

estat gof — Goodness-of-fit statistics

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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 ]
```

<i>options</i>	Description
<code>stats(<i>statlist</i>)</code>	statistics to be displayed
<code>nodescribe</code>	suppress descriptions of statistics

<i>statlist</i>	Description
<code>chi2</code>	χ^2 tests; the default
<code>rmsea</code>	root mean squared error of approximation
<code>ic</code>	information indices
<code>indices</code>	indices for comparison against baseline
<code>residuals</code>	measures based on residuals
<code>all</code>	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(rmse)` 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. SRMR is calculated using the first and second moments unless `sem option nomeans` was specified or implied, in which case SRMR is calculated based on second moments only. Some software packages ignore the first moments even when available.

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

[stata.com](http://www.stata.com)

See [\[SEM\] example 4](#).

Stored results

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

Scalars

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

Matrices

<code>r(nobs)</code>	sample size for each group
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References

- Akaike, H. 1987. Factor analysis and AIC. *Psychometrika* 52: 317–332.
- Bentler, P. M. 1990. Comparative fit indexes in structural models. *Psychological Bulletin* 107: 238–246.
- 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.

Also see

- [SEM] [example 4](#) — Goodness-of-fit statistics
- [SEM] [estat ggof](#) — Group-level goodness-of-fit statistics
- [SEM] [estat eqgof](#) — Equation-level goodness-of-fit statistics
- [SEM] [estat residuals](#) — Display mean and covariance residuals
- [SEM] [methods and formulas for sem](#) — Methods and formulas for sem
- [SEM] [sem postestimation](#) — Postestimation tools for sem
- [R] [estat ic](#) — Display information criteria