

Package ‘fitDTVARMx’

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Title Fit the Discrete-Time Vector Autoregressive Model

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Description Fit the discrete-time vector autoregressive model using the 'OpenMx' package.

URL <https://github.com/jeksterslab/fitDTVARMx>,
<https://jeksterslab.github.io/fitDTVARMx/>

BugReports <https://github.com/jeksterslab/fitDTVARMx/issues>

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Encoding UTF-8

Roxygen list(markdown = TRUE)

VignetteBuilder knitr

Depends R (>= 3.0.0), OpenMx

Imports stats

Suggests knitr, rmarkdown, testthat, simStateSpace

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NeedsCompilation no

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| | |
|-------------------|----------------------------|
| coef.fitdtvaridmx | <i>Parameter Estimates</i> |
|-------------------|----------------------------|

Description

Parameter Estimates

Usage

```
## S3 method for class 'fitdtvaridmx'  
coef(object, alpha = FALSE, psi = FALSE, theta = FALSE, ...)
```

Arguments

| | |
|--------|---|
| object | Object of class fitdtvaridmx. |
| alpha | Logical. If alpha = TRUE, include estimates of the alpha vector, if available. If alpha = FALSE, exclude estimates of the alpha vector. |
| psi | Logical. If psi = TRUE, include estimates of the psi matrix, if available. If psi = FALSE, exclude estimates of the psi matrix. |
| theta | Logical. If theta = TRUE, include estimates of the theta matrix, if available. If theta = FALSE, exclude estimates of the theta matrix. |
| ... | additional arguments. |

Value

Returns a list of vectors of parameter estimates.

Author(s)

Ivan Jacob Agaloos Pesigan

| | |
|-----------------|----------------------------|
| coef.fitdtvarmx | <i>Parameter Estimates</i> |
|-----------------|----------------------------|

Description

Parameter Estimates

Usage

```
## S3 method for class 'fitdtvarmx'  
coef(object, alpha = FALSE, psi = FALSE, theta = FALSE, ...)
```

Arguments

| | |
|--------|---|
| object | Object of class fitdtdvarmx. |
| alpha | Logical. If alpha = TRUE, include estimates of the alpha vector, if available. If alpha = FALSE, exclude estimates of the alpha vector. |
| psi | Logical. If psi = TRUE, include estimates of the psi matrix, if available. If psi = FALSE, exclude estimates of the psi matrix. |
| theta | Logical. If theta = TRUE, include estimates of the theta matrix, if available. If theta = FALSE, exclude estimates of the theta matrix. |
| ... | additional arguments. |

Value

Returns a vector of parameter estimates.

Author(s)

Ivan Jacob Agaloos Pesigan

FitDTVARIDMx

Fit the First-Order Discrete-Time Vector Autoregressive Model by ID

Description

Fit the First-Order Discrete-Time Vector Autoregressive Model by ID

Usage

```
FitDTVARIDMx(
  data,
  observed,
  id,
  alpha_fixed = TRUE,
  alpha_start = NULL,
  alpha_lbound = NULL,
  alpha_ubound = NULL,
  beta_start = NULL,
  beta_lbound = NULL,
  beta_ubound = NULL,
  psi_diag = TRUE,
  psi_start = NULL,
  psi_lbound = NULL,
  psi_ubound = NULL,
  theta_fixed = TRUE,
  theta_start = NULL,
  theta_lbound = NULL,
  theta_ubound = NULL,
```

```

mu0_fixed = TRUE,
mu0_start = NULL,
mu0_lbound = NULL,
mu0_ubound = NULL,
sigma0_fixed = TRUE,
sigma0_diag = TRUE,
sigma0_start = NULL,
sigma0_lbound = NULL,
sigma0_ubound = NULL,
try = 1000,
ncores = NULL
)

```

Arguments

| | |
|--------------|---|
| data | Data frame. A data frame object of data for potentially multiple subjects that contain a column of subject ID numbers (i.e., an ID variable), and at least one column of observed values. |
| observed | Character vector. A vector of character strings of the names of the observed variables in the data. |
| id | Character string. A character string of the name of the ID variable in the data. |
| alpha_fixed | Logical. If <code>alpha_fixed = TRUE</code> , the dynamic model intercept vector <code>alpha</code> is fixed at zero. If <code>alpha_fixed = FALSE</code> , the dynamic model intercept vector <code>alpha</code> is estimated. |
| alpha_start | Optional starting values for <code>alpha</code> . If <code>alpha_fixed = TRUE</code> , <code>alpha_start</code> will be used as fixed values. If <code>alpha_fixed = FALSE</code> , <code>alpha_start</code> will be used as starting values. |
| alpha_lbound | Optional lower bound for <code>alpha</code> . Ignored if <code>alpha_fixed = TRUE</code> . |
| alpha_ubound | Optional upper bound for <code>alpha</code> . Ignored if <code>alpha_fixed = TRUE</code> . |
| beta_start | Numeric matrix. Optional starting values for <code>beta</code> . |
| beta_lbound | Numeric matrix. Optional lower bound for <code>beta</code> . |
| beta_ubound | Numeric matrix. Optional upper bound for <code>beta</code> . |
| psi_diag | Logical. If <code>psi_diag = TRUE</code> , <code>psi</code> is a diagonal matrix. |
| psi_start | Numeric matrix. Optional starting values for <code>psi</code> . |
| psi_lbound | Numeric matrix. Optional lower bound for <code>psi</code> . |
| psi_ubound | Optional upper bound for <code>psi</code> . |
| theta_fixed | Logical. If <code>theta_fixed = TRUE</code> , the measurement error matrix <code>theta</code> is fixed to zero. If <code>theta_fixed = FALSE</code> , estimate the diagonal measurement error matrix <code>theta</code> . |
| theta_start | Optional starting values for <code>theta</code> . Ignored if <code>theta_fixed = TRUE</code> . |
| theta_lbound | Optional lower bound for <code>theta</code> . Ignored if <code>theta_fixed = TRUE</code> . |
| theta_ubound | Optional upper bound for <code>theta</code> . Ignored if <code>theta_fixed = TRUE</code> . |
| mu0_fixed | Logical. If <code>mu0_fixed = TRUE</code> , initial mean vector <code>mu0</code> is fixed. If <code>mu0_fixed = FALSE</code> , initial mean vector <code>mu0</code> is estimated. |

| | |
|----------------------------|--|
| <code>mu0_start</code> | Optional starting values for <code>mu0</code> . If <code>mu0_fixed = TRUE</code> , <code>mu0_start</code> will be used as fixed values. If <code>mu0_fixed = FALSE</code> , <code>mu0_start</code> will be used as starting values. |
| <code>mu0_lbound</code> | Optional lower bound for <code>mu0</code> . Ignored if <code>mu0_fixed = TRUE</code> . |
| <code>mu0_ubound</code> | Optional upper bound for <code>mu0</code> . Ignored if <code>mu0_fixed = TRUE</code> . |
| <code>sigma0_fixed</code> | Logical. If <code>sigma0_fixed = TRUE</code> , initial mean vector <code>sigma0</code> is fixed. If <code>sigma0_fixed = FALSE</code> , initial mean vector <code>sigma0</code> is estimated. |
| <code>sigma0_diag</code> | Logical. If <code>sigma0_diag = TRUE</code> , <code>sigma0</code> is a diagonal matrix. |
| <code>sigma0_start</code> | Optional starting values for <code>sigma0</code> . If <code>sigma0_fixed = TRUE</code> , <code>sigma0_start</code> will be used as fixed values. If <code>sigma0_fixed = FALSE</code> , <code>sigma0_start</code> will be used as starting values. |
| <code>sigma0_lbound</code> | Optional lower bound for <code>sigma0</code> . Ignored if <code>sigma0_fixed = TRUE</code> . |
| <code>sigma0_ubound</code> | Optional upper bound for <code>sigma0</code> . Ignored if <code>sigma0_fixed = TRUE</code> . |
| <code>try</code> | Positive integer. Number of extra optimization tries. |
| <code>ncores</code> | Positive integer. Number of cores to use. |

Value

Returns an object of class `fitdtvaridmx` which is a list with the following elements:

call Function call.

args List of function arguments.

fun Function used ("FitDTVARIDMx").

output A list of fitted OpenMx models.

Author(s)

Ivan Jacob Agaloos Pesigan

References

Hunter, M. D. (2017). State space modeling in an open source, modular, structural equation modeling environment. *Structural Equation Modeling: A Multidisciplinary Journal*, 25(2), 307–324. doi:10.1080/10705511.2017.1369354

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 DTVAR Functions: [FitDTVARm\(\)](#)

Examples

```
## Not run:
# Generate data using the simStateSpace package-----
set.seed(42)
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"
)
print(fit)
summary(fit)
coef(fit)
vcov(fit)

## End(Not run)
```

Description

Fit the First-Order Discrete-Time Vector Autoregressive Model

Usage

```
FitDTVARMx(
  data,
  observed,
  id,
  alpha_fixed = TRUE,
  alpha_start = NULL,
  alpha_lbound = NULL,
  alpha_ubound = NULL,
  beta_start = NULL,
  beta_lbound = NULL,
  beta_ubound = NULL,
  psi_diag = TRUE,
  psi_start = NULL,
  psi_lbound = NULL,
  psi_ubound = NULL,
  theta_fixed = TRUE,
  theta_start = NULL,
  theta_lbound = NULL,
  theta_ubound = NULL,
  mu0_fixed = TRUE,
  mu0_start = NULL,
  mu0_lbound = NULL,
  mu0_ubound = NULL,
  sigma0_fixed = TRUE,
  sigma0_diag = TRUE,
  sigma0_start = NULL,
  sigma0_lbound = NULL,
  sigma0_ubound = NULL,
  try = 1000,
  ncores = NULL
)
```

Arguments

| | |
|--------------------------|---|
| <code>data</code> | Data frame. A data frame object of data for potentially multiple subjects that contain a column of subject ID numbers (i.e., an ID variable), and at least one column of observed values. |
| <code>observed</code> | Character vector. A vector of character strings of the names of the observed variables in the data. |
| <code>id</code> | Character string. A character string of the name of the ID variable in the data. |
| <code>alpha_fixed</code> | Logical. If <code>alpha_fixed = TRUE</code> , the dynamic model intercept vector <code>alpha</code> is fixed at zero. If <code>alpha_fixed = FALSE</code> , the dynamic model intercept vector <code>alpha</code> is estimated. |
| <code>alpha_start</code> | Optional starting values for <code>alpha</code> . If <code>alpha_fixed = TRUE</code> , <code>alpha_start</code> will be used as fixed values. If <code>alpha_fixed = FALSE</code> , <code>alpha_start</code> will be used as starting values. |

| | |
|---------------|--|
| alpha_lbound | Optional lower bound for alpha. Ignored if alpha_fixed = TRUE. |
| alpha_ubound | Optional upper bound for alpha. Ignored if alpha_fixed = TRUE. |
| beta_start | Numeric matrix. Optional starting values for beta. |
| beta_lbound | Numeric matrix. Optional lower bound for beta. |
| beta_ubound | Numeric matrix. Optional upper bound for beta. |
| psi_diag | Logical. If psi_diag = TRUE, psi is a diagonal matrix. |
| psi_start | Numeric matrix. Optional starting values for psi. |
| psi_lbound | Numeric matrix. Optional lower bound for psi. |
| psi_ubound | Optional upper bound for psi. |
| theta_fixed | Logical. If theta_fixed = TRUE, the measurement error matrix theta is fixed to zero. If theta_fixed = FALSE, estimate the diagonal measurement error matrix theta. |
| theta_start | Optional starting values for theta. Ignored if theta_fixed = TRUE. |
| theta_lbound | Optional lower bound for theta. Ignored if theta_fixed = TRUE. |
| theta_ubound | Optional upper bound for theta. Ignored if theta_fixed = TRUE. |
| mu0_fixed | Logical. If mu0_fixed = TRUE, initial mean vector mu0 is fixed. If mu0_fixed = FALSE, initial mean vector mu0 is estimated. |
| mu0_start | Optional starting values for mu0. If mu0_fixed = TRUE, mu0_start will be used as fixed values. If mu0_fixed = FALSE, mu0_start will be used as starting values. |
| mu0_lbound | Optional lower bound for mu0. Ignored if mu0_fixed = TRUE. |
| mu0_ubound | Optional upper bound for mu0. Ignored if mu0_fixed = TRUE. |
| sigma0_fixed | Logical. If sigma0_fixed = TRUE, initial mean vector sigma0 is fixed. If sigma0_fixed = FALSE, initial mean vector sigma0 is estimated. |
| sigma0_diag | Logical. If sigma0_diag = TRUE, sigma0 is a diagonal matrix. |
| sigma0_start | Optional starting values for sigma0. If sigma0_fixed = TRUE, sigma0_start will be used as fixed values. If sigma0_fixed = FALSE, sigma0_start will be used as starting values. |
| sigma0_lbound | Optional lower bound for sigma0. Ignored if sigma0_fixed = TRUE. |
| sigma0_ubound | Optional upper bound for sigma0. Ignored if sigma0_fixed = TRUE. |
| try | Positive integer. Number of extra optimization tries. |
| ncores | Positive integer. Number of cores to use. |

Value

Returns an object of class `fitdtvarmx` which is a list with the following elements:

call Function call.

args List of function arguments.

fun Function used ("FitDTVARMx").

output A fitted OpenMx model.

Author(s)

Ivan Jacob Agaloos Pesigan

References

Hunter, M. D. (2017). State space modeling in an open source, modular, structural equation modeling environment. *Structural Equation Modeling: A Multidisciplinary Journal*, 25(2), 307–324. doi:[10.1080/10705511.2017.1369354](https://doi.org/10.1080/10705511.2017.1369354)

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](https://doi.org/10.1007/s1133601494358)

See Also

Other DTVAR Functions: [FitDTVARIDMx\(\)](#)

Examples

```
## Not run:
# Generate data using the simStateSpace package-----
set.seed(42)
sim <- simStateSpace::SimSSMVARFixed(
  n = 5,
  time = 100,
  mu0 = rep(x = 0, times = 3),
  sigma0_l = t(chol(diag(3))),
  alpha = rep(x = 0, times = 3),
  beta = matrix(
    data = c(
      0.7, 0.5, -0.1,
      0.0, 0.6, 0.4,
      0, 0, 0.5
    ),
    nrow = 3
  ),
  psi_l = t(chol(diag(3)))
)
data <- as.data.frame(sim)

# Fit the model-----
library(fitDTVARMx)
fit <- FitDTVARMx(
  data = data,
  observed = c("y1", "y2", "y3"),
  id = "id"
)
print(fit)
summary(fit)
coef(fit)
vcov(fit)
```

```
## End(Not run)
```

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

Description

Print Method for Object of Class fitdtvaridmx

Usage

```
## S3 method for class 'fitdtvaridmx'  
print(x, means = TRUE, ...)
```

Arguments

| | |
|--------------------|--|
| <code>x</code> | an object of class fitdtvaridmx. |
| <code>means</code> | Logical. If means = TRUE, return means. Otherwise, the function returns raw estimates. |
| <code>...</code> | further arguments. |

Author(s)

Ivan Jacob Agaloos Pesigan

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

Description

Print Method for Object of Class fitdtvarmx

Usage

```
## S3 method for class 'fitdtvarmx'  
print(x, ...)
```

Arguments

| | |
|------------------|--------------------------------|
| <code>x</code> | an object of class fitdtvarmx. |
| <code>...</code> | further arguments. |

Author(s)

Ivan Jacob Agaloos Pesigan

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

Description

Summary Method for Object of Class fitdtvaridmx

Usage

```
## S3 method for class 'fitdtvaridmx'
summary(object, means = TRUE, ...)
```

Arguments

| | |
|--------|--|
| object | an object of class fitdtvaridmx. |
| means | Logical. If means = TRUE, return means. Otherwise, the function returns raw estimates. |
| ... | further arguments. |

Author(s)

Ivan Jacob Agaloos Pesigan

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

Description

Summary Method for Object of Class fitdtvarmx

Usage

```
## S3 method for class 'fitdtvarmx'
summary(object, ...)
```

Arguments

| | |
|--------|--------------------------------|
| object | an object of class fitdtvarmx. |
| ... | further arguments. |

Author(s)

Ivan Jacob Agaloos Pesigan

| | |
|------------------|--|
| vcov.fitdvaridmx | <i>Sampling Covariance Matrix of the Parameter Estimates</i> |
|------------------|--|

Description

Sampling Covariance Matrix of the Parameter Estimates

Usage

```
## S3 method for class 'fitdvaridmx'  
vcov(object, alpha = FALSE, psi = FALSE, theta = FALSE, ...)
```

Arguments

| | |
|--------|---|
| object | Object of class fitdvaridmx. |
| alpha | Logical. If alpha = TRUE, include estimates of the alpha vector, if available. If alpha = FALSE, exclude estimates of the alpha vector. |
| psi | Logical. If psi = TRUE, include estimates of the psi matrix, if available. If psi = FALSE, exclude estimates of the psi matrix. |
| theta | Logical. If theta = TRUE, include estimates of the theta matrix, if available. If theta = FALSE, exclude estimates of the theta matrix. |
| ... | additional arguments. |

Value

Returns a list of sampling variance-covariance matrices.

Author(s)

Ivan Jacob Agaloos Pesigan

| | |
|----------------|--|
| vcov.fitdvarmx | <i>Sampling Covariance Matrix of the Parameter Estimates</i> |
|----------------|--|

Description

Sampling Covariance Matrix of the Parameter Estimates

Usage

```
## S3 method for class 'fitdvarmx'  
vcov(object, alpha = FALSE, psi = FALSE, theta = FALSE, ...)
```

Arguments

| | |
|--------|---|
| object | Object of class fittedvarmx. |
| alpha | Logical. If alpha = TRUE, include estimates of the alpha vector, if available. If alpha = FALSE, exclude estimates of the alpha vector. |
| psi | Logical. If psi = TRUE, include estimates of the psi matrix, if available. If psi = FALSE, exclude estimates of the psi matrix. |
| theta | Logical. If theta = TRUE, include estimates of the theta matrix, if available. If theta = FALSE, exclude estimates of the theta matrix. |
| ... | additional arguments. |

Value

Returns a list of sampling variance-covariance matrices.

Author(s)

Ivan Jacob Agaloos Pesigan

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