Fit Indices Details

The fit indices provided in the `simsem` package:

Chi-square Test of the Target Model (χ^2_T). The value of chi-square is the -2 times log likelihood between the observed means and covariance matrix and model-implied means and covariance matrix. The degree of freedom (df_T) is the number of elements in the means and covariance matrix subtracted by the number of free parameters in the target model.

Chi-square Test of the Baseline Model (χ^2_B). Mostly, the baseline model estimates means and variances of the observed data but not the covariances of the observed data. When there are auxiliary variables, the covariance of the auxiliary variables to all other variables (including themselves) are estimated. The chi-square value is the -2 times log likelihood between the observed means and covariance matrix and baseline model-implied means and covariance matrix. The degree of freedom (df_B) is the number of elements in means and covariance matrix and the number of free parameters in the baseline model.

Comparative Fit Index (CFI). This index is one of the relative fit indices comparing between the fit of the target model and the fit of the baseline model. The minimum is 0 indicating bad fit and the maximum is 1 indicating perfect fit.

$$CFI = \frac{(\chi^2_B - df_B) - (\chi^2_T - df_T)}{\chi^2_B - df_B}$$

Tucker-Lewis Index (TLI) or ***Non-Normed Fit Index*** (NNFI). This index is also one of the relative fit indices comparing between target model and baseline model. The minimum is 0 indicating bad fit and the maximum can be slightly greater than 1. The larger value indicates good fit.

$$TLI = \frac{\frac{\chi^2_B}{df_B} - \frac{\chi^2_T}{df_T}}{\frac{\chi^2_B}{df_B} - 1}$$

Akaike Information Criterion (AIC). This index is usually used to compare between two nonnested model. The model with smaller AIC provides better fit to the observed data.

$$AIC = f_T + 2k_T$$

where $f_T = \exp(-\chi^2_T/2)$ and k_T is the number of free parameters

Bayesian Information Criterion (BIC). This index is also usually used to compare between two nonnested model. The model with smaller BIC provides better fit to the observed data.

$$BIC = f_T + \log(N)\, k_T$$

where *N* is sample size.

Root Mean Squared Error of Approximation (RMSEA). This index approximates the amount of misfit per degree of freedom. The minimum value is 0 indicating excellent fit.

$$RMSEA = \sqrt{\frac{\chi_T^2 - df_T}{df_T(N-1)}}$$

Standardized Root Mean Squared Residual (SRMR). This index indicates the average discrepancy between observed correlations and model-implied correlations. The minimum value is 0 indicating excellent fit.

$$SRMR = \sqrt{\frac{2\sum_i \sum_{j \leq i} \left(\frac{s_{ij}}{\sqrt{s_{ii}}\sqrt{s_{jj}}} - \frac{\hat{\sigma}_{ij}}{\sqrt{\hat{\sigma}_{ii}}\sqrt{\hat{\sigma}_{jj}}} \right)^2}{p(p+1)}}$$

where s_{ij} is the observed covariance between indicator *i* and *j*, $\hat{\sigma}_{ij}$ is the model-implied covariance between the indicator *i* and *j*, and *p* is the number of indicators.