Package 'normality'

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Title Tests for Departure from Normality

Version 0.0.1

Description

A toolkit for assessing data normality using a comprehensive collection of statistical methods. It includes descriptive measures and formal hypothesis tests, such as skewness and kurtosis tests, the Anderson–Darling test, the Shapiro–Wilk test, and the D'Agostino–Pearson K2 omnibus test.

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URL https://github.com/P10911004-NPUST/normality

BugReports https://github.com/P10911004-NPUST/normality/issues

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Contents

`.Shapiro_Francia` *Shapiro-Francia Normality Test*

Description

Performs the Shapiro-Francia test of normality.

Usage

```
.Shapiro_Francia(x)
```

Arguments

`x`	Numeric vector.

Value

A list.

References

Shapiro, S.S., Francia, R.S., 1972. An Approximate Analysis of Variance Test for Normality. Journal of the American Statistical Association 67, 215–216. https://doi.org/10.1080/01621459.1972.10481232

Royston, P., 1993. A pocket-calculator algorithm for the shapiro-francia test for non-normality: An application to medicine. Statistics in Medicine 12, 181–184. https://doi.org/10.1002/sim.4780120209

`Anderson_Darling_test` *Anderson-Darling Normality Test*

Description

Anderson-Darling Normality Test

Usage

```
Anderson_Darling_test(x, alpha = 0.05, min_n = 8, verbose = FALSE)
```

Arguments

`x`	A numeric vector.
`alpha`	Numeric (default: 0.05). Significance threshold, range from 0 to 1.
`min_n`	Integer. The minimum observations required (default: 8).
`verbose`	Logical (default: FALSE). Show messages.

Value

A list:

- is_normal: Is the input data normally distributed?
- method: The name of the test.
- alpha: Significance threshold (default: 0.05).
- alternative: The alternative hypothesis (H1) to test.
- summary_table: Statistic summary, if any. Mostly output as a data frame.
- statistic: The value used to calculate p-value.
- pvalue: The p value.
- confidence_interval: The lower and upper bound of confidence interval (CI).

References

D'Agostino, RalphB., 2017. Goodness-of-Fit Techniques, page 123-128 & 372-373. 1st ed. Routledge. https://doi.org/10.1201/9780203753064

Examples

```
Anderson_Darling_test(leghorn_chick)
```

`cholesterol` *Cholesterol data*

Description

A numeric vector, the cholesterol values from a sample of 62 subjects from the Framingham Heart Study (FHS). This dataset was obtained from D'Agostino paper.

Usage

```
cholesterol
```

Format

A numeric vector length of 62.

References

D'agostino, R.B., Belanger, A., D'agostino, R.B., 1990. A Suggestion for Using Powerful and Informative Tests of Normality. The American Statistician 44, 316–321. https://doi.org/10.1080/00031305.1990.10475751

`D.Agostino_Pearson_test` *D'Agostino-Pearson K2 Normality Test*

Description

The D'Agostino–Pearson Chi-square (K2) test is a statistical test for assessing whether a sample comes from a normal distribution. It combines information from skewness (asymmetry) and kurtosis (tail heaviness) into a single omnibus test statistic.

Usage

```
D.Agostino_Pearson_test(
  x,
  alpha = 0.05,
  alternative = c("two.sided", "less", "greater"),
  min_n = 20
)
```

Arguments

`x`	A numeric vector.
`alpha`	Significance threshold (default: 0.05).
`alternative`	Character (default: "two.sided). The alternative hypothesis (H1) to test. Available options are c("two.sided", "less", "greater"). Note that, this is only applied on skewness and kurtosis test.
`min_n`	Integer. The minimum observations required (default: 20).

Value

A list:

- is_normal: Is the input data normally distributed?
- method: The name of the test.
- alpha: Significance threshold (default: 0.05).
- alternative: The alternative hypothesis (H1) to test.
- summary_table: Statistic summary, if any. Mostly output as a data frame.
- statistic: The value used to calculate p-value.
- pvalue: The p value.
- confidence_interval: The lower and upper bound of confidence interval (CI).

References

D'agostino, R.B., Belanger, A., D'agostino, R.B., 1990. A Suggestion for Using Powerful and Informative Tests of Normality. The American Statistician 44, 316–321. https://doi.org/10.1080/00031305.1990.10475751

Examples

```
D.Agostino_Pearson_test(cholesterol)
```

`kurtosis` *Kurtosis test*

Description

Kurtosis test

Usage

```
kurtosis(
  x,
  alpha = 0.05,
  alternative = c("two.sided", "less", "greater"),
  method = c("G2", "b2", "g2")
)
```

Arguments

`x`	Numeric vector. The input data.
`alpha`	Numeric (default: 0.05). Significance threshold (0 - 1).
`alternative`	Character (default: "two.sided). The alternative hypothesis (H1) to test. Available options are c("two.sided", "less", "greater").
`method`	Character (default: "G2"). Different skewness formula. Available options are c("G2", "b2", "g2"). The "g2" is the original one. The "G2" and "b2" are the unbiased estimate version of "g2".

Value

A list: is_normal: Is the input data normally distributed? method: The name of the test. alpha: Significance threshold (default: 0.05). alternative: The alternative hypothesis (H1) to test. summary_table: Statistic summary, if any. statistic: The value used to calculate p-value. pvalue: p-value. confidence_interval: The lower and upper bound of CI.

References

Joanes, D.N., Gill, C.A., 1998. Comparing measures of sample skewness and kurtosis. J Royal Statistical Soc D 47, 183–189. https://doi.org/10.1111/1467-9884.00122

Wright, D.B., Herrington, J.A., 2011. Problematic standard errors and confidence intervals for skewness and kurtosis. Behav Res 43, 8–17. https://doi.org/10.3758/s13428-010-0044-x

Examples

```
x <- c(10:17, 12, 12, 13, 13, 13, 13, 13, 14, 14, 14, 15, 15)
kurtosis(x)
```

leghorn_chick *Leghorn chicken data*

Description

A numeric vector

Usage

```
leghorn_chick
```

Format

A numeric vector length of 20.

References

D'Agostino, RalphB., 2017. Goodness-of-Fit Techniques, page 98 (Table 4.1). 1st ed. Routledge. https://doi.org/10.1201/9780203753064

normality_standard_output *Standard output format*

Description

The standard output format for `normality` package.

Usage

```
normality_standard_output(
  method = "what test?",
  is_normal = NA,
  alpha = NA_real_,
  alternative = c("two.sided", "less", "greater"),
  summary_table = NULL,
  statistic = NA_real_,
  pvalue = NA_real_,
  confidence_interval = c(lower = NA_real_, upper = NA_real_)
)
```

Arguments

method	Character. The name of the test.
is_normal	Logical. Is the input data normally distributed?
alpha	Numeric (default: 0.05). Significance threshold.
alternative	Character. The alternative hypothesis (H1) to test. Available options are c("two.sided", "less", "greater").
summary_table	Statistic summary, if any.
statistic	Numeric. The value used to calculate p-value.
pvalue	Numeric. The p-value of the test.
confidence_interval	Numeric vector of length 2. The lower and upper bound of CI.

Value

A list contains 8 vectors.

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skewness *Skewness test*

Description

Skewness test

Usage

```
skewness(
  x,
  alpha = 0.05,
  alternative = c("two.sided", "less", "greater"),
  method = c("G1", "b1", "g1")
)
```

Arguments

x	Numeric vector. The input data.
alpha	Numeric (default: 0.05). Significance threshold (0 - 1).
alternative	Character (default: "two.sided). The alternative hypothesis (H1) to test. Available options are c("two.sided", "less", "greater").
method	Character (default: "G1"). Different skewness formula. Available options are c("G1", "b1", "g1"). The "g1" is the original one. The "G1" and "b1" are the unbiased estimate version of "g1".

Value

A list: is_normal: Is the input data normally distributed? method: The name of the test. alpha: Significance threshold (default: 0.05). alternative: The alternative hypothesis (H1) to test. summary_table: Statistic summary, if any. statistic: The value used to calculate p-value. pvalue: p-value. confidence_interval: The lower and upper bound of CI.

References

Joanes, D.N., Gill, C.A., 1998. Comparing measures of sample skewness and kurtosis. J Royal Statistical Soc D 47, 183–189. https://doi.org/10.1111/1467-9884.00122

Wright, D.B., Herrington, J.A., 2011. Problematic standard errors and confidence intervals for skewness and kurtosis. Behav Res 43, 8–17. https://doi.org/10.3758/s13428-010-0044-x

Examples

```
skewness(cholesterol)
```

Index