

Package ‘multivar’

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Encoding UTF-8

Title Penalized Estimation and Forecasting of Multiple Subject Vector
Autoregressive (multi-VAR) Models

Version 0.0.2

Description Functions for simulating, estimating and forecasting stationary Vector Autoregressive (VAR) models for multiple subject data using the penalized multi-VAR framework in Fisher, Kim and Pipiras (2020) <arXiv:2007.05052>.

Depends R (>= 2.10)

Imports stats, utils, MASS, Rcpp (>= 1.0.3)

License GPL (>= 2)

LazyData true

ByteCompile true

RoxygenNote 6.1.1

NeedsCompilation yes

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Repository CRAN

LinkingTo Rcpp,RcppArmadillo

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multivar-package *A short title line describing what the package does*

Description

A more detailed description of what the package does. A length of about one to five lines is recommended.

Details

This section should provide a more detailed overview of how to use the package, including the most important functions.

Author(s)

Your Name, email optional.

Maintainer: Your Name <your@email.com>

References

This optional section can contain literature or other references for background information.

See Also

Optional links to other man pages

Examples

```
## Not run:
## Optional simple examples of the most important functions
## These can be in \dontrun{} and \donttest{} blocks.

## End(Not run)
```

fista_sparse *Estimate a Sparse Multiple-Subject Vector Autoregression (VAR) Model*

Description

Function for estimating multiple-subject Vector Autoregression models using Fast Iterative Shrinkage-Thresholding Algorithm (FISTA; Beck and Teboulle, 2009)

Usage

```
fista_sparse(A, b, lambda, x_true, niter, backtrack, w = NULL,
             conv = 1e-10)
```

Arguments

A	An N x P design matrix.
b	An N x P outcome matrix.
lambda	Regularization parameter.
x_true	Numeric matrix containing the true transition matrix (if available).
niter	Integer giving the maximum number of iterations.
backtrack	Logical. If backtracking should be used in the FISTA algorithm.
w	Numeric matrix containing the weights (if available).
conv	Convergence criterion.

Details**Function Under Development**

This is a prototype function and is currently under development.

References

Fisher, Z.F., Kim, Y., and Pipiras, V. (Under Review) Penalized Estimation and Forecasting of Multiple Subject Intensive Longitudinal Data.

Beck A. and Teboulle, M. (2009). A Fast Iterative Shrinkage-Thresholding Algorithm for Linear Inverse Problems. SIAM J. Img. Sci. 2, 1, 183–202.

Examples

```
theta <- matrix(rnorm(9),3,3)
data <- var_sim(20, theta, diag(.1,3))
datalag <- embed(data, 2)
b <- datalag[,1:3]
A <- datalag[,4:6]
fista_sparse(A, b, 1, theta, niter = 1, backtrack = TRUE)
```

var_forecast	<i>Estimate h-step ahead forecasts based on the recovered transition matrix.</i>
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Description

Estimate h-step ahead forecasts based on the recovered transition matrix.

Usage

```
var_forecast(yf, h, A)
```

Arguments

yf	A $d \times T$ data matrix where d is the number of observed variables and T is the number of timepoints.
h	An integer indicating the forecast horizon.
A	A $d \times d$ transition matrix.

Examples

```
theta <- diag(c(.7,.8,.9,.6,.7,.9))
data <- t(var_sim(100, theta, diag(.1,6)))
datalag <- embed(data, 2)
b <- datalag[,1:6]
A <- datalag[,7:12]
A_est <- fista_sparse(A, b, 1, theta, niter = 10, backtrack = TRUE)$out.x
var_forecast(t(b), 2, A_est)
```

var_sim

*Simulate a stationary Vector Autoregressive (VAR) time series.***Description**

Simulate a stationary Vector Autoregressive (VAR) time series.

Usage

```
var_sim(T, A, Sigma)
```

Arguments

T	An integer giving the number of timepoints.
A	A $d \times d$ transition matrix.
Sigma	A $d \times d$ innovation covariance matrix.

Examples

```
theta <- diag(c(.7,.8,.9,.6,.7,.9))
data <- t(var_sim(100, theta, diag(.1,6)))
datalag <- embed(data, 2)
b <- datalag[,1:6]
A <- datalag[,7:12]
A_est <- fista_sparse(A, b, 1, theta, niter = 10, backtrack = TRUE)$out.x
var_forecast(t(b), 2, A_est)
```

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