

Quantile estimations via modified Cholesky decomposition for longitudinal single-index models

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Abstract Quantile regression is a powerful complement to the usual mean regression and becomes increasingly popular due to its desirable properties. In longitudinal studies, it is necessary to consider the intra-subject correlation among repeated measures over time to improve the estimation efficiency. In this paper, we focus on longitudinal single-index models. Firstly, we apply the modified Cholesky decomposition to parameterize the intra-subject covariance matrix and develop a regression approach to estimate the parameters of the covariance matrix. Secondly, we propose efficient quantile estimating equations for the index coefficients and the link function based on the estimated covariance matrix. Since the proposed estimating equations include a discrete indicator function, we propose smoothed estimating equations for fast and accurate computation of the index coefficients, as well as their asymptotic covariances. Thirdly, we establish the asymptotic properties of the proposed estimators. Finally, simulation studies and a real data analysis have illustrated the efficiency of the proposed approach.

Keywords B-spline · Longitudinal data · Modified Cholesky decomposition · Quantile regression · Single-index models

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