Title

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estat gof — Goodness-of-fit statistics

Description

`estat gof` is for use after `sem` but not `gsem`.

`estat gof` displays a variety of overall goodness-of-fit statistics.

Menu

Statistics > SEM (structural equation modeling) > Goodness of fit > Overall goodness of fit

Syntax

`estat gof` [, *options*]

options	Description
`stats(`*statlist*`)`	statistics to be displayed
`nodescribe`	suppress descriptions of statistics

`collect` is allowed; see [U] **11.1.10 Prefix commands**.

statlist	Description
`chi2`	χ^2 tests; the default
`rmsea`	root mean squared error of approximation
`ic`	information indices
`indices`	indices for comparison against baseline
`residuals`	measures based on residuals
`all`	all the above

Note: The statistics reported by `chi2`, `rmsea`, and `indices` are dependent on the assumption of joint normality of the observed variables. If `vce(sbentler)` is specified with `sem`, modified versions of these statistics that are computed using the Satorra–Bentler scaled χ^2 statistics will also be reported.

Options

`stats(`*statlist*`)` specifies the statistics to be displayed. The default is `stats(chi2)`.

`stats(chi2)` reports the model versus saturated test and the baseline versus saturated test. The saturated model is the model that fits the covariances perfectly.

The model versus saturated test is a repeat of the test reported at the bottom of the `sem` output.

In the baseline versus saturated test, the baseline model includes the means and variances of all observed variables plus the covariances of all observed exogenous variables. For a covariance model (a model with no endogenous variables), the baseline includes only the means and variances of observed variables. Be aware that different authors define the baseline model differently.

`stats(rmsea)` reports the root mean squared error of approximation (RMSEA) and its 90% confidence interval, and pclose, the p-value for a test of close fit, namely, RMSEA < 0.05. Most interpreters of this test label the fit close if the lower bound of the 90% CI is below 0.05 and label the fit poor if the upper bound is above 0.10. See Browne and Cudeck (1993).

`stats(ic)` reports the Akaike information criterion (AIC) and Bayesian (or Schwarz) information criterion (BIC). These statistics are available only after estimation with `sem method(ml)` or `method(mlmv)`. These statistics are used not to judge fit in absolute terms but instead to compare the fit of different models. Smaller values indicate a better fit. Be aware that there are many variations (minor adjustments) to statistics labeled AIC and BIC. Reported here are statistics that match `estat ic`; see [R] **estat ic**.

To compare models that use statistics based on likelihoods, such as AIC and BIC, models should include the same variables; see [SEM] **lrtest**. See Akaike (1987), Schwarz (1978), and Raftery (1993).

`stats(indices)` reports CFI and TLI, two indices such that a value close to 1 indicates a good fit. CFI stands for comparative fit index. TLI stands for Tucker–Lewis index and is also known as the nonnormed fit index. See Bentler (1990).

`stats(residuals)` reports the standardized root mean squared residual (SRMR) and the coefficient of determination (CD).

A perfect fit corresponds to an SRMR of 0. A good fit is a small value, considered by some to be limited to 0.08.

Concerning CD, a perfect fit corresponds to a CD of 1. CD is like R^2 for the whole model.

`stats(all)` reports all the statistics. You can also specify just the statistics you wish reported, such as

```
. estat gof, stats(indices residuals)
```

`nodescribe` suppresses the descriptions of the goodness-of-fit measures.

Remarks and examples

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See [SEM] **Example 4**.

Stored results

`estat gof` stores the following in `r()`:

Scalars

`r(chi2_ms)`	test of target model against saturated model
`r(df_ms)`	degrees of freedom for `r(chi2_ms)`
`r(p_ms)`	p-value for `r(chi2_ms)`
`r(chi2sb_ms)`	Satorra–Bentler scaled test of target model against saturated model
`r(psb_ms)`	p-value for `r(chi2sb_ms)`
`r(chi2_bs)`	test of baseline model against saturated model
`r(df_bs)`	degrees of freedom for `r(chi2_bs)`
`r(p_bs)`	p-value for `r(chi2_bs)`
`r(chi2sb_bs)`	Satorra–Bentler scaled test of baseline model against saturated model
`r(psb_bs)`	p-value for `r(chi2sb_bs)`
`r(rmsea)`	root mean squared error of approximation
`r(lb90_rmsea)`	lower bound of 90% CI for RMSEA
`r(ub90_rmsea)`	upper bound of 90% CI for RMSEA
`r(pclose)`	p-value for test of close fit: RMSEA $<$ 0.05
`r(rmsea_sb)`	RMSEA using Satorra–Bentler χ^2
`r(aic)`	Akaike information criterion
`r(bic)`	Bayesian information criterion
`r(cfi)`	comparative fit index
`r(cfi_sb)`	CFI using Satorra–Bentler χ^2
`r(tli)`	Tucker–Lewis fit index
`r(tli_sb)`	TLI using Satorra–Bentler χ^2
`r(cd)`	coefficient of determination
`r(srmr)`	standardized root mean squared residual
`r(N_groups)`	number of groups

Matrices

`r(nobs)`	sample size for each group

References

Akaike, H. 1987. Factor analysis and AIC. *Psychometrika* 52: 317–332. https://doi.org/10.1007/BF02294359.

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Bentler, P. M. 1990. Comparative fit indexes in structural models. *Psychological Bulletin* 107: 238–246. https://doi.org/10.1037/0033-2909.107.2.238.

Browne, M. W., and R. Cudeck. 1993. Alternative ways of assessing model fit. Reprinted in *Testing Structural Equation Models*, ed. K. A. Bollen and J. S. Long, pp. 136–162. Newbury Park, CA: SAGE.

Raftery, A. E. 1993. Bayesian model selection in structural equation models. Reprinted in *Testing Structural Equation Models*, ed. K. A. Bollen and J. S. Long, pp. 163–180. Newbury Park, CA: SAGE.

Schwarz, G. 1978. Estimating the dimension of a model. *Annals of Statistics* 6: 461–464. https://doi.org/10.1214/aos/1176344136.

Also see

[SEM] **sem** — Structural equation model estimation command

[SEM] **sem postestimation** — Postestimation tools for sem

[SEM] **estat eqgof** — Equation-level goodness-of-fit statistics

[SEM] **estat ggof** — Group-level goodness-of-fit statistics

[SEM] **estat residuals** — Display mean and covariance residuals

[SEM] **Example 4** — Goodness-of-fit statistics

[SEM] **Methods and formulas for sem** — Methods and formulas for sem

[R] **estat ic** — Display information criteria