Package: normality (via r-universe)

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Title Tests for Departure from Normality

Version 0.0.2

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

Anderson_Darling_test 2
cholesterol 3
D.Agostino_Pearson_test 3
is_tied 4

kurtosis 5
leghorn_chick 6
normality_standard_output 6
Shapiro_Wilk_coef_table 7
Shapiro_Wilk_pval_table 8
Shapiro_Wilk_test 8
skewness 9

Index **11**

`Anderson_Darling_test` *Anderson-Darling Normality Test*

Description

Performs the Anderson-Darling (A2) normality test which is based on the empirical distribution function (EDF).

Usage

```
Anderson_Darling_test(x, alpha = 0.05, silent = FALSE)
```

Arguments

`x`	A numeric vector.
`alpha`	Numeric (default: 0.05). Significance threshold, range from 0 to 1.
`silent`	Logical (default: FALSE). If `FALSE`, print out the results.

Value

A list.

References

D'Agostino, R.B., 2017. Tests for the Normal Distribution. In: D'Agostino, R.B., Stephens, M.A. (Eds.), Goodness-of-Fit Techniques, 1st ed. Routledge, New York, pp. 372–373. https://doi.org/10.1201/9780203753064

Stephens, M.A., 2017. Tests Based on EDF Statistics. In: D'Agostino, R.B., Stephens, M.A. (Eds.), Goodness-of-Fit Techniques, 1st ed. Routledge, New York, pp. 126–128. https://doi.org/10.1201/9780203753064

Anderson, T.W., Darling, D.A., 1954. A Test of Goodness of Fit. J. Am. Stat. Assoc. 49, 765–769. https://doi.org/10.1080/01621459.1954.10501232

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 Jr., R.B., 1990. A Suggestion for Using Powerful and Informative Tests of Normality. Am. Stat. 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 moment 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"),
  silent = FALSE
)
```

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.
silent	Logical (default: FALSE). If FALSE, print out the results.

Value

A list

References

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

Examples

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

---

is_tied *Tied data*

Description

Tied data

Usage

```
is_tied(x, ratio = 0.3, remove_NA = FALSE)
```

Arguments

x	A numeric vector
ratio	Numeric (default: 0.3). The ratio threshold of being considred as tied-data. The value range from 0 to 1.
remove_NA	Logical (default: TRUE). Whether or not to remove NAs.

Value

Logical

Examples

```
is_tied(c(1, 1, 2, 2, 2, 3, 4, 5))
#> TRUE
```

`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. R. Stat. Soc. D (The Statistician) 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. Methods 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

Stephens, M.A., 2017. Tests Based on EDF Statistics. In: D'Agostino, R.B., Stephens, M.A. (Eds.), Goodness-of-Fit Techniques, 1st ed. Routledge, New York, pp. 98. 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.

Shapiro_Wilk_coef_table

Shapiro-Wilk normality test (coefficients)

Description

Coefficients (ai) for the W test for normality.

Usage

```
Shapiro_Wilk_coef_table
```

Format

A data frame with 50 rows and 25 variables:

rownames is the sample size (n); colnames is the corresponding coefficients (ai).

References

Shapiro, S.S., Wilk, M.B., 1965. An Analysis of Variance Test for Normality (Complete Samples). Biometrika 52, 591–611. https://doi.org/10.2307/2333709

Shapiro_Wilk_pval_table *Shapiro-Wilk normality test (p-values)*

Description

The percentage points (critical values of W) of the W test for n = 3(1)50.

Usage

```
Shapiro_Wilk_pval_table
```

Format

A data frame with 50 rows and 10 variables:

rownames is the sample size (n); colnames is the corresponding p-values.

References

Shapiro, S.S., Wilk, M.B., 1965. An Analysis of Variance Test for Normality (Complete Samples). Biometrika 52, 591–611. https://doi.org/10.2307/2333709

Shapiro_Wilk_test *Shapiro-Wilk Normality Test*

Description

Performs the Shapiro-Wilk normality test which is based on the regression and correlation technique.

Usage

```
Shapiro_Wilk_test(
  x,
  alpha = 0.05,
  method = c("SWR", "SF", "SW"),
  silent = FALSE
)
```

Arguments

x	A numeric vector.
alpha	Significance threshold (default: 0.05).
method	Character (default: "SWR"). Use which modification of the test? Available options are c("SWR", "SF", "SW").
silent	Logical (default: FALSE). If FALSE, print out the results.

Details

method

- "SW": Shapiro-Wilk, the original test (`Shapiro and Wilk, 1965`). Only applicable when 3 <= n <= 50.
- "SF": Shapiro-Francia, modified by Francia (`Shapiro and Francia, 1972`), and finally simplified and extended by Royston (`Royston, 1993`). Only applicable when 5 <= n <= 5000.
- "SWR": Shapiro-Wilk-Royston, modified by Royston (`Royston, 1995`). Only applicable when 3 <= n <= 5000.

Value

A list.

References

Shapiro, S.S., Wilk, M.B., 1965. An Analysis of Variance Test for Normality (Complete Samples). Biometrika 52, 591–611. https://doi.org/10.2307/2333709

Shapiro, S.S., Francia, R.S., 1972. An Approximate Analysis of Variance Test for Normality. J. Am. Stat. Assoc. 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. Stat. Med. 12, 181–184. https://doi.org/10.1002/sim.4780120209

Royston, P., 1992. Approximating the Shapiro–Wilk W-test for non-normality. Stat. Comput. 2, 117–119. https://doi.org/10.1007/BF01891203

Royston, P., 1995. Remark AS R94: A Remark on Algorithm AS 181: The W-test for Normality. Appl. Stat. 44, 547–551. https://doi.org/10.2307/2986146

Examples

```
Shapiro_Wilk_test(rnorm(20), method = "SW")
```

`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. R. Stat. Soc. D (The Statistician) 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. Methods 43, 8–17. https://doi.org/10.3758/s13428-010-0044-x

Examples

```
skewness(cholesterol)
```

Index

∗ **datasets**
cholesterol, 3
leghorn_chick, 6
Shapiro_Wilk_coef_table, 7
Shapiro_Wilk_pval_table, 8

Anderson_Darling_test, 2

cholesterol, 3

D.Agostino_Pearson_test, 3

is_tied, 4

kurtosis, 5

leghorn_chick, 6

normality_standard_output, 6

Shapiro_Wilk_coef_table, 7
Shapiro_Wilk_pval_table, 8
Shapiro_Wilk_test, 8
skewness, 9