Evaluation and Comparison among SEM, ESEM and BSEM in Estimating Structural Models with Potentially Unknown Cross-loadings

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Cross-loadings are common in multidimensional instruments but could not be appropriately addressed in conventional structural equation modeling (SEM) due to the assumption of zero cross-loadings in standard confirmatory factor analysis (CFA). Although it has been proposed that exploratory equation modeling (ESEM) and Bayesian structural equation modeling (BSEM) could address this issue more flexibly, their performance in structural parameter estimation have not been adequately compared. This study used simulated data to evaluate and compare SEM, ESEM, and BSEM in estimating structural models under different manipulated conditions (i.e., the size of sample, target loading, cross-loading and path coefficients). Results showed that the performance of these approaches were similar when cross-loadings were zero or small. In the case of non-ignorable cross-loadings, SEM performed relatively poor and the performance of BSEM depended largely on the accuracy of priors for cross-loadings. ESEM was superior to SEM and BSEM with zero-mean priors for cross-loadings in general but did not exceed BSEM with correctly specified prior means for cross-loadings in most evaluation measures. Recommended strategies to choose an appropriate modeling approach were discussed based on our findings.

Keywords: structural equation modeling, cross-loadings, Bayesian analysis