Package ‘MVN’

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Type Package

Title Multivariate Normality Tests

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Description Assessing the assumption of multivariate normality is required by many parametric multivariate statistical methods, such as discriminant analysis, principal component analysis, MANOVA, etc. Here, we present an R package to assess multivariate normality. The MVN package contains three most widely used multivariate normality tests, including Mardia's, Henze-Zirkler's, and Royston's multivariate normality tests.

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### Description

Assessing the assumption of multivariate normality is required by many parametric multivariate statistical methods, such as discriminant analysis, principal component analysis, MANOVA, etc. Here, we present an R package to assess multivariate normality. The MVN package contains three most widely used multivariate normality tests, including Mardia’s, Henze-Zirkler’s and Royston’s multivariate normality tests.

### Details

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

### Author(s)

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hzTest

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)

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hzTest 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.

Value

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

Author(s)

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References


See Also

roystonTest mardiaTest mvnPlot

Examples

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

mardia-class

Class "mardia"

Description

An S4 class for Mardia’s Multivariate Normality Test

Slots

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

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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
Calculates the Mardia’s multivariate skewness and kurtosis coefficients as well as their corresponding statistical tests. For large sample size the multivariate skewness is asymptotically distributed as a Chi-square random variable; here it is corrected for small sample size. Likewise, the multivariate kurtosis it is distributed as a unit-normal.

Value

\[
g1p \quad \text{Mardia’s } g1p \text{ estimate of multivariate skew}
\]
\[
skew \quad \text{Mardia’s skew statistic}
\]
\[
p.value.skew \quad \text{p-value of skew statistic}
\]
\[
g2p \quad \text{Mardia’s } g2p \text{ estimate of multivariate kurtosis}
\]
\[
kurtosis \quad \text{Mardia’s multivariate kurtosis statistic}
\]
\[
p.value.kurt \quad \text{p-value of kurtosis statistic}
\]
\[
small.skew \quad \text{Mardia’s small sample skew statistic}
\]
\[
p.value.small \quad \text{p-value of small sample skew statistic}
\]

Author(s)
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References


See Also

roystonTest hzTest mvnPlot

Examples

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

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

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.

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See Also

roystonTest hzTest mardiaTest

Examples

Iris = iris[1:50, 1:2] # Iris data only for setosa and two variables
result = hzTest(Iris)
### Perspective Plot ###
mvnPlot(result, type = "persp", default = TRUE)
### Contour Plot ###
mvnPlot(result, type = "contour", default = TRUE)
Description

This function performs Royston’s Multivariate Normality Test.

Usage

```r
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.

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)

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References


See Also

hzTest mardiaTest mvnPlot

Examples

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