Robust generalized likelihood ratio test based on penalization

Meijiao Zhang

Preprint no. 2018-06

Abstract

The Least Absolute Deviation combined with the least absolute shrinkage and selection operator (LAD-lasso) estimator can do regression shrinkage and selection, and is also resistant to outliers or heavy-tailed errors. Generalized Likelihood Ratio (GLR) test motivated from the likelihood principle, which does not require knowing the underlying distribution family and also shares the Wilks property, has wide applications and nice interpretations. In this dissertation, we propose a GLR test based on LAD-lasso estimators in order to combine their advantages together. We obtain the asymptotic distributions of the test statistics by applying the Bahadur representation of the LAD-lasso estimators into the quantile regression theories. Furthermore, we show that the test has oracle property and can detect alternatives nearing the null hypothesis at a rate of $\sqrt{n}$. Simulations are conducted to compare test statistics under different procedures for a variety of error distributions including normal, $t(3)$ and mixed normal. A real data example is used to illustrate the performance of the testing approach.

Department of Mathematics, UNC Charlotte, Charlotte, NC 28223