

Package ‘metaVAR’

July 27, 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>

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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

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Contents

coef.metavarmeta	2
Meta	2
MetaVARMx	4
print.metavarmeta	6
summary.metavarmeta	7
vcov.metavarmeta	7

Index	8
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coef.metavarmeta	<i>Estimated Parameter Method for an Object of Class metavarmeta</i>
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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	<i>Fit Multivariate Meta-Analysis</i>
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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

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

Details

For $i = \{1, \dots, n\}$, 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

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

where q is the number of unique elements in $\boldsymbol{\mu}$ and $\boldsymbol{\Sigma}$, and $\mathbb{V}(\mathbf{y}_i)$ 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\(\)](#)

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 <code>fitDTVARMx::FitDTVARIDMx()</code> or <code>fitCTVARMx::FitCTVARIDMx()</code> 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 $t(\text{chol}(\text{sigma}))$.
sigma_l_lbound	Numeric matrix. Optional matrix of lower bound values for $t(\text{chol}(\text{sigma}))$.
sigma_l_ubound	Numeric matrix. Optional matrix of upper bound values for $t(\text{chol}(\text{sigma}))$.
diag	Logical. If <code>diag = TRUE</code> , sigma is a diagonal matrix. If <code>diag = FALSE</code> , sigma is a symmetric matrix.
intercept	Logical. If <code>intercept = TRUE</code> , include estimates of the process intercept vector, if available. If <code>intercept = FALSE</code> , exclude estimates of the process intercept vector.
noise	Logical. If <code>noise = TRUE</code> , include estimates of the process noise matrix, if available. If <code>noise = FALSE</code> , 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.

Details

For $i = \{1, \dots, n\}$, 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

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

where q is the number of unique elements in $\boldsymbol{\mu}$ and $\boldsymbol{\Sigma}$, and $\mathbb{V}(\mathbf{y}_i)$ 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_1 = 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	<i>Print Method for Object of Class metavarmeta</i>
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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	<i>Summary Method for Object of Class metavarmeta</i>
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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	<i>Variance-Covariance Matrix Method for an Object of Class metavarmeta</i>
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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

* **Meta-Analysis of VAR Functions**

Meta, [2](#)

MetaVARmX, [4](#)

* **metaVAR**

Meta, [2](#)

MetaVARmX, [4](#)

* **meta**

Meta, [2](#)

MetaVARmX, [4](#)

* **methods**

coef.metavarmeta, [2](#)

print.metavarmeta, [6](#)

summary.metavarmeta, [7](#)

vcov.metavarmeta, [7](#)

coef.metavarmeta, [2](#)

fitCTVARmX::FitCTVARIDmX(), [4](#)

fitDTVARMX::FitDTVARMIDmX(), [4](#)

Meta, [2](#), [5](#)

MetaVARmX, [3](#), [4](#)

print.metavarmeta, [6](#)

summary.metavarmeta, [7](#)

vcov.metavarmeta, [7](#)