On approaches for modelling time-varying effects in survival analysis

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The Cox proportional hazards (PH) model is the standard tool for the analysis of survival time data in many application areas in medicine. With long-term follow-up, time-varying effects of covariates measured at time $t = 0$ are often observed, and these violate the PH assumption. To overcome this problem, Cox proposed to include an interaction between a covariate and a prespecified parametric function of time. However, a particular function has to be specified.

Since then, several approaches have been proposed for the modelling of time-varying effects, such as step-function models based on partitioning the time-axis, fractional polynomial based models [1, 3], reduced rank models [2] and semiparametric approaches based on cumulative regression functions [4]. So far, knowledge on properties of the procedures is limited and no larger comparison of results in real data has been published.

We will briefly introduce the above approaches and apply them to a data set from Rotterdam in primary breast cancer (N=2982, 1518 events, 20 years follow-up, 10 covariates). In this data set we will compare the results obtained for the different approaches.

References

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