Usual non parametric methods estimate a deterministic frontier. Extension to non parametric approach of stochastic frontiers may be proposed.
- The introduction of the environmental variable Z is often done in a two steps methods non always valid. I will discuss some more relevant alternative approaches

Anne Vanhems (TSE, Toulouse Business School) & Léopold Simar (*Université Catholique de Louvain*)**.**
Unobserved heterogeneity and endogeneity in nonparametric frontier estimation

In production theory and efficiency analysis, firm efficiencies are measured by their distances to a production frontier, which is the geometrical locus of optimal combinations of inputs and outputs. It is today recognized that in the presence of heterogenous conditions (like environmental factors) that are not under the control of the producer but that may influence the shape and the position of the frontier, traditional measures of efficiency obtained in the space of inputs/outputs are much more difficult to interpret, since they mix managerial inefficiency and shift of the frontier. Using a nonparametric approach, this can be corrected by using the conditional frontiers and conditional efficiency scores developed in the literature. In this paper we extend these concepts in the case where the heterogeneity is not observed. We propose and analyze a model where the heterogeneity variable is linked to a particular input (or output). It is defined as the part of the input (or the output), independent from some instrumental variable through a non separable nonparametric model. We discuss endogeneity issues involved in this model. Under certain regularity assumptions, we show that the model is identified, we propose nonparametric estimators of the conditional frontier and the conditional efficiency score, and analyze their asymptotic properties. When using FDH estimators we prove the asymptotic convergence to a Weibull distribution, whereas when using the robust order-m estimators we obtain the asymptotic normality of the estimators. The method is illustrated with some simulated and real data examples. A Monte-Carlo experiment shows how the procedure works for finite samples.

Abdelaati Daouia (TSE, Université de Toulouse 1 Capitole)
Data envelope fitting with constrained polynomial splines

Estimation of support frontiers and boundaries often involves monotone and/or concave edge data smoothing. This estimation problem arises in various unrelated contexts, such as optimal cost and production assessments in econometrics and master curve prediction in the reliability programs of nuclear reactors. Very few constrained estimators of the support boundary of a bivariate distribution have been introduced in the literature. They are based on simple envelopment techniques which often suffer from lack of precision and smoothness. Combining the edge estimation idea of Hall, Park and Stern with the quadratic spline smoothing method of He and Shi, we develop a novel constrained fit of the boundary curve which benefits from the smoothness of spline approximation and the computational efficiency of linear programs.
Using cubic splines is also feasible and more attractive under multiple shape constraints; computing the optimal spline smoother is then formulated into a second-order cone programming problem. Both constrained quadratic and cubic spline frontiers have a similar level of computational complexity to the unconstrained fits and inherit their asymptotic properties. The utility of this method is illustrated through applications to some real datasets and simulation evidence is also presented to show its superiority over the best known methods.

François Fall (LEREPS, Université Toulouse 2 Jean Jaurès)

Efficiency analysis in microfinance: summary of the methods and avenues for future research

Efficiency analysis has become an important topic of study in microfinance (MF). Over the last decade, a significant number of empirical studies have been conducted on this subject wherein the methodologies centered mainly on the nonparametric DEA approach and the stochastic frontier method (SFA). However, the robustness of these usual methods has been widely criticized, especially the DEA approach. Also, the estimation choices made in most works do not guarantee a consideration of the specificities of MF. To date, there is no critical analysis of these methods and the estimation choices used which essentially is transposition of the work on bank efficiency literature on MF. In light of recent developments in the literature on the estimation of efficiency frontiers, we propose here a diagnosis of the methods used and identify the gaps. We recommend some avenues to explore in order to improve the literature on the efficiency of FM, integrating in the particularities of microfinance.

Hubert Tchakoute Tchouguia (*Kedge Business School, Talence, France)* & Isabelle PIOT-LEPETIT (*University of Montpellier, France)*

Ownership type and efficiency of microfinance institution: A pseudo-Panel Malmquist Index Approach

The objective of this study is to explore performance efficiency and technical change gaps between microfinance institutions (MFIs) based on their ownership type (Banks, Cooperatives and credit Unions and NGOs), allowing us to explore alternatives organizational approaches to carry out the microfinance activity and identify strengths and weaknesses of their managerial guideline and organizational structure. The paper uses a pseudo-panel Malmquist index approach to evaluate the performance of MFIs in Latin America over the 2005-2013 period in order to investigate the potential performance disparities among different groups of MFIs and to overcome the problem of a different number of observations per year. The selected approach based on Aparicio et al. (2017) avoids the need to pool all IMFs together to analyze groups differences. Performance of MFIs is investigated in its two main components, namely financial and social efficiency. Besides, the sample is divided into three sub-periods: pre-crisis (2005-2007), crisis (2008-2010) and post-crisis (2011-2013), for identifying the global financial crisis has impacted the different ownership types of MFIs.

Fall F., Ferraty F., Romain G., Sarda P. (Equipe de recherche ERTEEP-M, LEREPS, IMT, IRIT, UT2J)

Social/Financial dilemma and global efficiency of microfinance: analysis through a DEA estimate guided by synthetic inputs-outputs

The double performance or double-bottom-line of microfinance, also known as the "social / financial dilemma", has been the subject of much debate, which globally opposes the commercial profile institutions (banks and public limited companies) and the social profile institutions (NGOs, mutuals and cooperatives). Many empirical studies have analyzed this link but essentially from the standpoint of legal status or ownership. The implicit assumption underlying this work is that the choice between the social and the commercial is dictated solely by the legal status or type of ownership. This is not always true, especially in certain contexts such as sub-Saharan Africa. In addition, most studies have approached performance by conventional indicators that do not give an overall view of performance. In this paper, we estimate this link non-parametrically by making three major changes. (i) We analyze this link by taking into account the real relationship between the social and the commercial within each institution, whatever its legal status. (ii) We develop a multidimensional approach to performance, rather than basing the analysis on a few conventional indicators. (iii) The non-parametric estimation of efficiency is based on the construction of synthetic inputs (outputs) from the ACP of all inputs (outputs). Our results show that 1) the statute does not affect efficiency, 2) efficient MFIs respect a social / financial equilibrium, 3) MFIs orienting their activity too much to the social sector degrade their overall performance, 4) this analysis reveals Aberrant behavior for some of the MFIs