

Extending the Classical Koziol-Green model by using a copula function

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SUMMARY

In survival analysis, we are interested in the time until an event. However, due to different practical reasons, we often do not fully observe this time. There is a second independent random variable, a censoring time, which obscures the observation process and we only observe the smallest of both times and an indicator variable that indicates which variable is the smallest. The classical approach to estimate the distribution function for the time until an event under the assumption that the distribution of the censoring time is informative for this time until an event is by the Koziol-Green model. In this model, it is assumed that the survival function of the censoring time is a power of the survival function of the time until an event. In this talk, we generalize this model and assume a parametric function, depending on a parameter θ , to describe the relationship between the distribution functions of the time until an event and the censoring time. Hereby we first show that this assumption is equivalent to specifying a slide of a copula function between the observed lifetime and the censoring indicator. Based on this equivalence, we propose a pseudo maximum likelihood function to estimate the parameter θ . Furthermore we construct a semi-parametric estimator for the distribution function of the time until an event. As results, we first show the consistency and asymptotic normality of the parameter θ . Next we derive the weak convergence of the process associated to the semi-parametric estimator for the distribution function of the time until an event. In a simulation study, we investigate the finite sample performance of these estimators and finally we apply this model to a practical data set on survival with malignant melanoma.

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