

The ordinal pairwise comparisons with and without ties

KONRAD KULAKOWSKI

AGH University of Science and Technology, Kraków, Poland

Comparing alternatives in pairs are the well-known method of ranking creation. The experts are asked to perform a series of binary comparisons next using the mathematical methods the final ranking is prepared. As experts do the individual assessments, they may not always be consistent. The level of inconsistency among individual assessments is widely accepted as a measure of the ranking quality. The higher the ranking quality, the greater its credibility.

One way to determine the level of inconsistency among the paired comparisons is to calculate the value of inconsistency index. One of the earliest and most widespread inconsistency indexes is consistency coefficient defined by Kendall and Babington Smith. In their work, the authors consider binary pairwise comparisons, i.e., those where the result of an individual comparison can only be: better or worse. The presented work extends the Kendall and Babington Smith index to the set of paired comparison with ties. Hence, this extension allows the decision makers to determine the inconsistency for sets of paired comparisons that can result “worse,” “better” or “equal.” To capture the quantitative relationship between the consistent and inconsistent triads of pairwise comparisons new absolute inconsistency index is introduced.

The presentation contains definition and analysis of the most inconsistent set of pairwise comparisons with and without ties. In particular, for the first time, the number of inconsistent triads in the ordinal pairwise comparisons matrix with ties is given. It is also shown that the most inconsistent set of pairwise comparisons with ties is also a solution of a particular case of a set cover problem.