Package 'metaVAR'

August 1, 2024

Title Multivariate Meta-Analysis of Vector Autoregressive Model Coefficients

Version 0.9.1

Description Estimates the mean vector and covariance matrix of the multivariate meta-analysis of vector autoregressive model coefficients.

URL https://github.com/jeksterslab/metaVAR, https://jeksterslab.github.io/metaVAR/

BugReports https://github.com/jeksterslab/metaVAR/issues

License MIT + file LICENSE

Encoding UTF-8

Roxygen list(markdown = TRUE)

Depends R (>= 3.5.0), OpenMx

Imports numDeriv, Matrix, fitDTVARMx, fitCTVARMx

Remotes jeksterslab/fitDTVARMx, jeksterslab/fitCTVARMx

Suggests knitr, rmarkdown, testthat, simStateSpace, MASS

RoxygenNote 7.3.2

NeedsCompilation no

Author Ivan Jacob Agaloos Pesigan [aut, cre, cph] (<https://orcid.org/0000-0003-4818-8420>)

Maintainer Ivan Jacob Agaloos Pesigan <r.jeksterslab@gmail.com>

Contents

coef.metavarmeta *Estimated Parameter Method for an Object of Class* metavarmeta

Description

Estimated Parameter Method for an Object of Class metavarmeta

Usage

```
## S3 method for class 'metavarmeta'
coef(object, ...)
```

Arguments

object	an object of class metavarmeta.
...	further arguments.

Value

Returns a vector of the mean estimated parameters.

Author(s)

Ivan Jacob Agaloos Pesigan

Meta *Fit Multivariate Meta-Analysis*

Description

This function estimates the mean and covariance matrix of a vector of coefficients using the estimated coefficients and sampling variance-covariance matrix from each individual.

Usage

```
Meta(
  y,
  v,
  mu_start = NULL,
  mu_lbound = NULL,
  mu_ubound = NULL,
  sigma_l_start = NULL,
  sigma_l_lbound = NULL,
  sigma_l_ubound = NULL,
  diag = FALSE,
```

```
  try = 1000,
  ncores = NULL,
  ...
)
```

Arguments

y	A list. Each element of the list is a numeric vector of estimated coefficients.
v	A list. Each element of the list is a sampling variance-covariance matrix of y.
mu_start	Numeric vector. Optional vector of starting values for mu.
mu_lbound	Numeric vector. Optional vector of lower bound values for mu.
mu_ubound	Numeric vector. Optional vector of upper bound values for mu.
sigma_l_start	Numeric matrix. Optional matrix of starting values for t(chol(sigma)).
sigma_l_lbound	Numeric matrix. Optional matrix of lower bound values for t(chol(sigma)).
sigma_l_ubound	Numeric matrix. Optional matrix of upper bound values for t(chol(sigma)).
diag	Logical. If diag = TRUE, sigma is a diagonal matrix. If diag = FALSE, sigma is a symmetric matrix.
try	Positive integer. Number of extra optimization tries.
ncores	Positive integer. Number of cores to use.
...	Additional optional arguments to pass to mxTryHard.

Details

For $i = \{1, \cdots, n\}$, the objective function used to estimate the mean $\boldsymbol{\mu}$ and covariance matrix $\boldsymbol{\Sigma}$ of the random coefficients $\mathbf{y}_i$ is given by

$$\ell\left(\boldsymbol{\mu}, \boldsymbol{\Sigma} \mid \mathbf{y}_i, \mathbb{V}\left(\mathbf{y}_i\right)\right) = -\frac{1}{2}\left[q \log\left(2\pi\right) + \log\left(\left|\mathbb{V}\left(\mathbf{y}_i\right) - \boldsymbol{\Sigma}\right|\right) + \left(\mathbf{y}_i - \boldsymbol{\mu}\right)' \left(\mathbb{V}\left(\mathbf{y}_i\right) - \boldsymbol{\Sigma}\right)^{-1} \left(\mathbf{y}_i - \boldsymbol{\mu}\right)\right]$$

where q is the number of unique elements in $\boldsymbol{\mu}$ and $\boldsymbol{\Sigma}$, and $\mathbb{V}\left(\mathbf{y}_i\right)$ is the sampling variance-covariance matrix of $\mathbf{y}_i$.

Author(s)

Ivan Jacob Agaloos Pesigan

References

Neale, M. C., Hunter, M. D., Pritikin, J. N., Zahery, M., Brick, T. R., Kirkpatrick, R. M., Estabrook, R., Bates, T. C., Maes, H. H., & Boker, S. M. (2015). OpenMx 2.0: Extended structural equation and statistical modeling. *Psychometrika*, *81*(2), 535–549. doi:10.1007/s1133601494358

See Also

Other Meta-Analysis of VAR Functions: MetaVARMx()

MetaVARMx *Fit Multivariate Meta-Analysis*

Description

This function estimates the mean and covariance matrix of a vector of coefficients using the estimated coefficients and sampling variance-covariance matrix from each individual.

Usage

```
MetaVARMx(
  object,
  mu_start = NULL,
  mu_lbound = NULL,
  mu_ubound = NULL,
  sigma_l_start = NULL,
  sigma_l_lbound = NULL,
  sigma_l_ubound = NULL,
  diag = FALSE,
  intercept = FALSE,
  noise = FALSE,
  error = FALSE,
  try = 1000,
  ncores = NULL,
  ...
)
```

Arguments

object	Output of the fitDTVARMx::FitDTVARIDMx() or fitCTVARMx::FitCTVARIDMx() functions.
mu_start	Numeric vector. Optional vector of starting values for mu.
mu_lbound	Numeric vector. Optional vector of lower bound values for mu.
mu_ubound	Numeric vector. Optional vector of upper bound values for mu.
sigma_l_start	Numeric matrix. Optional matrix of starting values for t(chol(sigma)).
sigma_l_lbound	Numeric matrix. Optional matrix of lower bound values for t(chol(sigma)).
sigma_l_ubound	Numeric matrix. Optional matrix of upper bound values for t(chol(sigma)).
diag	Logical. If diag = TRUE, sigma is a diagonal matrix. If diag = FALSE, sigma is a symmetric matrix.
intercept	Logical. If intercept = TRUE, include estimates of the process intercept vector, if available. If intercept = FALSE, exclude estimates of the process intercept vector.
noise	Logical. If noise = TRUE, include estimates of the process noise matrix, if available. If noise = FALSE, exclude estimates of the process noise matrix.

error	Logical. If error = TRUE, include estimates of the measurement error matrix, if available. If error = FALSE, exclude estimates of the measurement error matrix.
try	Positive integer. Number of extra optimization tries.
ncores	Positive integer. Number of cores to use.
...	Additional optional arguments to pass to mxTryHard.

Details

For $i = \{1, \cdots, n\}$, the objective function used to estimate the mean $\boldsymbol{\mu}$ and covariance matrix $\boldsymbol{\Sigma}$ of the random coefficients $\mathbf{y}_i$ is given by

$$\ell\left(\boldsymbol{\mu}, \boldsymbol{\Sigma} \mid \mathbf{y}_i, \mathbb{V}\left(\mathbf{y}_i\right)\right) = -\frac{1}{2}\left[q \log\left(2\pi\right) + \log\left(\left|\mathbb{V}\left(\mathbf{y}_i\right) - \boldsymbol{\Sigma}\right|\right) + \left(\mathbf{y}_i - \boldsymbol{\mu}\right)' \left(\mathbb{V}\left(\mathbf{y}_i\right) - \boldsymbol{\Sigma}\right)^{-1} \left(\mathbf{y}_i - \boldsymbol{\mu}\right)\right]$$

where q is the number of unique elements in $\boldsymbol{\mu}$ and $\boldsymbol{\Sigma}$, and $\mathbb{V}\left(\mathbf{y}_i\right)$ is the sampling variance-covariance matrix of $\mathbf{y}_i$.

Author(s)

Ivan Jacob Agaloos Pesigan

References

Neale, M. C., Hunter, M. D., Pritikin, J. N., Zahery, M., Brick, T. R., Kirkpatrick, R. M., Estabrook, R., Bates, T. C., Maes, H. H., & Boker, S. M. (2015). OpenMx 2.0: Extended structural equation and statistical modeling. *Psychometrika*, *81*(2), 535–549. doi:10.1007/s1133601494358

See Also

Other Meta-Analysis of VAR Functions: Meta()

Examples

```
## Not run:
# Generate data using the simStateSpace package------------------------------
beta_mu <- matrix(
  data = c(
    0.7, 0.5, -0.1,
    0.0, 0.6, 0.4,
    0, 0, 0.5
  ),
  nrow = 3
)
beta_sigma <- diag(3 * 3)
beta <- simStateSpace::SimBetaN(
  n = 5,
  beta = beta_mu,
  vcov_beta_vec_l = t(chol(beta_sigma))
)
sim <- simStateSpace::SimSSMVARIVary(
  n = 5,
```

```
  time = 100,
  mu0 = list(rep(x = 0, times = 3)),
  sigma0_l = list(t(chol(diag(3)))),
  alpha = list(rep(x = 0, times = 3)),
  beta = beta,
  psi_l = list(t(chol(diag(3))))
)
data <- as.data.frame(sim)

# Fit the model-----------------------------------------------------------------
library(fitDTVARMx)
fit <- FitDTVARIDMx(
  data = data,
  observed = c("y1", "y2", "y3"),
  id = "id"
)
# Multivariate meta-analysis----------------------------------------------------
library(metaVAR)
meta <- MetaVARMx(fit)
print(meta)
summary(meta)
coef(meta)
vcov(meta)

## End(Not run)
```

`print.metavarmeta` *Print Method for Object of Class* `metavarmeta`

Description

Print Method for Object of Class `metavarmeta`

Usage

```
## S3 method for class 'metavarmeta'
print(x, alpha = 0.05, digits = 4, ...)
```

Arguments

`x`	an object of class `metavarmeta`.
`alpha`	Numeric vector. Significance level α.
`digits`	Integer indicating the number of decimal places to display.
`...`	further arguments.

Author(s)

Ivan Jacob Agaloos Pesigan

summary.metavarmeta *Summary Method for Object of Class* metavarmeta

Description

Summary Method for Object of Class metavarmeta

Usage

```
## S3 method for class 'metavarmeta'
summary(object, alpha = 0.05, digits = 4, ...)
```

Arguments

object	an object of class metavarmeta.
alpha	Numeric vector. Significance level α.
digits	Integer indicating the number of decimal places to display.
...	further arguments.

Author(s)

Ivan Jacob Agaloos Pesigan

vcov.metavarmeta *Variance-Covariance Matrix Method for an Object of Class* metavarmeta

Description

Variance-Covariance Matrix Method for an Object of Class metavarmeta

Usage

```
## S3 method for class 'metavarmeta'
vcov(object, ...)
```

Arguments

object	an object of class metavarmeta.
...	further arguments.

Value

Returns the variance-covariance matrix of the estimated parameters.

Author(s)

Ivan Jacob Agaloos Pesigan

Index