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TWO-SAMPLE PROBLEMS OF SURVIVAL DATA

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Most often in the survival data analysis researchers are interested to compare two or more groups of patients exposed to different treatment. Comparing two survival curves is only a rough way to show the difference. Some testing procedures are required in that case.

The Cox proportional hazards model introduced in 1972 by David Cox is the most important distribution-free regression model in survival analysis. It can be expressed as

$$h(t;\beta,\mathbf{Z}) = e^{\beta^T \mathbf{Z}} h_0(t),$$

where $h_0(\cdot)$ is a baseline hazard function and $h(t;\beta,\mathbf{Z})$ is a hazard function associated with $h_0(t)$ through the covariate $\mathbf{Z}$ and the parameter β.

When the covariate is a single binary variable indicating, for example, treatment groups, the model simply says that the survival function of one group is a power transformation of the other, thereby we encounter the two-sample problem. It shows that there is an important connection of Cox proportional hazards model to the class of Lehmann alternatives. Two distribution functions F_1 and F_2 belong to that class if the relationship

$$F_1(t) = 1 - [1 - F_2(t)]^{1/h}, \quad t \in \mathbb{R}$$

holds with some parameter $h > 0$.

Valeinis and Cers [1] established the empirical likelihood method for two-sample problems in a general framework which also includes Lehmann alternatives as a special case of structural relationship models. We use the same empirical likelihood approach to deal with various two-sample problems for the censored data case such as Lehmann alternatives, the difference of survival functions, the two-sample cox proportional hazards model etc.

REFERENCES

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