Package ‘MVN’

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R topics documented:

MVN-package ............................................................. 2
contourControl ......................................................... 2
hz-class ................................................................. 3
hzTest ................................................................. 4
mardia-class ............................................................ 5
mardiaTest ............................................................. 6
mvnPlot . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7
mvOutlier . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
perspControl . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9
royston-class . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 11
roystonTest . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 11
uniNorm . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 13
uniPlot . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 14

Index 15

MVN package

Performs several multivariate normality tests.

Description

Performs multivariate normality tests and graphical approaches and implements multivariate outlier
detection and univariate normality of marginal distributions through plots and tests.

Details

Package: MVN
Type: Package
License: GPL (>= 2)

Author(s)

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contourControl

Control options for contour plot in mvnPlot

Description

This function includes options for contour plot in mvnPlot function

Usage

contourControl(nlevels = 20, labels = NULL, xlab = NULL, ylab = NULL, labcex = 0.6,
drawlabels = TRUE, method = c("simple", "edge", "flattest"), axes = TRUE,
frame.plot = TRUE, col = par("fg"), lty = par("lty"), lwd = par("lwd"))
Arguments

nlevels  number of contour levels.
labels  a vector giving the labels for the contour lines.
xlab  label for x-axis.
ylab  label for y-axis.
labcex  cex for contour labelling.
drawlabels  Contours are labelled if TRUE.
method  character string specifying where the labels will be located. Possible values are "simple", "edge" and "flattest" (the default).
axes  logical indicating whether axes should be drawn.
frame.plot  logical indicating whether a box should be drawn.
col  color for the lines drawn.
lty  line type for the lines drawn.
lwd  line width for the lines drawn.

Details

This function adapted from graphics::contour. Please see ?graphics::contour for more details.

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

hz-class

Class "hz"

Description

An S4 class for Henze-Zirkler’s Multivariate Normality Test

Slots

HZ: stores the value of Henze-Zirkler statistic
p.value: stores the p-value for the HZ test
dname: stores the data set name
dataframe: stores the data set

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz
Henze-Zirkler's Multivariate Normality Test

Description
This function performs Henze-Zirkler’s Multivariate Normality Test.

Usage
hzTest(data, cov = TRUE, qqplot = FALSE)

Arguments
data a numeric matrix or data frame
cov if TRUE covariance matrix is normalized by n, if FALSE it is normalized by n-1
qqplot if TRUE it creates a chi-square Q-Q plot

Details
The Henze-Zirkler test is based on a non-negative functional distance that measures the distance between two distribution functions. If the data is multivariate normal, the test statistic HZ is approximately lognormally distributed. It proceeds to calculate the mean, variance and smoothness parameter. Then, mean and variance are lognormalized and the p-value is estimated.

If there are missing values in the data, a listwise deletion will be applied and a complete-case analysis will be performed.

Value
HZ the value of Henze-Zirkler statistic at significance level 0.05
p-value a p-value for the HZ test

Author(s)
Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

References


See Also

roystonTest mardiaTest mvnPlot mvOutlier uniPlot uniNorm

Examples

setosa = iris[1:50, 1:4]  # Iris data only for setosa and four variables
result = hzTest(setosa, qqplot = TRUE)
result

Description

An S4 class for Mardia’s Multivariate Normality Test

Slots

g1p: stores the Mardia’s multivariate skewness statistic
chi.skew: stores the chi-square value of the skewness statistic
p.value.small: stores the p-value of small sample skew statistic
g2p: stores the Mardia’s multivariate kurtosis statistic
z.kurtosis: stores the z value of the kurtosis statistic
p.value.kurt: stores the p-value of kurtosis statistic
p.value.skew: stores the p-value of skewness statistic
chi.small.skew: stores the chi-square value of the small sample skewness statistic
dname: stores the data set name
dataframe: stores the data set

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz
mardiaTest

Mardia’s Multivariate Normality Test

Description
This function performs Mardia’s Multivariate Normality Test.

Usage
mardiaTest(data, cov = TRUE, qqplot = FALSE)

Arguments
data a numeric matrix or data frame
cov if TRUE covariance matrix is normalized by n, if FALSE it is normalized by n-1
qqplot if TRUE it creates a chi-square Q-Q plot

Details
This function calculate the Mardia’s multivariate skewness and kurtosis coefficients as well as their corresponding statistical significance. It can also calculate corrected version of skewness coefficient for small sample size (n< 20).

For multivariate normality, both p-values of skewness and kurtosis statistics should be greater than 0.05.

If sample size less than 20 then p.value.small should be used as significance value of skewness instead of p.value.skew.

If there are missing values in the data, a listwise deletion will be applied and a complete-case analysis will be performed.

Value
g1p Mardia’s multivariate skewness statistic
chi.skew Chi-square value of the skewness statistic
p.value.skew p-value of the skewness statistic
g2p Mardia’s multivariate kurtosis statistic
z.kurtosis z value of the kurtosis statistic
p.value.kurt p-value of kurtosis statistic
chi.small.skew Chi-square value of the small sample skewness statistic
p.value.small p-value of small sample skew statistic

Author(s)
Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz
References


See Also

roystonTest hzTest mvnPlot mvOutlier uniPlot uniNorm

Examples

setosa = iris[1:50, 1:4] # Iris data only for setosa and four variables
result = mardiaTest(setosa, qqplot = TRUE)
result

mvnPlot

Perspective and Contour Plots

Description

This function creates perspective and contour plots for a bivariate data set.

Usage

mvnPlot(object, type=c("persp","contour"), default = TRUE,
plotCtrl = c(perspControl(), contourControl()), ...)

Arguments

  object an object of mardia, hz or royston class
  type if type is selected as persp it creates a perspective plot, if type is selected as
contour it creates a contour plot.
  default when default is TRUE it creates plots in default settings
  plotCtrl options for plot control
  ... an optional argument
Details

After set the default=FALSE option, users can define their own plot settings with changing theta, phi, border and shade.

Note

Please be careful that this function creates perspective and contour plots when there are only two variables.

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

See Also

roystonTest hzTest mardiaTest mvOutlier uniPlot uniNorm

Examples

```r
setosa = iris[1:50, 1:2] # Iris data only for setosa and two variables
result = hzTest(setosa)
### Perspective Plot ###
mvnPlot(result, type = "persp", default = TRUE)
### Contour Plot ###
mvnPlot(result, type = "contour", default = TRUE)
```
tol  a numeric tolerance value which is used for inversion of the covariance matrix (default = 1e-25).
method quan for Mahalanobis distance and adj.quan for adjusted Mahalanobis distance.
label an optional term to display outlier labels (i.e. observation number) on the Q-Q plot.
position a position specifier for the text. Values of 1, 2, 3 and 4, respectively indicate positions below, to the left of, above and to the right of the specified coordinates.
offset  when pos is specified, this value gives the offset of the label from the specified coordinate in fractions of a character width.

Value

outlier an outlier set
newData  new data set without possible outliers

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

See Also

mardiaTest roystonTest hzTest mvnPlot uniPlot uniNorm

Examples

setosa = iris[1:50, 1:3]  # Iris data only for setosa and three variables
result = mvOutlier(setosa, qqplot = TRUE, method = "quan", label = TRUE)
result

perspControl

Control options for perspective plot in mvnPlot

Description

This function includes options for perspective plot in mvnPlot function

Usage

perspControl(theta = 1, phi = 30, r = sqrt(3), d = 1, scale = TRUE, expand = 1,
col = "white", border = NULL, ltheta = -135, lphi = 0, shade = 0.5, box = TRUE,
axes = TRUE, nticks = 5, ticktype = "simple", xlab = NULL, ylab = NULL,
zlab = NULL, main = NULL)
Arguments

theta  angles defining the azimuthal direction.
phi    angles defining the colatitude direction.
r     the distance of the eyepoint from the centre of the plotting box.
d     a value which can be used to vary the strength of the perspective transformation. Values of d greater than 1 will lessen the perspective effect and values less and 1 will exaggerate it.
scale  If scale is TRUE the x, y and z coordinates are transformed separately. If scale is FALSE the coordinates are scaled so that aspect ratios are retained.
expand an expansion factor applied to the z coordinates.
col    the color(s) of the surface facets.
border the color of the line drawn around the surface facets.
ltheta, lphi if finite values are specified for ltheta and lphi, the surface is shaded as though it was being illuminated from the direction specified by azimuth ltheta and colatitude lphi.
shade  the shade at a surface facet
box    should the bounding box for the surface be displayed. The default is TRUE.
axes   should ticks and labels be added to the box. The default is TRUE.
nticks the (approximate) number of tick marks to draw on the axes. Has no effect if ticktype is "simple".
ticktype character: "simple" draws just an arrow parallel to the axis to indicate direction of increase; "detailed" draws normal ticks as per 2D plots.
xlab   label for x-axis.
ylab   label for y-axis.
zlab   label for z-axis.
main   main title.

Details

This function adapted from graphics::persp. Please see ?graphics::persp for more details.

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz
royston-class

Description
An S4 class for Royston’s Multivariate Normality Test

Slots
h: stores the value of Royston’s H statistic
p.value: stores the p-value for the Royston test
dname: stores the data set name
dataframe: stores the data set

Author(s)
Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

roystonTest

Description
This function performs Royston’s Multivariate Normality Test.

Usage
roystonTest(data, qqplot = FALSE)

Arguments
data a numeric matrix or data frame
qqplot if TRUE it creates a chi-square Q-Q plot

Details
A function to generate the Shapiro-Wilk’s W statistic needed to feed the Royston’s H test for multivariate normality. However, if kurtosis of the data greater than 3 then Shapiro-Francia test is used for leptokurtic samples else Shapiro-Wilk test is used for platykurtic samples.
If there are missing values in the data, a listwise deletion will be applied and a complete-case analysis will be performed.
Value

- H: the value of Royston’s H statistic at significance level 0.05
- p-value: an approximate p-value for the test with respect to equivalent degrees of freedom (edf)

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

References


See Also

hzTest mardiaTest mvnPlot mvOutlier uniPlot uniNorm

Examples

setosa = iris[1:50, 1:4] # Iris data only for setosa and four variables
result = roystonTest(setosa, qqplot = TRUE)
result
uniNorm

Univariate Normality Tests

Description

This function performs univariate normality tests, including Shapiro-Wilk, Cramer-von Mises, Lilliefors (Kolmogorov-Smirnov), Shapiro-Francia and Anderson-Darling.

Usage

uniNorm(data, type = c("SW", "CVM", "Lillie", "SF", "AD"), desc = TRUE)

Arguments

data a vector, data frame or matrix
type select one of the univariate normality tests: SW: Shapiro-Wilk, CVM: Cramer-von Mises, Lillie: Lilliefors (Kolmogorov-Smirnov), SF: Shapiro-Francia, AD: Anderson-Darling
desc if TRUE, it displays descriptive statistics including mean, standard deviation, median, minimum, maximum, 25th and 75th percentiles, skewness and kurtosis.

Details

SW is default.

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

See Also

mardiaTest roystonTest hzTest mvnPlot mvOutlier uniPlot

Examples

setosa = iris[1:50, 1:4] # Iris data only for setosa and four variables
uniNorm(setosa, type = "SW", desc = TRUE)
uniPlot  

Description

This function creates univariate plots, including Q-Q plot, histogram, box-plot and scatterplot matrices.

Usage

uniPlot(data, type = c("qqplot", "histogram", "box", "scatter"), mfrow = NULL, ...)

Arguments

data  
a vector, data frame or matrix

type  
select one of the univariate plots: qqplot: Q-Q plot, histogram: histogram with a normal curve, box: box-plot and scatter: scatterplot matrix

mfrow  
multi-paneled plotting window

...  
optional arguments

Details

Box-Plots are based on standardized values, variables are centered and scaled before plotting. qqplot is default.

Author(s)

Selcuk Korkmaz, Dincer Goksuluk, Gokmen Zararsiz

See Also

mardiaTest roystonTest hzTest mvnPlot mvOutlier uniNorm

Examples

setosa = iris[1:50, 1:4] # Iris data only for setosa and four variables
uniPlot(setosa, type = "qqplot")
Index

contourControl, 2

hz (hz-class), 3
hz-class, 3
hzTest, 4, 7–9, 12–14

mardia (mardia-class), 5
mardia-class, 5
mardiaTest, 5, 6, 8, 9, 12–14
MWN (MVN-package), 2
MVN-package, 2
mvnPlot, 5, 7, 7, 9, 12–14
mvOutlier, 5, 7, 8, 8, 12–14

perspControl, 9

royston (royston-class), 11
royston-class, 11
roystonTest, 5, 7–9, 11, 13, 14

uniNorm, 5, 7–9, 12, 13, 14
uniPlot, 5, 7–9, 12, 13, 14