Bayesian quantile structural equation models

Yifan Wang

Department of Statistics, The Chinese University of Hong Kong

Abstract

Structural equation modeling is a common multivariate technique for the assessment of the interrelationships among latent variables. In recent years, structural equation models (SEMs) have been extensively applied to behavioral, medical, and social sciences. Basic SEMs consist of a measurement equation for characterizing latent variables through multiple observed variables and a mean regression-type structural equation for investigating how explanatory latent variables influence outcomes of interest. However, the mean regression-type structural equation does not provide a comprehensive analysis of the relationship between latent variables. In this paper, we introduce the quantile regression method into SEMs to assess the conditional quantile of the outcome latent variable given the explanatory latent variables and covariates. The estimation is conducted in a Bayesian framework with MCMC algorithm, and the posterior inference is performed with the help of asymmetric Laplace distribution. A simulation study shows that the proposed method performs satisfactorily. An application to a real study on the risk factors of chronic kidney disease is presented.