An Estimating Equation for Survival Data with a Possibly Time-Varying Covariates under a Semiparametric Transformation Models

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Abstract : An estimating equation technique is an alternative method of the widely used maximum likelihood methods, which enables us to ease some complexity due to the complex characteristics of time-varying covariates. In the situations, when both the time-varying covariates and left-truncation are considered in the model, the maximum likelihood estimation procedures become much more burdensome and complex. To ease the complexity, in this study, the modified estimating equations those have been given high attention and considerations in many researchers under semiparametric transformation model was proposed. The purpose of this article was to develop the modified estimating equation under flexible and general class of semiparametric transformation models for left-truncated and right censored survival data with time-varying covariates. Besides the commonly applied Cox proportional hazards model, such kind of problems can be also analyzed with a general class of semiparametric transformation models to estimate the effect of treatment given possibly time-varying covariates on the survival time. The consistency and asymptotic properties of the estimators were intuitively derived via the expectation-maximization (EM) algorithm. The characteristics of the estimators in the finite sample performance for the proposed model were illustrated via simulation studies and Stanford heart transplant real data examples. To sum up the study, the bias for covariates has been adjusted by estimating density function for the truncation time variable. Then the effect of possibly time-varying covariates was evaluated in some special semiparametric transformation models.

Keywords : EM algorithm, estimating equation, semiparametric transformation models, time-to-event outcomes, time varying covariate

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