

# Regression models for rank tests when samples are small

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## Suggested talk duration (15-60 minutes)

30 minutes (if possible)

## Summary (max. 500 words)

We demonstrate how many classical rank tests, such as the Wilcoxon-Mann-Whitney, Kruskal-Wallis and Friedman test, can be embedded in a statistical modelling framework and how the method can be used to construct new rank tests. In addition to hypothesis testing, the method allows for estimating effect sizes with an informative interpretation, resulting in a better understanding of the data. Our method results from two particular parametrizations of probabilistic index models (Thas et al., 2012). The popularity of rank tests for small sample inference makes probabilistic index models also natural candidates for small sample studies. However inference for such models relies on asymptotic theory that can deliver poor approximations of the sampling distribution if the sample size is rather small. We therefore explore a bias-reduced version of the bootstrap and adjusted jackknife empirical likelihood and show that their application leads to drastic improvements in small sample inference for probabilistic index models. These results justify the use of such models for reliable and informative statistical inference in small sample studies.

## References:

Thas, O. De Neve, J. Clement, L. and Ottoy, JP. (2012). Probabilistic index models (with Discussion). *Journal of the Royal Statistical Society - Series B.* 74:623-671.

De Neve, J. and Thas, O. (2015) A Regression framework for rank tests based on the probabilistic index model. *Journal of the American Statistical Association.* 110:1276-1283.

Amorim, G., Thas, O., Vermeulen, K., Vansteelandt, S. and De Neve, J. Small sample inference for probabilistic index models (under review).

## Relevance to conference theme

Rank tests are typically used when sample sizes are small. In this presentation we discuss how rank tests can be embedded in a regression context and how asymptotic estimation theory can be improved for small sample sizes.

## Keywords (max. 3)

Wilcoxon-Mann-Whitney test, rank tests, small sample inference.