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Bayesian Variable Selection in Quantile Regression with Application to the Health and Retirement Study

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Abstract : There is a rich literature on variable selection in regression setting. However, most of these methods assume normality for the response variable under consideration for implementing the methodology and establishing the statistical properties of the estimates. In many real applications, the distribution for the response variable may be non-Gaussian, and one might be interested in finding the best subset of covariates at some predetermined quantile level. We develop dynamic Bayesian approach for variable selection in quantile regression framework. We use a zero-inflated mixture prior for the regression coefficients, and consider the asymmetric Laplace distribution for the response variable for modeling different quantiles of its distribution. An efficient Gibbs sampler is developed for our computation. Our proposed approach is assessed through extensive simulation studies, and real application of the proposed approach is also illustrated. We consider the data from health and retirement study conducted by the University of Michigan, and select the important predictors when the outcome of interest is out-of-pocket medical cost, which is considered as an important measure for financial risk. Our analysis finds important predictors at different quantiles of the outcome, and thus enhance our understanding on the effects of different predictors on the out-of-pocket medical cost.

Keywords : variable selection, quantile regression, Gibbs sampler, asymmetric Laplace distribution
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