

lavaan

latent variable analysis

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O balíčku

- =**L**aten **V**ariable **A**nalysis
- Hlavní vývojář: Y. Rosseel
 - A osm dalších spolutvůrců
- Dostupné na CRAN
- Verze 0.3-1 v květnu 2010
 - Přejmenováno z semplus, tento balíček nebyl dostupný na CRAN
- Poslední verze 0.6-5 ze srpna 2019

Využití

- Multivariační statistické analýzy
 - Confirmatory factor analysis
 - Path analysis
 - Structural equation modeling (SEM), i multilevel
 - ...
- Umožňuje různé způsoby odhadů a dalších možností
 - ML (*maximum likelihood* a robustní varianty)
 - ULS (*unweighted least squares* a robustní varianty)
 - WLS (*weighted least squares* a robustní varianty)
 - Podpora pro analýzu kategorických dat
 - Různé způsoby odhadu SE (*bootstrap, standard, robust...*)
 - ...

Syntax

Definice modelu

- `model_m1 <- "kontrola_m1=~ M1 + M2 + M3 + M4 + M5 + M6 + M7 + M8"`
- `model_m1.res <- "kontrola_m1=~ M1 + M2 + M3 + M4 + M5 + M6 + M7 + M8
M1~~M5
M2~~M4
M4~~M6"`

Syntax

Analýza modelu

- `fit_m1 <- cfa(model = model_m1, data = m1, ordered = TRUE, std.lv = TRUE)`

Hodnocení modelu

- `summary(fit_m1, fit.measures = TRUE)`

Output

```
lavaan 0.6-5 ended normally after 17 iterations

Estimator                      DWLS
Optimization method             NLMINB
Number of free parameters       35

Number of observations          Used      Total
                               877      929

Model Test User Model:

Test Statistic                  Standard      Robust
Degrees of freedom              32.961      66.857
P-value (Chi-square)           17          17
Scaling correction factor       0.011      0.000
Shift parameter                 0.501      1.022
  for the simple second-order correction

Model Test Baseline Model:

Test statistic                   6167.485    3715.619
Degrees of freedom               28          28
P-value                          0.000      0.000
Scaling correction factor        1.665

User Model versus Baseline Model:

Comparative Fit Index (CFI)     0.997      0.986
Tucker-Lewis Index (TLI)       0.996      0.978

Robust Comparative Fit Index (CFI)      NA
Robust Tucker-Lewis Index (TLI)        NA

Root Mean Square Error of Approximation:

RMSEA                           0.033      0.058
90 Percent confidence interval - lower 0.015      0.044
90 Percent confidence interval - upper 0.049      0.073
P-value RMSEA <= 0.05           0.957      0.172

Robust RMSEA                     NA
90 Percent confidence interval - lower NA
90 Percent confidence interval - upper NA

Standardized Root Mean Square Residual:

SRMR                             0.032      0.032

Parameter Estimates:

Information                      Expected
Information saturated (h1) model Unstructured
Standard errors                   Robust.sem
```

Latent Variables:

	Estimate	Std.Err	z-value	P(> z)	Std.lv	Std.all
kontrola_m1 =~						
M1	0.717	0.024	29.919	0.000	0.717	0.717
M2	0.667	0.025	26.273	0.000	0.667	0.667
M3	0.746	0.029	25.532	0.000	0.746	0.746
M4	0.405	0.039	10.438	0.000	0.405	0.405
M5	0.734	0.023	32.366	0.000	0.734	0.734
M6	0.660	0.029	22.441	0.000	0.660	0.660
M7	0.484	0.033	14.686	0.000	0.484	0.484
M8	0.824	0.018	44.936	0.000	0.824	0.824

Covariances:

	Estimate	Std.Err	z-value	P(> z)	Std.lv	Std.all
.M1 ~						
.M5	0.172	0.025	6.971	0.000	0.172	0.363
.M2 ~						
.M4	0.116	0.032	3.661	0.000	0.116	0.171
.M4 ~						
.M6	0.030	0.032	0.937	0.349	0.030	0.044

Intercepts:

	Estimate	Std.Err	z-value	P(> z)	Std.lv	Std.all
.M1	0.000				0.000	0.000
.M2	0.000				0.000	0.000
.M3	0.000				0.000	0.000
.M4	0.000				0.000	0.000
.M5	0.000				0.000	0.000
.M6	0.000				0.000	0.000
.M7	0.000				0.000	0.000
.M8	0.000				0.000	0.000
kontrola_m1	0.000				0.000	0.000

Thresholds:

	Estimate	Std.Err	z-value	P(> z)	Std.lv	Std.all
M1 t1	-1.542	0.067	-23.075	0.000	-1.542	-1.542
M1 t2	-0.715	0.047	-15.376	0.000	-0.715	-0.715
M1 t3	0.183	0.043	4.284	0.000	0.183	0.183
M2 t1	-1.188	0.055	-21.515	0.000	-1.188	-1.188
M2 t2	-0.457	0.044	-10.388	0.000	-0.457	-0.457
M2 t3	0.633	0.046	13.887	0.000	0.633	0.633
M3 t1	-1.903	0.086	-22.075	0.000	-1.903	-1.903
M3 t2	-1.280	0.058	-22.177	0.000	-1.280	-1.280
M3 t3	-0.643	0.046	-14.082	0.000	-0.643	-0.643
M4 t1	-1.999	0.093	-21.442	0.000	-1.999	-1.999
M4 t2	-1.126	0.054	-20.971	0.000	-1.126	-1.126
M4 t3	-0.067	0.042	-1.586	0.113	-0.067	-0.067
M5 t1	-1.570	0.068	-23.086	0.000	-1.570	-1.570
M5 t2	-0.760	0.047	-16.142	0.000	-0.760	-0.760
M5 t3	0.238	0.043	5.563	0.000	0.238	0.238
M6 t1	-2.118	0.103	-20.486	0.000	-2.118	-2.118
M6 t2	-1.362	0.060	-22.615	0.000	-1.362	-1.362
M6 t3	-0.361	0.043	-8.317	0.000	-0.361	-0.361
M7 t1	-1.542	0.067	-23.075	0.000	-1.542	-1.542
M7 t2	-0.470	0.044	-10.655	0.000	-0.470	-0.470
M7 t3	0.650	0.046	14.212	0.000	0.650	0.650
M8 t1	-1.235	0.056	-21.881	0.000	-1.235	-1.235
M8 t2	-0.650	0.046	-14.212	0.000	-0.650	-0.650
M8 t3	0.073	0.042	1.721	0.085	0.073	0.073

Variances:

	Estimate	Std.Err	z-value	P(> z)	Std.lv	Std.all
.M1	0.486				0.486	0.486
.M2	0.555				0.555	0.555
.M3	0.444				0.444	0.444
.M4	0.836				0.836	0.836
.M5	0.461				0.461	0.461
.M6	0.565				0.565	0.565
.M7	0.766				0.766	0.766
.M8	0.321				0.321	0.321
kontrola_m1	1.000				1.000	1.000

Scales y*:

	Estimate	Std.Err	z-value	P(> z)	Std.lv	Std.all
M1	1.000				1.000	1.000
M2	1.000				1.000	1.000
M3	1.000				1.000	1.000
M4	1.000				1.000	1.000
M5	1.000				1.000	1.000
M6	1.000				1.000	1.000
M7	1.000				1.000	1.000
M8	1.000				1.000	1.000

Více o lavaanu

- <http://lavaan.ugent.be/features.html>

Díky za
pozornost