Efficient estimation of spatial econometrics models with skewed and/or heavy-tailed distributed errors

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March 25, 2022

Abstract

In spatial econometrics, estimation of models by maximum likelihood (ML) generally relies on the assumption of normally distributed errors. While this approach leads to highly efficient estimators when the distribution is Gaussian, GMM might yield more efficient estimators if the distribution is misspecified. For the SAR model, Lee (2004) proposes an alternative QML estimator that is less sensitive to the violation of the normality assumption. In this paper, we derive an estimator that is highly efficient in case of skewed and/or heavy tailed distributions. More precisely, we here assume that the distribution of the errors is a Tukey g-and-h (Tgh hereafter). However, since the density function of the Tgh has no explicit form, the optimization program for the MLE needs a numeric inversion of the quantile function to fit the model, which is a computationally demanding task. To solve this difficulty, we rely on the local asymptotic normality (LAN) property of spatial econometrics models to propose an estimator that avoids such a computational burden. Our Monte Carlo simulations show that our estimator outperforms the ones available as soon as the distribution of the errors departs from Gaussianity either by exhibiting heavier tails or skewness. We illustrate the usefulness of the suggested procedure relying on a trade regression.

*Vincenzo Verardi is Associated Researcher of the FNRS and gratefully aknowledges their financial support.