Public Abstract

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Title:STATISTICAL ANALYSIS OF MULTIVARIATE
INTERVAL-CENSORED FAILURE TIME DATA

A voluminous literature on right-censored failure time data has been developed in the past 30 years. Due to advances in biomedical research, interval censoring has become increasingly common in medical follow-up studies. In these cases, each study subject is examined or observed periodically, thus the observed failure time falls into a certain interval.

  Additional problems arise in the analysis of multivariate interval-censored failure time data. These include the estimating the correlation among failure times. The first part of this dissertation considers regression analysis of multivariate interval-censored failure time data using the proportional odds model. One situation in which the proportional odds model is preferred is when the covariate effects diminish over time. In contrast, if the proportional hazards model is applied for the situation, one may have to deal with time-dependent covariates. We present an inference approach for fitting the model to multivariate interval-censored failure time data. Simulation studies are conducted and an AIDS clinical trial is analyzed by using this methodology.

  The second part of this dissertation is devoted to the additive hazards model for multivariate interval-censored failure time data. In many applications, the proportional hazards model may not be appropriate and the additive hazards model provides an important and useful alternative. The presented estimates of regression parameters are consistent and asymptotically normal and a robust estimate of their covariance matrix is given that takes into account the correlation of the survival variables. Simulation studies are conducted for practical situations.

  The third part of this dissertation discusses regression analysis of multivariate interval-censored failure time data using the frailty model approach. Based on the most commonly used regression model, the proportional hazards model, the frailty model approach considers the random effect directly models the correlation between multivariate failure times. For the analysis, we will focus on current status or case I interval-censored data and the maximum likelihood approach is developed for inference. The simulation studies are conducted to asses and compare the finite-sample behaviors of the estimators and we apply the proposed method to an animal tumorigenicity experiment.