



Fit Indices commonly reported for CFA and SEM

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There are more than a dozen different fit statistics researchers use to assess their confirmatory factor analyses and structural equation models. Here we have assembled a list of the most popular fit statistics used and recommended cut-offs that indicate a good fit.

Measure	Name	Description	Cut-off for good fit
X^2	Model Chi-Square	Assess overall fit and the discrepancy between the sample and fitted covariance matrices. Sensitive to sample size. H0: The model fits perfectly.	p-value > 0.05
(A)GFI	(Adjusted) Goodness of Fit	GFI is the proportion of variance accounted for by the estimated population covariance. Analogous to R ² . AGFI favors parsimony.	GFI ≥ 0.95 AGFI ≥ 0.90
(N)NFI TLI	(Non) Normed-Fit Index Tucker Lewis index	An NFI of 0.95 indicates the model of interest improves the fit by 95% relative to the null model. NNFI is preferable for smaller samples. Sometimes the NNFI is called the Tucker Lewis index (TLI)	NFI ≥ 0.95 NNFI ≥ 0.95
CFI	Comparative Fit Index	A revised form of NFI. Not very sensitive to sample size. Compares the fit of a target model to the fit of an independent, or null, model.	CFI ≥ 0.90
RMSEA	Root Mean Square Error of Approximation	A parsimony-adjusted index. Values closer to 0 represent a good fit.	RMSEA < 0.08
(S)RMR	(Standardized) Root Mean Square Residual	The square-root of the difference between the residuals of the sample covariance matrix and the hypothesized model. If items vary in range (i.e. some items are 1-5, others 1-7) then RMR is hard to interpret, better to use SRMR.	SRMR < 0.08
AVE (CFA only)	Average Value Explained	The average of the R ² s for items within a factor	AVE > 0.5

Kline suggests that at a minimum the following indices should be reported:

1. The model chi-square
2. RMSEA
3. CFI
4. SRMR

How to estimate these fit indices:

- In R, use the FitMeasures function from the lavaan package.
- In SAS's Proc Calis, specify the fitindex option with the particular indices you want.
- In Stata, after executing a CFA or SEM, use the command: estat gof, stats(all)

References:

Principles and Practice of Structural Equation Modeling. Rex B. Kline. 2005. Structural Equation Modelling: Guidelines for Determining Model Fit. Daire Hooper, et al. 2008.

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