

Analyzing paired-comparison data in R using probabilistic choice models

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When human subjects are required to evaluate a set of options or stimuli with respect to some attribute, the simplest data that can be obtained are binary paired-comparison judgments. Such data might result from so-called sensory evaluation studies, where participants are asked to judge which of two audio samples sounds brighter or more natural, which of two coffee brands tastes better, or from surveys where subjects are to indicate which political party they would vote for or which insurance package they would rather buy. It is the goal of the analysis of the data to arrive at a scaling of the options involved.

A well known model for paired-comparison data is the Bradley-Terry-Luce (BTL) model that relates the pairwise choice probabilities to scale values representing the weight or strength of each option. Often in empirical studies, however, it is found that the data do not meet the restrictions imposed by the BTL model, one of them being that the choices are made independently of the context introduced by a given pair. In psychology, more general models have been developed, the most prominent one being the elimination-by-aspects (EBA) model (Tversky, 1972; Tversky & Sattath, 1979), which does not require context independence of the judgments.

Although these general models seem to be promising alternatives to the BTL model, they have not been frequently applied, presumably due to the lack of easy-to-use software for their fitting and testing. The presentation will illustrate the analysis of paired-comparison data using the `eba` package in R (Wickelmaier & Schmid, 2004). It will be demonstrated with examples from empirical research that, whenever similarity among the options of a choice set plays a role, the modeling is more successful when more complex choice models, such as EBA, are employed.

Tversky, A. (1972). Elimination by aspects: A theory of choice. *Psychological Review*, 79, 281-299.

Tversky, A., & Sattath, S. (1979). Preference trees. *Psychological Review*, 86, 542-573.

Wickelmaier, F. & Schmid, C. (2004). A Matlab function to estimate choice-model parameters from paired-comparison data. *Behavior Research Methods, Instruments, and Computers*, 36, 29-40.