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A General Framework for Quantile Estimation with Incomplete Data

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ABSTRACT

Quantile estimation has attracted significant research interests in recent years. However, there has been only a limited literature on quantile estimation in the presence of incomplete data. In this paper, we propose a general framework to address this problem. Our framework combines the two widely adopted approaches for missing data analysis, the imputation approach and the inverse probability weighting approach, via the empirical likelihood method. The proposed method is capable of dealing with many different missingness settings. We mainly study three of them: (i) estimating the marginal quantile of a response that is subject to missingness while there are fully observed covariates; (ii) estimating the conditional quantile of a fully observed response while the covariates are partially available; and (iii) estimating the conditional quantile of a response that is subject to missingness with fully observed covariates and extra auxiliary variables. The proposed method allows multiple models for both the missingness probability and the data distribution. The resulting estimators are multiply robust in the sense that they are consistent if any one of these models is correctly specified. The asymptotic distributions are established using the empirical process theory.

Joint work with Peisong Han, Jiwei Zhao and Xingcai Zhou.