

THE NONPARAMETRIC METHODS FOR THE ANALYSIS OF INTERVAL-CENSORED FAILURE TIME DATA

Ran Duan

Dr. Jianguo Sun, Dissertation Supervisor

ABSTRACT

My dissertation is about the nonparametric analysis of interval-censored failure time data. I focus on two very important directions. One is the nonparametric comparison of interval-censored data, the other one is the regression analysis of multivariate interval censored data.

For the nonparametric comparison of interval censored data, I proposed a new class of test procedures whose asymptotic distributions are established under both null and alternative hypotheses, since the entire existing test procedures cannot be used if one intends to perform some power or sample size calculation under the alternative hypothesis. We applied the proposed method to a real data set arising from an AIDS clinical trial concerning the opportunistic infection cytomegalovirus (CMV).

Moreover, as we know, one common drawback or restriction of the nonparametric test procedures given in the literature is that they can only apply to situations where the observation processes follow the same distribution among different treatment groups. To remove the restriction, a test procedure is proposed, which takes into account the difference between the distributions of the censoring variables. Also the asymptotic distribution of the test statistics is developed by counting process and martingale theory. An illustrative example from a study aiming to investigate the HIV -1 infection risk among hemophilia patients is provided.

For the regression analysis of interval censored data, different types of models have been proposed for the regression analysis (Zhang et al. (2008); Tong et al.(2008); Chen et al.(2009); Sun (2006)). However, most of these methods only deal with the situation where observation time is independent of the underlying survival time completely or given covariates. In my dissertation, we discuss regression analysis of multivariate interval-censored data when the observation time may be related to the underlying survival time. An estimating equation based approach is proposed for regression coefficient estimate with the additive hazards frailty model and the asymptotic properties of the proposed estimates are established by using counting processes. A major advantage of the proposed method is that it does not involve estimation of any baseline hazard function.