A Quantile Cure Model with Fully or Partially Functional Covariate Effects

Chyong-Mei Chen

Institute of Public Health, School of Medicine, National Yang Ming Chiao Tung University

Abstract

The quantile regression has several attractive features, such as its ability to allow covariate effects to vary at different quantile levels and to handle heteroscedasticity in data easily, which make it a viable alternative when analyzing data with continuous outcomes in recent years. In particular, it has been used in modeling survival data with and without a cured fraction. In this work, we propose novel estimating equation approaches to estimate a mixture cure model where the latency survival time is modeled by a quantile regression. The proposed estimation methods enjoy a double robustness in the sense that a misspecification in one of the two parts in the mixture cure model will not affect the estimation in the other part. The methods do not require the global log-linear assumption in the quantile regression, and they allow mixed effects of functional and constant effects in the regression when the log-linear assumption is hold in an interval of quantile levels. We established the asymptotic properties of the proposed estimators. Our simulation studies demonstrated the double robustness and the efficiency gains in the proposed estimators. An application of the proposed model and methods to data from a lung cancer study revealed new and interesting findings that were not reported in a previous analysis of the data. This is joint work with Prof. Yingwei Peng.

Keyword: Estimating equation; Inverse probability censoring weight; Mixture cure model; Quantile regression model