

Package ‘latcontrol’

August 17, 2023

Type Package

Title Evaluation of the Role of Control Variables in Structural Equation Models

Version 0.1.0

Depends R (>= 4.3.0), lavaan

Description Various opportunities to evaluate the effects of including one or more control variable(s) in structural equation models onto model-implied variances, covariances, and parameter estimates. The derivation of the methodology employed in this package can be obtained from Blötner (2023) <[doi:10.31234/osf.io/dy79z](https://doi.org/10.31234/osf.io/dy79z)>.

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Repository CRAN

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compare.res	<i>Parameter estimates of structural equation models with and without control variable(s)</i>
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Description

Comprehensive heads-on comparison of pertinent parameter estimates of two structural equation models that only differ in terms of the inclusion or exclusion of one or more control variable(s). Thereby, standardized loadings, path coefficients, and covariances as well as p-values are displayed. The models must have been fitted with the R package lavaan (Rosseel, 2012) <doi:10.18637/jss.v048.i02>. The derivation of the methodology employed in this package can be obtained from Blötner (2023) <doi:10.31234/osf.io/dy79z>.

Usage

```
compare.res(object_with, object_without)
```

Arguments

object_with Fitted lavaan object involving the control variable(s).
 object_without Fitted lavaan object without the control variable(s).

Value

Results	A list containing the parameter estimates of the structural equation models with and without the control variable(s) outlined below.
lhs	Left-hand side of the parameter estimate both models contain.
op	Operator ('=~' indicates a loading, '~' a prediction of the left-hand side object by the right-hand side object, and '~~' an undirected covariance. See the documentation of the lavaan package (Rosseel, 2012) for details.)
rhs	Right-hand side of the parameter estimate both models contain.
est.std.with	Standardized parameter estimate in the model with the control variable(s).
p.with	p-value of the standardized parameter estimate in the model with the control variable(s).
est.std.wo	Standardized parameter estimate in the model without the control variable(s).
p.wo	p-value of the standardized parameter estimate in the model without the control variable(s).
r	Bivariate correlation between the parameter estimates detected in both models as an index of profile similarity.

Author(s)

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References

- Blötner, C. (2023). latcontrol: Evaluation of the role of control variables in structural equation models. PsyArXiv. <https://doi.org/10.31234/osf.io/dy79z>
- Rossee, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, 48(2), 1–36. <https://doi.org/10.18637/jss.v048.i02>

Examples

```
data <- data.frame(i1 = rnorm(100),
                  i2 = rnorm(100),
                  i3 = rnorm(100),
                  i4 = rnorm(100),
                  i5 = rnorm(100),
                  i6 = rnorm(100),
                  i7 = rnorm(100),
                  i8 = rnorm(100),
                  i9 = rnorm(100),
                  i10 = rnorm(100),
                  i11 = rnorm(100),
                  i12 = rnorm(100))

m_with <- 'IV =~ i1 + i2 + i3 + i4
          DV =~ i5 + i6 + i7 + i8
          CV =~ i9 + i10 + i11 + i12

          DV ~ IV + CV
          IV ~ CV'
m_without <- 'IV =~ i1 + i2 + i3 + i4
             DV =~ i5 + i6 + i7 + i8

             DV ~ IV'

fit_with <- sem(m_with, data = data)
fit_without <- sem(m_without, data = data)

compare.res(fit_with, fit_without)
```

get_resid

Raw and correlation residuals in the evaluation of structural equation models with and without control variables

Description

Computation of the differences between the variances and covariances of items implied by two structural equation models that only differ in terms of inclusion or exclusion of one or more control variable(s). Both models need to be fitted with the R package lavaan (Rossee, 2012) <doi:10.18637/jss.v048.i02>. The derivation of the methodology employed in this package can be obtained from Blötner (2023) <doi:10.31234/osf.io/dy79z>.

Arguments

object_with	Fit object from the lavaan package with the control variable(s).
object_without	Fit object from the lavaan package without the control variable(s).
type	Optional. Specifies whether a single-level structural equation model or a multi-level structural equation model is entered (DEFAULT = "simple").

Value

raw	A matrix of unstandardized residuals.
cor	A matrix of correlation residuals.

Author(s)

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References

- Blötner, C. (2023). latcontrol: Evaluation of the role of control variables in structural equation models. PsyArXiv. <https://doi.org/10.31234/osf.io/dy79z>
- Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, 48(2), 1–36. <https://doi.org/10.18637/jss.v048.i02>

Examples

```
data <- data.frame(i1 = rnorm(100),
                  i2 = rnorm(100),
                  i3 = rnorm(100),
                  i4 = rnorm(100),
                  i5 = rnorm(100),
                  i6 = rnorm(100),
                  i7 = rnorm(100),
                  i8 = rnorm(100),
                  i9 = rnorm(100),
                  i10 = rnorm(100),
                  i11 = rnorm(100),
                  i12 = rnorm(100))

m_with <- 'IV =~ i1 + i2 + i3 + i4
          DV =~ i5 + i6 + i7 + i8
          CV =~ i9 + i10 + i11 + i12

          DV ~ IV + CV
          IV ~ CV'
m_without <- 'IV =~ i1 + i2 + i3 + i4
             DV =~ i5 + i6 + i7 + i8

             DV ~ IV'

fit_with <- sem(m_with, data = data)
```

```
fit_without <- sem(m_without, data = data)

get_resid(fit_with, fit_without)
```

latcontrol	<i>Evaluation of the equivalence of the model-implied matrices of structural equation models with and without control variables</i>
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Description

Evaluation of the model-implied variance-covariance matrices of two structural equation models that only differ by the inclusion versus exclusion of one or more control variable(s). Both models need to be fitted with the R package lavaan (Rosseel, 2012) <doi:10.18637/jss.v048.i02>. The derivation of the methodology employed in this package can be obtained from Blötner (2023) <doi:10.31234/osf.io/dy79z>.

Usage

```
latcontrol(object_with, object_without, type = c("simple", "complex"))
```

Arguments

object_with	Fit object from the ‘lavaan’ package (Rosseel, 2012 <doi:10.18637/jss.v048.i02>) with the control variable(s).
object_without	Fit object from the ‘lavaan’ package (Rosseel, 2012 <doi:10.18637/jss.v048.i02>) without the control variable(s).
type	Optional. Specifies whether a single-level structural equation model or a multi-level structural equation model is entered (DEFAULT = "simple").

Details

The latcontrol function itself was derived from the discrepancy function from confirmatory factor analysis and structural equation models. In analogy to the latter latent model classes, the function provides a chi-square-based index of discrepancy, model degrees of freedom, a p-value, and derivatives of common descriptive model fit indices (i.e., Root Mean Square Error of Approximation and Square Root Mean Residual).

Value

X2	Chi-square value, reflecting the difference between the two matrices.
df	Degrees of freedom of the Chi-square statistic.
p_value	Corresponding p-value of the Chi-square statistic with the stated degrees of freedom.
rmsea	Adapted version of the Root Mean Square Error of Approximation to evaluate whether the two matrices differ.
srmr	Adapted version of the Square Root Mean Residual to evaluate whether the two matrices differ.

Author(s)

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References

Blötner, C. (2023). latcontrol: Evaluation of the role of control variables in structural equation models. PsyArXiv. <https://doi.org/10.31234/osf.io/dy79z>

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. Journal of Statistical Software, 48(2), 1–36. <https://doi.org/10.18637/jss.v048.i02>

Examples

```
data <- data.frame(i1 = rnorm(100),
                  i2 = rnorm(100),
                  i3 = rnorm(100),
                  i4 = rnorm(100),
                  i5 = rnorm(100),
                  i6 = rnorm(100),
                  i7 = rnorm(100),
                  i8 = rnorm(100),
                  i9 = rnorm(100),
                  i10 = rnorm(100),
                  i11 = rnorm(100),
                  i12 = rnorm(100))

m_with <- 'IV =~ i1 + i2 + i3 + i4
          DV =~ i5 + i6 + i7 + i8
          CV =~ i9 + i10 + i11 + i12

          DV ~ IV + CV
          IV ~ CV'
m_without <- 'IV =~ i1 + i2 + i3 + i4
            DV =~ i5 + i6 + i7 + i8

            DV ~ IV'

fit_with <- sem(m_with, data = data)
fit_without <- sem(m_without, data = data)

latcontrol(fit_with, fit_without)
```

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