Local spatial quantile estimation of multivariate functional-coefficient regression models

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Abstract

In this dissertation we propose a local spatial quantile regression method to estimate the functional coefficient matrices of multivariate time series. First, a "local spatial quantile regression" estimator (LSQR) is proposed by running spatial quantile regression and local smoothing. Then we propose a "weighted composite LSQR" estimator (WCLSQR) using the idea of weighted composite quantile regression for better performance. We establish the asymptotic normality of the proposed estimators, based on which we also consider the procedures to select the optimal bandwidth and the optimal weights for the estimation. Furthermore, to achieve computational efficiency, we propose a "smoothed spatial QR" which simplifies and accelerates the minimization problem in the spatial quantile regression. Based on the smoothed spatial QR, we propose the smoothed LSQR and WCLSQR estimators using the same technique as LSQR and WCLSQR. By establishing the asymptotic normality of the proposed estimators, we show that the estimators using the smoothed spatial QR can achieve comparable performance with a proper choice of the smoothing parameter while consuming less computing resource. Simulation study of the proposed estimators demonstrates good finite sample performance and computational efficiency. We also demonstrate a real example to show the application of our method.

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