**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**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong><code>stats(statlist)</code></strong></td>
</tr>
<tr>
<td>statistics to be displayed</td>
</tr>
<tr>
<td><strong><code>noderive</code></strong></td>
</tr>
<tr>
<td>suppress descriptions of statistics</td>
</tr>
</tbody>
</table>

Collect is allowed; see [U] 11.1.10 Prefix commands.

**statlist**

<table>
<thead>
<tr>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td><strong>chi2</strong></td>
</tr>
<tr>
<td>$\chi^2$ tests; the default</td>
</tr>
<tr>
<td><strong>rmsea</strong></td>
</tr>
<tr>
<td>root mean squared error of approximation</td>
</tr>
<tr>
<td><strong>ic</strong></td>
</tr>
<tr>
<td>information indices</td>
</tr>
<tr>
<td><strong>indices</strong></td>
</tr>
<tr>
<td>indices for comparison against baseline</td>
</tr>
<tr>
<td><strong>residuals</strong></td>
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<tr>
<td>measures based on residuals</td>
</tr>
<tr>
<td><strong>all</strong></td>
</tr>
<tr>
<td>all the above</td>
</tr>
</tbody>
</table>

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 $\chi^2$ 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

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 $\chi^2$
- `r(aic)` Akaike information criterion
- `r(bic)` Bayes information criterion
- `r(cfi)` comparative fit index
- `r(cfi_sb)` CFI using Satorra–Bentler $\chi^2$
- `r(tli)` Tucker–Lewis fit index
- `r(tli_sb)` TLI using Satorra–Bentler $\chi^2$
- `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


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
[SEM] `estat ic` — Display information criteria