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NormalityTests {fBasics}

Normality Tests

`Package:   fBasics`
Version: 3010.86

Description

A collection and description of functions of one sample tests for testing normality of financial return series.

The functions for testing normality are:

`ksnormTest`	Kolmogorov-Smirnov normality test,
`shapiroTest`	Shapiro-Wilk's test for normality,
`jarqueberaTest`	Jarque--Bera test for normality,
`dagoTest`	D'Agostino normality test.

Functions for high precision Jarque Bera LM and ALM tests:

`jbTest`	Performs finite sample adjusted JB LM and ALM test.

Additional functions for testing normality from the 'nortest' package:

`adTest`	Anderson--Darling normality test,
`cvmTest`	Cramer--von Mises normality test,
`lillieTest`	Lilliefors (Kolmogorov-Smirnov) normality test,
`pchiTest`	Pearson chi--square normality test,
`sfTest`	Shapiro--Francia normality test.

For SPlus/Finmetrics Compatibility:

`normalTest`	test suite for some normality tests.

Usage

```
ksnormTest(x, title = NULL, description = NULL)

jbTest(x, title = NULL, description = NULL)
shapiroTest(x, title = NULL, description = NULL)
normalTest(x, method = c("sw", "jb"), na.rm = FALSE)

jarqueberaTest(x, title = NULL, description = NULL)
dagoTest(x, title = NULL, description = NULL)

adTest(x, title = NULL, description = NULL)
cvmTest(x, title = NULL, description = NULL)
lillieTest(x, title = NULL, description = NULL)
pchiTest(x, title = NULL, description = NULL)
sfTest(x, title = NULL, description = NULL)
```

Arguments

`description`
    optional description string, or a vector of character strings.

`method`

[normalTest] -
indicates four different methods for the normality test, `"ks"` for the Kolmogorov-Smirnov one--sample test, `"sw"` for the Shapiro-Wilk test, `"jb"` for the Jarque-Bera Test, and `"da"` for the D'Agostino Test. The default value is `"ks"`.

`na.rm`

[normalTest] -
a logical value. Should missing values removed before computing the tests? The default value is `FALSE`.

`title`

an optional title string, if not specified the inputs data name is deparsed.

`x`

a numeric vector of data values or a S4 object of class `timeSeries`.

Details

The hypothesis tests may be of interest for many financial and economic applications, especially for the investigation of univariate time series returns.

Normal Tests:

Several tests for testing if the records from a data set are normally distributed are available. The input to all these functions may be just a vector x or a univariate time series object x of class `timeSeries`.

First there exists a wrapper function which allows to call one from two normal tests either the Shapiro--Wilks test or the Jarque--Bera test. This wrapper was introduced for compatibility with S-Plus' FinMetrics package.

Also available are the Kolmogorov--Smirnov one sample test and the D'Agostino normality test.

The remaining five normal tests are the Anderson--Darling test, the Cramer--von Mises test, the Lilliefors (Kolmogorov--Smirnov) test, the Pearson chi--square test, and the Shapiro--Francia test. They are calling functions from R's contributed package `nortest`. The difference to the original test functions implemented in R and from contributed R packages is that the Rmetrics functions accept time series objects as input and give a more detailed output report.

The Anderson-Darling test is used to test if a sample of data came from a population with a specific distribution, here the normal distribution. The `adTest` goodness-of-fit test can be considered as a modification of the Kolmogorov--Smirnov test which gives more weight to the tails than does the `ksnormTest`.

Values

In contrast to R's output report from S3 objects of class `"htest"` a different output report is produced. The tests here return an S4 object of class `"fHTEST"`. The object contains the following slots:

The slot @test returns an object of class `"list"` containing the following (otionally empty) elements:

The meaning of the elements of the @test slot is the following:

`ksnormTest`
returns the values for the 'D' statistic and p-values for the three alternatives 'two-sided, 'less' and 'greater'.

`shapiroTest`
returns the values for the 'W' statistic and the p-value.

`jarqueberaTest`
`jbTest`
returns the values for the 'Chi-squared' statistic with 2 degrees of freedom, and the asymptotic p-value. `jbTest` is the finite sample version of the Jarque Bera Lagrange multiplier, LM, and adjusted Lagrange multiplier test, ALM.

`dagoTest`
returns the values for the 'Chi-squared', the 'Z3' (Skewness) and 'Z4' (Kurtosis) statistic together with the corresponding p values.

`adTest`
returns the value for the 'A' statistic and the p-value.

`cvmTest`
returns the value for the 'W' statistic and the p-value.

`lillieTest`

returns the value for the 'D' statistic and the p-value.

pchiTest

returns the value for the 'P' statistic and the p-values for the adjusted and not adjusted test cases. In addition the number of classes is printed, taking the default value due to Moore (1986) computed from the expression n.classes = ceiling(2 * (n^(2/5))), where n is the number of observations.

sfTest

returns the value for the 'W' statistic and the p-value.

@call

the function call.

@data

the data as specified by the input argument(s).

@test

a list whose elements contain the results from the statistical test. The information provided is similar to a list object of class "htest".

@title

a character string with the name of the test. This can be overwritten specifying a user defined input argument.

@description

a character string with an optional user defined description. By default just the current date when the test was applied will be returned.

statistic

the value(s) of the test statistic.

p.value

the p-value(s) of the test.

parameters

a numeric value or vector of parameters.

estimate

a numeric value or vector of sample estimates.

conf.int

a numeric two row vector or matrix of 95

method

a character string indicating what type of test was performed.

data.name

a character string giving the name(s) of the data.

References

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Weiss M.S. (1978); *Modification of the Kolmogorov-Smirnov Statistic for Use with Correlated Data*, JASA 73, 872--75.

Wuertz D., Katzgraber H.G. (2005); *Precise finite-sample quantiles of the Jarque-Bera adjusted Lagrange multiplier test*, ETHZ Preprint.

Note

Some of the test implementations are selected from R's `ctest` and `nortest` packages.

Examples

```
## Series:
   x = rnorm(100)

## ksnormTests -
   # Kolmogorov - Smirnov One-Sampel Test
   ksnormTest(x)

## shapiroTest - Shapiro-Wilk Test
   shapiroTest(x)

## jarqueberaTest -
   # Jarque - Bera Test
   # jarqueberaTest(x)
   # jbTest(x)
```

Author(s)

R-core team for the tests from R's ctest package,
Adrian Trapletti for the runs test from R's tseries package,
Juergen Gross for the normal tests from R's nortest package,
James Filliben for the Fortran program producing the runs report,
Diethelm Wuertz and Helmut Katzgraber for the finite sample JB tests,
Diethelm Wuertz for the Rmetrics R-port.
Earlier versions of theses functions were based on Fortran code of Paul Johnson.

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