

# Local Least Squares Approach to Stochastic Frontier and Efficiency in Cross Section: Can We make it Fully Non-Parametric?

## Abstract

When analyzing productivity and efficiency of firms, stochastic frontier models are very attractive because they allow, as in typical regression models, to introduce some noise in the data generating process. Most of the approaches so far have been using very restrictive fully parametric specified models, both for the frontier function and for the components of the stochastic terms. Recently, local MLE approaches were introduced to relax these parametric hypotheses. However, the high computational complexity of the latter makes them difficult to use, in particular if bootstrap-based inference is needed. In this work we show that most of the benefits of the local MLE approach can be obtained with less assumptions and involving much easier, faster and numerically more robust computations, by using nonparametric least-squares methods. Our approach can also be viewed as a semi-parametric generalization of the so-called “modified OLS” that was introduced in the parametric setup. If the final evaluation of individual efficiencies requires, as in the local MLE approach, the local specification of the distributions of noise and inefficiencies, it is shown that a lot can be learned on the production process without such specifications. Even elasticities of the mean inefficiency can be analyzed with unspecified noise distribution and a general class of local one-parameter scale family for inefficiencies. This allows to discuss the variation in inefficiency levels with respect to explanatory variables with minimal assumptions on the data generating process. Our method is also illustrated with a real data set.