Covariate-adjusted generalized pairwise comparisons in small samples

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1   Short Bio

Dr. Stijn Jaspers (stijn.jaspers@uhasselt.be) holds a master degree in statistics - trajectory epidemiology and public health methodology, and a PhD in biostatistics (2016) on "Development of new semi-parametric mixture models for interval censored data: mathematical properties, performance for finite samples, comparison of different approaches, with applications in antimicrobial resistance". His current research focuses, amongst others, on the field of generalized pairwise comparisons using probabilistic index models and the exploration of the latter in multivariate and small sample settings.

2   Short Summary

Generalized pairwise comparisons, as introduced by Buyse (2010) [1], offer a highly flexible class of statistical methodologies, that can be used in the comparison of two (or more) groups of subjects for which multiple outcomes have been collected. The outcomes can be of any type (categorical, continuous, or time-to-event), and hence the area of application is very broad, also encompassing for example dose toxicity studies.

Semiparametric Probabilistic Index Models (PIM) (Thas et al., 2012) [2] allow for the comparison of two groups of observations, whilst adjusting for covariates, thereby fitting nicely within the framework of Generalized Pairwise Comparisons. As with most regression approaches, when limited amount of data is available, PIM results into invalid inference as the asymptotic normality assumption is not met. In addition, separation issues might arise when considering small samples. In this talk, we show that the parameters of the Probabilistic Index Model can be estimated using Generalized Estimating Equations, for which adjustments exist that lead to estimators of the sandwich variance-covariance matrix with improved finite sample properties and that can deal with bias due to separation. In this way, appropriate inference for small samples can be performed as is shown through extensive simulation studies.

The known relationships between the probabilistic index and other GPC statistics allow to also provide valid inference for e.g. the net treatment benefit or the success odds. This is further exemplified through a data application related to a toxicological study on pyridine performed in rats.

References

[1] Buyse, M. (2010) *Generalized pairwise comparisons of prioritized outcomes in the two-sample problem.* Statistics in Medicine, 30(29), 3245-3257

[2] Thas, O., De Neve, J., Clement, L. and Ottoy, J.P. (2012). *Probabilistic Index Models*, Journal of the Royal Statistical Society B, 74(4), 623-671.

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