

Assessing local fit

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Abstract

A SUPER AWESOME AMAZING ABSTRACT THAT SAYS THINGS ABOUT STUFF

Keywords: local fit, factor analysis, Laplace

Assessing local fit

Introduce the idea of assessing model fit

- add info about the explosion of fit indices
- reference local fit methods: Wald-test, mod indices, etc.

End with describing main purpose of the paper: describe the use of the proposed method of local fit evaluation.

Local Fit Evaluation

Need to outline the what local fit means.

Wald Tests

Modification Indices

Yeah...

Model Implied Instrumental Variables

Lots to look at here.

Bollen, K.A. (2019a). Model Implied Instrumental Variables (MIIVs): An alternative orientation to structural equation modeling. *Multivariate Behavioral Research* 54:1, 31-46, DOI: 10.1080/00273171.2018.1483224.

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Fisher, Z. F., Bollen, K. A., Gates, K. M., & Rönkkö, M. (2017). MIIVsem: Model implied instrumental variable (MIIV) estimation of structural equation models. R Package Version 0.5.2.

Residual Matrices

Evaluating a residual covariance matrix can provide insight into which bivariate relationships are not being captured by the proposed model. Four main types of residual covariance matrices are: 1) covariance residuals; 2) correlation residuals; 3) standardized residuals; and 4) normalized residuals. Each type of residual can help provide evidence of

where one's model needs to be modified to better represent one's data.

Proposed Bayesian Method

The above methods have provided us with many excellent ways of investigating how the proposed measurement structures capture the relationships in observed data. However, we were still left in a bit of quandary as to whether any potential changes would be of a substantive importance. We developed a hopefully straightforward approach to tackling this aspect of local fit evaluation by means of successive approximation of the non-estimated parameters. In our experience, we have found that the model changes proposed through modification indices results in parameter estimates that were of little substantive meaning. For example, a cross-loading that is low or a residual covariance that suggests a weak relationship that substantively doesn't add to our understanding of the measurement of the construct of interest.

We propose a method that approximates what the magnitude of the non-estimated parameters would be and to couch the estimates in terms of the probability that the parameter is of substantive interest. The idea is to set a threshold that we would consider to be of substantive meaningfulness. This is similar to defining a "region of practical equivalence (ROPE)" described in Shi et al. (2019). The ROPE is a region in the parameter space that the researcher determines to be insignificant, and this is already done in most applications of exploratory factor analysis (EFA) when the researcher suppresses factor loadings that are below 0.32 (Benson & Nasser, 1998).

Introduction to Bayesian Approach

A light introduction to Bayes idea - The Bayes LCA article is good example of how this can be done without being too technical.

Laplace Approximation

Describe Laplace's method for approximating posterior

Applying Laplace to CFA

describe how the above method can be used for individual parameters in a CFA model - testing parameters similar to modification indices.

- maybe supply a general algorithm block to describe the code

The code was written in R (R Core Team, 2020) so that the code can easily build on the lavaan package (Rosseel, 2012).

- condense code?

Illustrative Example

Apply the method to a misspecified KNOWN model

- simulate a normal theory CFA model
- Apply Laplace method, mod indices, etc.

Maybe try to find a good dataset to apply the methods to.

Conclusion

describe thoughts on how this method appears to stack up against existing methods.

Notes on what issues arise in using method

What should be done in future developments to help make the method more accessible

References

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Appendix

R Code

Create a self-contained function - will contain subfunctions.