Package 'Kurt'

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Maintainer Cinzia Franceschini <cinziafranceschini@msn.com>

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Author Cinzia Franceschini [aut, cre], Nicola Loperfido [aut]

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Contents

Kurt-package *Kurt: Performs kurtosis-based statistical analyses*

Description

Computes measures of multivariate kurtosis, matrices of fourth-order moments and cumulants, kurtosis-based projection pursuit

Details

Index of help topics:

Cum4	Cum4: fourth multivariate cumulant
ExtKur	ExtKur: kurtosis based projection pursuit
ExtKurBiv	ExtKurBiv: kurtosis-based projection pursuit for bivariate random vectors
Fourth	Fourth: matrices of fourth moments or fourth cumulants
Fourth4	Fourth4: fourth moment of a data matrix
Kurt-package	Kurt: Performs kurtosis-based statistical analyses
NoKurt	NoKurt: data projections whose excess kurtosis is as close to zero as possible
ScalarKurt	ScalarKurt
optik	optik

ScalarKurt(), ExtKurt(), ExtKurtBiv(), optik(), NoKurt(), Cum4(), Fourth(), Fourth4()

Author(s)

Cinzia Franceschini and Nicola Loperfido

Maintainer: Cinzia Franceschini cinziafranceschini@msn.com

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`Cum4` *Cum4: fourth multivariate cumulant*

Description

returns a matrix containing the fourth cumulants of the given data

Usage

```
Cum4(data, type, shape)
```

Arguments

`data`	data matrix
`type`	type=0 uses original data, type=1 uses centered data, type=2 uses standardized data
`shape`	if shape="square" the output is a d^2 x d^2 matrix. If shape="rectangular", the output is a d x d^3 matrix. Where d is the number of variables

Value

K4 is the matrix containing the fourth cumulants of the given data

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode
Cum4(iris[,1:4], 1, "square") # returns a matrix containing the fourth cumulants of the given data
```

ExtKur *ExtKur: kurtosis based projection pursuit*

Description

Returns a data projection with either maximal or minimal kurtosis.

Usage

```
ExtKur(data, iterations, maxmin)
```

Arguments

data	data matrix
iterations	number of required iterations
maxmin	is the choice to either maximise ("MAX") or minimise ("MIN") kurtosis

Value

linear	vector of coefficients
projection	vector of projected data
kurt	extreme kurtosis attainable by a data projection

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode
ExtKur(iris[,1:4],10,"MAX") #returns a data projection with maximal kurtosis
```

ExtKurBiv *ExtKurBiv: kurtosis-based projection pursuit for bivariate random vectors*

Description

Returns a projection of bivariate data with either maximal or minimal kurtosis.

Usage

```
ExtKurBiv(data, maxmin)
```

Arguments

data	data matrix
maxmin	choice between maximal ("MAX") and minimal ("MIN") kurtosis

Value

linearMAX	coefficients of the projections maximising kurtosis
projectionMAX	projection with maximal kurtosis
kurtMAX	maximal kurtosis
linearMIN	coefficients of the projections minimising kurtosis
projectionMIN	projection with minimal kurtosis
kurtMIN	minimal kurtosis

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode

ExtKurBiv(iris[,1:2],"MAX")# returns a projection of bivariate data with maximal kurtosis
```

Fourth *Fourth: matrices of fourth moments or fourth cumulants*

Description

Returns a matrix containing either the fourth moments or the fourth cumulants. It recalls the functions Fourth4 and Cum4.

Usage

```
Fourth(data, type, shape, feature)
```

Arguments

data	data matrix
type	type =0 is the ordinary fourth moment / cumulant; type =1 is the centered fourth moment / cumulant; type =2 is the standardized fourth moment / cumulant
shape	"square" or "rectangular"
feature	"moment" or "cumulant". If feature is "moment", the function computes the fourth moment of a data matrix. The function recalls the function Fourth4. If feature is "cumulant", the function computes the fourth multivariate cumulant. The function recalls the function Cum4.

Value

M	Fourth square moment matrix
MM	Fourth rectangular moment matrix
K4	Fourth cumulants of the given data

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode
Fourth(iris[,1:4], 1,"square", "moment")#returns a matrix containing the fourth moments
```

Fourth4 *Fourth4: fourth moment of a data matrix*

Description

Returns a matrix containing the fourth moments.

Usage

```
Fourth4(data, type, shape)
```

Arguments

data	data matrix
type	type=0 is the ordinary fourth moment, type=1 is the centered fourth moment, type=2 is the standardized fourh moment
shape	"square" or "rectangular"

Value

M	Fourth square moment matrix
MM	Fourth rectangular moment matrix

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode
Fourth4(iris[,1:4], 1,"square") #returns a matrix containing the fourth moments
```

NoKurt *NoKurt: data projections whose excess kurtosis is as close to zero as possible*

Description

Data projections whose excess kurtosis is as close to zero as possible. Excess kurtosis is the fourth standardized cumulant , that is the fourth standardized moment minus three.

Usage

```
NoKurt(data, number)
```

Arguments

data	data matrix
number	number of required projections. It must be greater than one and less than the number of variables

Value

Nkurtoses	kurtoses of Nprojections
Nprojections	data projections ordered according to the absolute values of their excess kurtoses
MATRIX	matrix characterizing the projection

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris[,1:4])
NoKurt(iris[,1:4],3)#returns data projections whose excess kurtosis is as close to zero as possible
```

---

optik *optik*

Description

It computes the matrix containing the smallest and largest kurtoses of data projections as well as the corresponding directions.

Usage

```
optik(data)
```

Arguments

data	data matrix

Value

kurMAX	kurtosis of the projection maximizing kurtosis
pMAX	projection maximizing kurtosis
dMAX	direction maximizing kurtosis
kurMINbis	kurtosis of the projection minimizing kurtosis
pMINbis	projection minimizing kurtosis
dMINbis	direction minimizing kurtosis

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode
optik(iris[,1:4])#starting values of the projections with extreme kurtosis
```

ScalarKurt *ScalarKurt*

Description

Returns the statistic and the p-value of either Mardia's kurtosis or Koziol's kurtosis tests for normality .

Usage

```
ScalarKurt(data, feature, type, prob)
```

Arguments

data	data matrix
feature	"moment" or "cumulant"
type	"Mardia" or "Koziol"
prob	"lower" if probability is P[X <= x], "upper" if probability is P[X > x], "twoside" if probability is computed on both tails

Details

For Koziol kurtosis only the upper tail is meaningful

Value

statistic

pvalue

Author(s)

Cinzia Franceschini and Nicola Loperfido

Examples

```
data(iris)
iris<-data.matrix(iris)#returns the matrix obtained by converting the data frame to numeric mode
ScalarKurt(iris[,1:4],"moment","Mardia","upper")#returns the statistic and the p-value
#of Mardia's kurtosis test for normality
```

Index