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Variable selection for spatial semivarying coefficient models

Kangning Wang[1,2]

Abstract Spatial semiparametric varying coefficient models are a useful extension of spatial linear model. Nevertheless, how to conduct variable selection for it has not been well investigated. In this paper, by basis spline approximation together with a general M-type loss function to treat mean, median, quantile and robust mean regressions in one setting, we propose a novel partially adaptive group $L_r (r \geq 1)$ penalized M-type estimator, which can select variables and estimate coefficients simultaneously. Under mild conditions, the selection consistency and oracle property in estimation are established. The new method has several distinctive features: (1) it achieves robustness against outliers and heavy-tail distributions; (2) it is more flexible to accommodate heterogeneity and allows the set of relevant variables to vary across quantiles; (3) it can keep balance between efficiency and robustness. Simulation studies and real data analysis are included to illustrate our approach.

Keywords Geostatistics · Variable selection · Robustness · Heterogeneity · Penalized M-type estimator · Oracle property

✉ Kangning Wang
wkn1986@126.com

[1] School of Statistics, Shandong Technology and Business University, Yantai 264005, China

[2] Institute for Financial Studies, Shandong University, Jinan 250100, China