Statistical Analysis of Mark-Specific Proportional Hazards Model

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Abstract

Competing risks occur frequently in survival analysis, and in some cases, the competing risks are not discrete. In this dissertation, we develop some statistical inferences to analyze continuous competing risks. In Chapter 2, inspired by the HIV vaccine trials, we extend the modeling of mark-specific hazards function to multivariate marks to better fit the HIV data. We develop the partial likelihood based parametric procedure to estimate the coefficients. The asymptotic properties of the proposed estimators are derived. We propose some tests to examine a variety of null hypotheses to understand how relevant the two distances are for protection. Finite sample performances of the proposed methods, are examined through extensive simulations and are shown satisfying. The methods are applied to STEP data to evaluate the vaccine efficacy and its dependence on the multivariate marks. A goodness of fit procedure is also developed. The test statistics are constructed based on the score function and the generalized weighted martingale residuals. The performance of tests are also examined through simulations. And the tests are used to check adequacy of the multivariate mark-specific proportional hazard model for STEP data. In Chapter 3, we develop a goodness of it procedure for the stratified mark-specific proportional hazard model with continuous marks. Coefficients are estimated through partial likelihood based kernel smoothing method. The asymptotic properties of the proposed estimators are derived. We also construct confidence bands for vaccine efficacy. We focus on the goodness of fit test of the model. The test statistics are constructed based on the generalized weighted martingale residuals. The finite sample properties of proposed tests are examined through simulations.

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