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A Different correlation matrix for factor analysis in categorical data: Goodman-Kruskal Lambda

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Abstract

Introduction: Factor analysis is frequently carried out with categorical data in the field of education and social sciences. Tetrachoric/polychoric correlation matrix is used in exploratory or confirmatory factor analysis performed with categorical data. However, it is stated in the literature that tetrachoric/polychoric correlations require large sample size.

Aim: The aim of this study is to investigate whether a Goodman-Kruskal Lambda correlation can be an alternative for exploratory factor analysis (EFA) performed with a tetrachoric/polychoric correlation matrix.

Method: This study is a Monte Carlo simulation. Simulation conditions; number of categories of indicators (2, 3, 4 and 5), average factor loading (0.40, 0.70), distribution of variables (left skewed, normal, right skewed) and sample size (100, 200, 500, 1000 and 5000). There are $4 \times 2 \times 3 \times 5 = 120$ simulation conditions. 100 replications were generated. EFA was carried out with the generated data sets. Principle axis was used for factor extraction method. Datasets have 20 indicators and they are unidimensional. Relative bias (RB) values are considered as dependent variables.

Findings: As a result of the research, it was observed that as the number of categories increased, the Lambda correlation matrix was biased within acceptable limits ($RB < |0.10|$). In addition, it has been observed that Lambda correlations are acceptable bias in some conditions where polychoric correlation matrix cannot be calculated. It can be said that Lambda correlations tend to overestimate for factor loadings. According to the results of the research, it can be suggested to consider that lambda correlation can also be used in small samples, especially in which the polychoric correlation coefficient cannot be calculated.

Key Words: Exploratory Factor Analysis, Correlation Techniques

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