

Package ‘symSEM’

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Type Package

Title Symbolic Computation for Structural Equation Models

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Depends caracas

Imports OpenMx, metaSEM

Suggests testthat, roxygen2

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Description A collection of functions for symbolic computation using the 'caracas' package for structural equation models and other statistical analyses. Among its features is the ability to calculate the model-implied covariance (and correlation) matrix and the sampling covariance matrix of variable functions using the delta method.

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Encoding UTF-8

SystemRequirements Python (>= 3.6.0)

LazyLoad yes

ByteCompile yes

URL <https://github.com/mikewlcheung/symsem>

RoxygenNote 7.2.3

NeedsCompilation no

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symSEM-package	<i>A collection of functions for symbolic computation using 'caracas' package for structural equation models and other statistical analyses. Among its features is the ability to calculate the model-implied covariance (and correlation) matrix and the sampling covariance matrix of variable functions using the delta method.</i>
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Description

A collection of functions for symbolic computation using 'caracas' package for structural equation models and other statistical analyses. Among its features is the ability to calculate the model-implied covariance (and correlation) matrix and the sampling covariance matrix of variable functions using the delta method.

deltamethod	<i>Compute the Variance-Covariance Matrix of Functions using the first-order Delta Method</i>
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Description

It computes the variance-covariance matrix of functions using the first-order delta method.

Usage

```
deltamethod(fn, Covvars, vars, Var.name = "V", Cov.name = "C", simplify = TRUE)
```

Arguments

fn	A function in character strings or a vector of functions.
Covvars	Variance-covariance matrix of the variables. If it is not specified, they are automatically generated.
vars	A vector of characters of the random variables. If the random variables are not listed in 'vars', they are treated as constants. If 'vars' is missing, all names in 'RAM' are treated as random variables.
Var.name	Name of the variances.
Cov.name	Name of the covariances.
simplify	Attempt to simplify the output.

Value

Variance-covariance matrix of the functions.

Author(s)

Mike W.-L. Cheung <mikewlcheung@nus.edu.sg>

Examples

```
## Not run:

#### Fisher-z-transformation
fn <- "0.5*log((1+r)/(1-r))"

## Sampling variance of r
Covvars <- "(1-r^2)^2/n"

deltamethod(fn=fn, Covvars=Covvars, vars="r")
## $fn
##      [,1]
## fn1 "0.5*log((r+1)/(1-r))"

## $Covfn
##      fn1
## fn1 "1/n"

## $vars
## [1] "r"

## $Covvars
##      r
## r "(1-r^2)^2/n"

## $Jmatrix
##      r
## fn1 "(0.5*(1-r+r+1)*(1-r))/((1-r)^2*(r+1))"

#### Raw mean difference: y_treatment - y_control
fn <- "yt - yc"

## Sampling covariance matrix
## S2p: pooled variance
## nt: n_treatment
## nc: n_control
Covvars <- matrix(c("S2p/nt", 0,
                   0, "S2p/nc"),
                 ncol=2, nrow=2)

deltamethod(fn=fn, Covvars=Covvars, vars=c("yt", "yc"))
## $fn
##      [,1]
## fn1 "yt-yc"

## $Covfn
##      fn1
## fn1 "(S2p*nt+S2p*nc)/(nt*nc)"
```

```

## $vars
## [1] "yt" "yc"

## $Covvars
##   yt      yc
## yt "S2p/nt" "0"
## yc "0"      "S2p/nc"

## $Jmatrix
##   yt  yc
## fn1 "1" "-1"

#### log(odds)
fn <- "log(p/(1-p))"

## Sampling variance of p
Covvars <- "p*(1-p)/n"

## Though it is correct, the simplification does not work well.
deltamethod(fn=fn, Covvars=Covvars, vars="p")
## $fn
##   [,1]
## fn1 "log(p/(1-p))"

## $Covfn
##   fn1
## fn1 "(3*p^2-p^3-3*p+1)/((p^4-4*p^3+6*p^2-4*p+1)*p*n)"

## $vars
## [1] "p"

## $Covvars
##   p
## p "(p*(1-p))/n"

## $Jmatrix
##   p
## fn1 "((1-p+p)*(1-p))/((1-p)^2*p)"

## End(Not run)

```

impliedS

Compute a Symbolic Model-Implied Covariance/Correlation Matrix

Description

It computes a symbolic model-implied covariance (or correlation) matrix in SEM using the RAM inputs.

Usage

```
impliedS(RAM, corr = FALSE, simplify = TRUE)
```

Arguments

RAM	A RAM object including a list of matrices of the model returned from lavaan2RAM
corr	Whether the model implied matrix is covariance (default) or correlation structure.
simplify	Attempt to simplify the output.

Value

The model implied covariance (or correlation) matrix and means vector.

Author(s)

Mike W.-L. Cheung <mikewlcheung@nus.edu.sg>

Examples

```
## Not run:

#### A mediation model
model1 <- "y ~ c*x + b*m
          m ~ a*x
          ## Means
          y ~ b0*1
          m ~ m0*1
          x ~ x0*1"

RAM1 <- metaSEM::lavaan2RAM(model1)

## Model-implied covariance matrix and mean structure
impliedS(RAM1, corr=FALSE)

## Model-implied correlation matrix
impliedS(RAM1, corr=TRUE)

#### A CFA model
model2 <- "f =~ x1 + x2 + x3 + x4#"
          ## Mean
          f ~ fmean*1"

RAM2 <- metaSEM::lavaan2RAM(model2)

## Model-implied covariance matrix
impliedS(RAM2, corr=FALSE)

## Model-implied correlation matrix
impliedS(RAM2, corr=TRUE)
```

End(Not run)

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