How can I obtain bootstrap standard errors in Mplus?

Authored by

stats writer

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Mplus is a statistical software widely used for structural equation modeling and other complex data analyses. In order to obtain bootstrap standard errors in Mplus, the user can specify the "BOOTSTRAP" option in the ANALYSIS command and specify the number of bootstrap samples to be generated. This option will perform a resampling procedure on the original data to create multiple bootstrap samples, and the standard errors will be calculated based on the variability of the parameter estimates across these samples. This method is useful for obtaining robust standard errors, particularly in cases where the assumptions of traditional methods may not be met. Additionally, Mplus offers various other options for obtaining standard errors, such as the "MONTECARLO" option for Monte Carlo simulation and the "TYPE=BOOTSTRAP" option for bias-corrected and accelerated bootstrap standard errors. Overall, the use of bootstrap standard errors in Mplus can provide a more accurate and reliable estimation of model parameters and increase the validity of statistical inference.

How can I obtain bootstrap standard errors in Mplus? | Mplus FAQ

Consider this seemingly unrelated regression using Stata.

use https://stats.idre.ucla.edu/stat/stata/notes/hsb2 sureg (read write math science) (socst write math science)

Seemingly unrelated regression

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Equation Obs Parms RMSE "R-sq" chi2 P

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read 200 3 6.930412 0.5408 235.54 0.0000 socst 200 3 8.180626 0.4164 142.73 0.0000

| Coef. Std. Err. z P>|z|

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read |

write | .2376706 .0689943 3.44 0.001 .1024443 .3728968

math | .3784015 .0738838 5.12 0.000 .2335919 .5232111

science | .2969347 .0669546 4.43 0.000 .1657061 .4281633

_cons | 4.369926 3.176527 1.38 0.169 -1.855954 10.59581

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socst |

write | .4656741 .0814405 5.72 0.000 .3060536 .6252946

math | .2763008 .0872121 3.17 0.002 .1053682 .4472334

science | .0851168 .0790329 1.08 0.281 -.0697848 .2400185

_cons | 8.869885 3.749558 2.37 0.018 1.520886 16.21888

You could preface the command with the bootstrap prefix, as
illustrated below, to obtain bias corrected bootstrap standard errors based

on 20,000 replications.

bootstrap, reps(20000) bca: sureg (read write math science) (socst write math science)

Seemingly unrelated regression

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Equation Obs Parms RMSE "R-sq" chi2 P

--

read 200 3 6.930412 0.5408 235.54 0.0000

socst 200 3 8.180626 0.4164 142.73 0.0000

--

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| Bootstrap

| Coef. Std. Err. z P>|z|

-------------+--

read |

write | .2376706 .0689077 3.45 0.001 .1026139 .3727272

math | .3784015 .072022 5.25 0.000 .2372409 .5195621

science | .2969347 .0732453 4.05 0.000 .1533766 .4404928

_cons | 4.369926 2.958737 1.48 0.140 -1.429093 10.16894

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socst |
write | .4656741 .0915943 5.08 0.000 .2861525 .6451957
math | .2763008 .0941304 2.94 0.003 .0918087 .4607929
science | .0851168 .0842935 1.01 0.313 -.0800954 .250329
_cons | 8.869885 3.412316 2.60 0.009 2.181869 15.5579
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The same analysis can be run in Mplus and obtaining bias corrected
standard errors. Here we run this based on the https://stats.idre.ucla.edu/wp-content/uploads/2016/02/hsb2.dat data file. Note that in the analysis section we use
the bootstrap = 20000; command to request 20,000 bootstrap
iterations, and then in the output section we use cinterval (bcbootstrap);
to request confidence intervals using bias corrected bootstrap
standard errors (by using bootstrap in place of bcbootstap
we would get bootstrap standard errors that were not bias corrected).

As you compare the first analysis (with standard confidence intervals) with the second analysis (with bootstrap confidence intervals), note the slight discrepancies in the confidence intervals for _cons for the two equations.

Title:
Bootstrap standard errors.
Data:
File = https://stats.idre.ucla.edu/wp-content/uploads/2016/02/hsb2.dat ;
Variable:
Names = id female race ses schtyp prog read write math science socst;
usevar = read socst write math science;
Analysis:
Type = meanstructure ;
bootstrap = 20000;
model:
read on write math science ;
socst on write math science;

output:

cinterval (bcbootstrap);

And here is the output.

MODEL RESULTS

Estimates S.E. Est./S.E.

READ ON

WRITE 0.238 0.070 3.410

MATH 0.378 0.072 5.271

SCIENCE 0.297 0.073 4.052

SOCST ON

WRITE 0.466 0.091 5.122

MATH 0.276 0.094 2.931

SCIENCE 0.085 0.085 1.004

SOCST WITH

READ 18.286 4.168 4.387

Intercepts

READ 4.370 2.947 1.483

SOCST 8.870 3.420 2.594

Residual Variances

READ 48.030 4.419 10.869

SOCST 66.922 6.326 10.579

CONFIDENCE INTERVALS OF MODEL RESULTS

Lower .5% Lower 2.5% Estimates Upper 2.5% Upper .5%

READ ON

WRITE 0.055 0.101 0.238 0.374 0.414

MATH 0.200 0.240 0.378 0.521 0.566

SCIENCE 0.101 0.148 0.297 0.434 0.478

SOCST ON

WRITE 0.226 0.284 0.466 0.640 0.694

MATH 0.036 0.093 0.276 0.461 0.523

SCIENCE -0.135 -0.083 0.085 0.249 0.303

SOCST WITH

READ 8.219 10.776 18.286 27.222 30.064

Intercepts

READ -3.200 -1.351 4.370 10.152 12.136

SOCST 0.140 2.260 8.870 15.653 18.054

Residual Variances

READ 38.242 40.671 48.030 58.322 61.399
SOCST 52.587 56.277 66.922 81.379 85.557

**The first and last column represent the LCL and UCL for a 99%
confidence interval, and the second and fourth columns represent the LCL
and UCL for a 95% confidence interval. The middle (third) column
contains the point estimate for each of the parameters.**

**Note how the Mplus confidence intervalue for the Intercepts change in
a similar way to the Stata values for _cons when using the
bootstrap confidence intervals.**