Partly Conditional Estimation of the Effect of a Time-dependent Factor in the Presence of Dependent Censoring

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Abstract

We propose semiparametric methods for estimating the effect of a time-dependent covariate on treatment-free survival. The observed data for each subject include longitudinal sequences of measurements, several of which are highly predictive of both the event of interest (death in the absence of treatment) and treatment assignment. Survival times may be censored independently (e.g., administratively) or dependently (via the receipt of treatment). An additional complication is that patients may become treatment-ineligible, temporarily or permanently. The proposed methods combine landmark analysis and partly conditional hazard regression. The hazard model of interest is marginal in the sense that it uses covariates 'frozen' at the time of each landmark. The resulting dependent censoring is overcome using the well-known Inverse Probability of Censoring Weighting. The proposed estimators are shown to be consistent and asymptotically normal, with consistent variance estimators provided. Simulation studies reveal that the proposed estimation procedures are appropriate for practical sample sizes. We present an application to the motivating data set obtained from the Scientific Registry of Transplant Recipients.

Keywords: Cross-sectional analysis; Cox regression; Partly conditional model; Inverse weighting; Treatment-free survival.

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