Robustness Properties of Generalized Correlation Coefficients, with Applications to Crossover Designs

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Abstract

To date, correlation coefficients have been the most utilized statistical measures in many fields for investigating the presence of a relationship between two variables or among several variables. Unfortunately, presently in the literature, there is a lack of discussion of correlation coefficients within the context of crossover designs.

A new and general 'class' of correlation coefficients that contains Pearson and Kendall statistics as two special members, being referred to as `Generalized Correlation Coefficient' (GCC) hereafter, was proposed by Chinchilli et al. (2005). Their approach gives a platform for defining and estimating the correlation coefficient within the context of a 2 × 2 crossover design. However, the authors do not pursue the robustness properties of the Generalized Correlation Coefficient. Thus, the basic stage we are studying is the development of the Generalized Correlation Coefficient, and an objective of our study is to derive the associated influence function that can address robustness behaviors of the Generalized Correlation Coefficient. In addition, we broaden the work of Chinchilli et al. (2005), allowing for the Generalized Correlation coefficient being applicable to more complex crossover designs which are uniform within sequences. We develop the corresponding asymptotic theory and influence function in this direction. Moreover, contours of constant influence for the Generalized Correlation Coefficient are introduced as well in this study. They are demonstrated to be useful for detecting unusual observations in a given data set.