

# Package ‘sparseCov’

May 9, 2026

**Title** Sparse Covariance Estimation Based on Thresholding

**Version** 0.0.1

**Description** A sparse covariance estimator based on different thresholding operators.

**License** GPL (>= 2)

**Encoding** UTF-8

**RoxygenNote** 7.3.1

**Imports** Matrix, methods, mvnfast, Rfast, sparseMVN, stats

**URL** <https://github.com/chexjiang/sparseCov>

**NeedsCompilation** no

**Author** Chenxin Jiang [aut, cre]

**Maintainer** Chenxin Jiang <cflorajiang@g.ucla.edu>

**Repository** CRAN

**Date/Publication** 2024-04-10 16:50:02 UTC

## Contents

block.true.cov . . . . .	2
est_delta . . . . .	2
est_sparseCov . . . . .	3
sampleMVN . . . . .	4
thresh_op . . . . .	5
<b>Index</b>	<b>6</b>

---

block.true.cov	<i>This function construct a covariance matrix with a block diagonal structure.</i>
----------------	---

---

### Description

This function construct a covariance matrix with a block diagonal structure.

### Usage

```
block.true.cov(p, block.size = 3)
```

### Arguments

p	The number of variants.
block.size	The block size.

### Value

A covariance matrix with a block diagonal structure.

### Examples

```
data.true.cov <- block.true.cov(30)
data.true.cov[1:9,1:9]
```

---

est_delta	<i>This function select the optimal thresholding level delta</i>
-----------	--

---

### Description

This function select the optimal thresholding level delta

### Usage

```
est_delta(
  data,
  method = c("cv", "qiu"),
  operator = c("hard", "soft", "scad", "al")
)
```

### Arguments

data	The data matrix.
method	The choice of method to select the optimal threshold level.
operator	The choice of thresholding operator.

**Value**

The optimal threshold level.

**Examples**

```
## generate data from a block diagonal covariance matrix structure
n <- 50
p <- 30
data.true.cov <- block.true.cov(p)
data <- sampleMVN(n, data.true.cov, sparse=TRUE)
## select the optimal thresholding level delta
delta <- est_delta(data, method='cv', operator='scad')
```

---

est_sparseCov	<i>This function computes the thresholding sparse covariance/correlation estimator with the optimal threshold level.</i>
---------------	--

---

**Description**

This function computes the thresholding sparse covariance/correlation estimator with the optimal threshold level.

**Usage**

```
est_sparseCov(
  data,
  method = c("cv", "qiu"),
  operator = c("hard", "soft", "scad", "al"),
  corr = TRUE
)
```

**Arguments**

data	The data matrix.
method	The choice of method to select the optimal threshold level.
operator	The choice of the thresholding operator.
corr	The indicator of computing correlation or covariance matrix.

**Value**

The thresholding sparse covariance/correlation estimator.

## Examples

```
## generate data from a block diagonal covariance matrix structure
n <- 50
p <- 30
data.true.cov <- block.true.cov(p)
data <- sampleMVN(n, data.true.cov, sparse=TRUE)
## compute the thresholding sparse covariance/correlation estimator
s <- est_sparseCov(data, method='cv', operator='scad', corr=FALSE)
```

---

sampleMVN

*This function samples MVN based on a given covariance matrix*

---

## Description

This function samples MVN based on a given covariance matrix

## Usage

```
sampleMVN(n, Sigma, sparse = TRUE, n_cores = 1, fastmvn = FALSE)
```

## Arguments

n	The sample size.
Sigma	The covariance matrix.
sparse	The indicator of sparse sampling or not.
n_cores	The number of cores used.
fastmvn	The indicator of fast sampling or not.

## Value

The data matrix sampled from the covariance matrix.

## Examples

```
## generate data from a block diagonal covariance matrix structure
n <- 50
p <- 30
data.true.cov <- block.true.cov(p)
data <- sampleMVN(n, data.true.cov, sparse=TRUE)
data[1:10, 1:10]
```

---

thresh_op	<i>This function computes the thresholding sparse covariance estimator for a given threshold level.</i>
-----------	---

---

**Description**

This function computes the thresholding sparse covariance estimator for a given threshold level.

**Usage**

```
thresh_op(z, operator, delta, n)
```

**Arguments**

z	The sample covariance matrix.
operator	The choice of the thresholding operator.
delta	The thresholding level.
n	The sample size of data matrix.

**Value**

The thresholding sparse covariance estimator for a given threshold level.

**Examples**

```
## generate data from a block diagonal covariance matrix structure
n <- 50
p <- 30
data.true.cov <- block.true.cov(p)
data <- sampleMVN(n, data.true.cov, sparse=TRUE)
## compute the sample covariance
z <- Rfast::cova(data) *(n-1)/n
## get the sparse covariance matrix estimator for a given threshold level
s <- thresh_op(z, operator='soft', delta=1, n=n)
s[1:9,1:9]
```

# Index

`block.true.cov`, 2

`est_delta`, 2

`est_sparseCov`, 3

`sampleMVN`, 4

`thresh_op`, 5