Package ‘exptest’

December 1, 2013

Version 1.2
Date 2013-11-30
Title Tests for Exponentiality
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Description Tests for the composite hypothesis of exponentiality
License GPL (>= 3)
NeedsCompilation no
Repository CRAN
Date/Publication 2013-12-01 07:58:31

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ahsanullah.exp.test

Test for exponentiality based on Ahsanullah characterization

Description

Performs test for the composite hypothesis of exponentiality based on the Ahsanullah characterization, see Volkova and Nikitin (2013).

Usage

ahsanullah.exp.test(x, simulate.p.value=FALSE, nrepl=2000)

Arguments

x a numeric vector of data values.

simulate.p.value

a logical value indicating whether to compute p-values by Monte Carlo simulation.

nrepl the number of replications in Monte Carlo simulation.

Details

The test is based on the following statistic:

\[ I_n = \int_0^\infty (H_n(t) - G_n(t))dF_n(t), \]

where \( F_n \) is the empirical distribution function,

\[ H_n(t) = \frac{1}{n^2} \sum_{i,j=1}^{n} 1\{|X_i - X_j| < t\}, \quad t \geq 0, \]

\[ G_n(t) = \frac{1}{n^2} \sum_{i,j=1}^{n} 1\{2 \min(X_i, X_j) < t\}, \quad t \geq 0. \]

Under exponentiality, one has

\[ \sqrt{n}I_n \xrightarrow{d} \mathcal{N}\left(0, \frac{647}{4725}\right) \]

(see Volkova and Nikitin (2013)).
atkinson.exp.test

Value
A list with class "htest" containing the following components:

- statistic: the value of the test statistic.
- p.value: the p-value for the test.
- method: the character string "Test for exponentiality based on Ahsanullah characterization".
- data.name: a character string giving the name(s) of the data.

Author(s)
Alexey Novikov and Ruslan Pusev

References

Examples
ahsanullah.exp.test(rexp(25))
ahsanullah.exp.test(rgamma(25,2))

Description
Performs Atkinson test for the composite hypothesis of exponentiality, see e.g. Mimoto and Zitikis (2008).

Usage
atkinson.exp.test(x, p=0.99, simulate.p.value=FALSE, nrepl=2000)

Arguments
- x: a numeric vector of data values.
- p: a parameter of the test (see below).
- simulate.p.value: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- nrepl: the number of replications in Monte Carlo simulation.
Details

The Atkinson test for exponentiality is based on the following statistic:

\[ T_n(p) = \sqrt{n} \left| \left( \frac{1}{X} \sum_{i=1}^{n} X_i^p \right)^{1/p} - (\Gamma(1 + p))^{1/p} \right| . \]

The statistic is asymptotically normal: \( T_n(p) \to \mathcal{N}(0, \sigma^2(p)) \), where

\[ \sigma^2(p) = (\Gamma(1 + p))^2 \left( -1 - \frac{1}{p^2} + \frac{\Gamma(1 + 2p)}{p^2 \Gamma^2(1 + p)} \right) . \]

Value

A list with class "htest" containing the following components:

- statistic: the value of the Atkinson statistic.
- p.value: the p-value for the test.
- method: the character string "Atkinson test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov and Ruslan Pusev

References


Examples

```r
atkinson.exp.test(rexp(100))
atkinson.exp.test(rchisq(100,3))
```

---

**co.exp.test**

Test for exponentiality of Cox and Oakes

Description

Performs Cox and Oakes test for the composite hypothesis of exponentiality, see e.g. Henze and Meintanis (2005, Sec. 2.5).

Usage

```r
coop.exp.test(x, simulate.p.value=FALSE, nrepl=2000)
```
Arguments

- **x**: a numeric vector of data values.
- **simulate.p.value**: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- **nrepl**: the number of replications in Monte Carlo simulation.

Details

The Cox and Oakes test is a test for the composite hypothesis of exponentiality. The test statistic is

\[ CO_n = n + \sum_{j=1}^{n} (1 - Y_j) \log Y_j, \]

where \( Y_j = \frac{X_j}{X} \). \((6/n)^{1/2}(CO_n/\pi)\) is asymptotically standard normal (see, e.g., Henze and Meintanis (2005, Sec. 2.5)).

Value

A list with class "htest" containing the following components:

- **statistic**: the value of the Cox and Oakes statistic.
- **p.value**: the p-value for the test.
- **method**: the character string "Test for exponentiality based on the statistic of Cox and Oakes".
- **data.name**: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov, Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
coop.exp.test(rexp(100))
coop.exp.test(runif(100, min = 0, max = 1))
```
Cramer-von Mises test for exponentiality

Description

Performs Cramer-von Mises test for the composite hypothesis of exponentiality, see e.g. Henze and Meintanis (2005, Sec. 2.1).

Usage

cvm.exp.test(x, nrepl=2000)

Arguments

x
  a numeric vector of data values.

nrepl
  the number of replications in Monte Carlo simulation.

Details

The Cramer-von Mises test for exponentiality is based on the following statistic:

\[ \omega_n^2 = \int_0^\infty (F_n(x) - (1 - \exp(-x)))^2 \exp(-x) dx, \]

where \( F_n \) is the empirical distribution function of the scaled data \( Y_j = X_j / \overline{X} \). The p-value is computed by Monte Carlo simulation.

Value

A list with class "htest" containing the following components:

- statistic  the value of the Cramer-von Mises statistic.
- p.value    the p-value for the test.
- method     the character string "Cramer-von Mises test for exponentiality".
- data.name  a character string giving the name(s) of the data.

Author(s)

Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
cvm.exp.test(rexp(100))
cvm.exp.test(runif(100, min = 50, max = 100))
```
deshpande.exp.test  Deshpande test for exponentiality

Description
Performs Deshpande test for the composite hypothesis of exponentiality, see Deshpande (1983).

Usage
deshpande.exp.test(x, b=0.44, simulate.p.value=FALSE, nrepl=2000)

Arguments
- x: a numeric vector of data values.
- b: a parameter of the test (see below).
- simulate.p.value: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- nrepl: the number of replications in Monte Carlo simulation.

Details
The test is based on the following statistic:

\[ J = \frac{1}{n(n-1)} \sum_{i \neq j} 1\{x_i > bx_j\}. \]

Under exponentiality, one has

\[ \sqrt{n}(J - \frac{1}{b+1}) \overset{d}{\rightarrow} N(0, 4\zeta_1), \]

where

\[ \zeta_1 = \frac{1}{4} \left( 1 + \frac{b}{b+2} + \frac{1}{2b+1} + \frac{2(1-b)}{b+1} - \frac{2b}{b^2+b+1} - \frac{4}{(b+1)^2} \right) \]

(see Deshpande (1983)).

Value
A list with class "htest" containing the following components:
- statistic: the value of the test statistic.
- p.value: the p-value for the test.
- method: the character string "Deshpande test for exponentiality".
- data.name: a character string giving the name(s) of the data.
Author(s)
Alexey Novikov and Ruslan Pusev

References

Examples
deshpande.exp.test(rexp(100))
deshpande.exp.test(rweibull(100, 1.5))

ep.exp.test
Test for exponentiality of Epps and Pulley

Description
Performs Epps and Pulley test for the composite hypothesis of exponentiality, see e.g. Henze and Meintanis (2005, Sec. 2.8.1).

Usage
ep.exp.test(x, simulate.p.value=FALSE, nrepl=2000)

Arguments
x a numeric vector of data values.
simulate.p.value a logical value indicating whether to compute p-values by Monte Carlo simulation.
nrepl the number of replications in Monte Carlo simulation.

Details
The Epps and Pulley test is a test for the composite hypothesis of exponentiality. The test statistic is

\[ EP_n = (48n)^{1/2} \left( \frac{1}{n} \sum_{j=1}^{n} \exp(-Y_j) - \frac{1}{2} \right), \]

where \( Y_j = X_j / \overline{X} \). \( EP_n \) is asymptotically standard normal (see, e.g., Henze and Meintanis (2005, Sec. 2.8.1)).
epstein.exp.test

Value

A list with class "htest" containing the following components:

- statistic: the value of the Epps and Pulley statistic.
- p.value: the p-value for the test.
- method: the character string "The test for exponentiality of Epps and Pulley".
- data.name: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov, Ruslan Pusev and Maxim Yakovlev

References


Examples

ep.exp.test(rexp(100))
ep.exp.test(runif(100, min = 0, max = 1))

Description

Performs Epstein test for the composite hypothesis of exponentiality, see e.g. Ascher (1990).

Usage

epstein.exp.test(x, simulate.p.value=FALSE, nrepl=2000)

Arguments

- x: a numeric vector of data values.
- simulate.p.value: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- nrepl: the number of replications in Monte Carlo simulation.
Details

The test is based on the following statistic:

\[ EPS_n = \frac{2n \left( \log \left( \sum_{i=1}^{n} D_i \right) - \sum_{i=1}^{n} \log(D_i) \right)}{1 + (n + 1)/(6n)}, \]

where \( D_i = (n - i + 1)(X_i - X_{i-1}) \), \( X(0) = 0 \) and \( X(1) \leq \ldots \leq X(n) \) are the order statistics. Under exponentiality, \( EPS \) is approximately distributed as a chi-square with \( n - 1 \) degrees of freedom.

Value

A list with class "htest" containing the following components:

- statistic: the value of the test statistic.
- p.value: the p-value for the test.
- method: the character string "Epstein test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov, Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
epstein.exp.test(rexp(100))
epstein.exp.test(rweibull(100))
```

Description

Performs Frozini test for the composite hypothesis of exponentiality, see e.g. Frozini (1987).

Usage

```r
frozini.exp.test(x, nrepl=2000)
```

Arguments

- `x`: a numeric vector of data values.
- `nrepl`: the number of replications in Monte Carlo simulation.
Details

The Frozini test for exponentiality is based on the following statistic:

\[ B_n = \frac{1}{\sqrt{n}} \sum_{i=1}^{n} \left| 1 - \exp\left(\frac{-X(i)}{\bar{X}}\right) - \frac{i - 0.5}{n} \right|. \]

The p-value is computed by Monte Carlo simulation.

Value

A list with class "htest" containing the following components:

- statistic: the value of the Frozini statistic.
- p.value: the p-value for the test.
- method: the character string "Frozini test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov and Ruslan Pusev

References


Examples

frozini.exp.test(rexp(100))
frozini.exp.test(rchisq(100,2))

**gini.exp.test**

Test for exponentiality based on the Gini statistic

Description

Performs test for the composite hypothesis of exponentiality based on the Gini statistic, see e.g. Gail and Gastwirth (1978).

Usage

`gini.exp.test(x, simulate.p.value=FALSE, nrepl=2000)`
Arguments

- **x** a numeric vector of data values.
- **simulate.p.value** a logical value indicating whether to compute p-values by Monte Carlo simulation.
- **nrepl** the number of replications in Monte Carlo simulation.

Details

The test is based on the Gini statistic

\[ G_n = \frac{\sum_{i,j=1}^{n} |X_i - X_j|}{2n(n-1)\bar{X}}. \]

Under exponentiality, the normalized statistic \((\frac{12(n-1)}{n-0.5})^{1/2}(G_n - 0.5)\) is asymptotically standard normal (see, e.g., Gail and Gastwirth (1978)).

Value

A list with class "htest" containing the following components:

- **statistic** the value of the Gini statistic.
- **p.value** the p-value for the test.
- **method** the character string "Test for exponentiality based on the Gini statistic".
- **data.name** a character string giving the name(s) of the data.

Author(s)

Alexey Novikov, Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
gini.exp.test(rexp(100))
gini.exp.test(runif(100, min = 0, max = 1))
```
gnedenko.exp.test

Gnedenko F-test of exponentiality

Description
Performs Gnedenko F-test for the composite hypothesis of exponentiality, see e.g. Ascher (1990).

Usage
gnedenko.exp.test(x, R=length(x)/2, simulate.p.value=FALSE, nrepl=2000)

Arguments

- **x**: a numeric vector of data values.
- **R**: a parameter of the test (see below).
- **simulate.p.value**: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- **nrepl**: the number of replications in Monte Carlo simulation.

Details
The test is based on the following statistic:

\[ Q_n(R) = \frac{\sum_{i=1}^{R} D_i / R}{\sum_{i=R+1}^{n} D_i / (n - R)} \]

where \( D_i = (n - i + 1)(X_{(i)} - X_{(i-1)}) \), \( X_{(0)} = 0 \) and \( X_{(1)} \leq \ldots \leq X_{(n)} \) are the order statistics. Under exponentiality, \( Q_n(R) \) has an F distribution with \( 2R \) and \( 2(n - R) \) degrees of freedom.

Value
A list with class "htest" containing the following components:

- **statistic**: the value of the test statistic.
- **p.value**: the p-value for the test.
- **method**: the character string "Gnedenko's F-test of exponentiality".
- **data.name**: a character string giving the name(s) of the data.

Author(s)
Alexey Novikov, Ruslan Pusev and Maxim Yakovlev

References
Examples

```r
gnedenko.exp.test(rexp(100))
gnedenko.exp.test(rweibull(100, 2))
```

**Description**

Performs Harris modification of Gnedenko F-test for the composite hypothesis of exponentiality, see e.g. Ascher (1990).

**Usage**

```r
harris.exp.test(x, R=length(x)/4, simulate.p.value=FALSE, nrepl=2000)
```

**Arguments**

- `x`: a numeric vector of data values.
- `R`: a parameter of the test (see below).
- `simulate.p.value`: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- `nrepl`: the number of replications in Monte Carlo simulation.

**Details**

The test is based on the following statistic:

\[
Q_n(R) = \frac{\left( \sum_{i=1}^{R} D_i + \sum_{i=R+1}^{n} D_i \right) / (2R)}{\sum_{i=R+1}^{n} D_i / (n - 2R)},
\]

where \( D_i = (n - i + 1)(X_{(i)} - X_{(i-1)}) \), \( X_{(0)} = 0 \) and \( X_{(1)} \leq \ldots \leq X_{(n)} \) are the order statistics. Under exponentiality, \( Q_n(R) \) has an F distribution with \( 4R \) and \( 2(n - 2R) \) degrees of freedom.

**Value**

A list with class "htest" containing the following components:

- `statistic`: the value of the test statistic.
- `p.value`: the p-value for the test.
- `method`: the character string "Harris modification of Gnedenko F-test".
- `data.name`: a character string giving the name(s) of the data.
Author(s)

Alexey Novikov, Ruslan Pusev and Maxim Yakovlev

References


Examples

harris.exp.test(rexp(100))
harris.exp.test(rlnorm(100))

Description

Performs Hegazy-Green test for the composite hypothesis of exponentiality, see e.g. Hegazy and Green (1975).

Usage

hegazy1.exp.test(x, nrepl=2000)

Arguments

x a numeric vector of data values.
nrepl the number of replications in Monte Carlo simulation.

Details

The Hegazy-Green test for exponentiality is based on the following statistic:

\[ T_1 = n^{-1} \sum \left| X_{(i)} + \ln \left( 1 - \frac{i}{n+1} \right) \right| \]

The p-value is computed by Monte Carlo simulation.

Value

A list with class "htest" containing the following components:

- statistic the value of the Hegazy-Green statistic.
- p.value the p-value for the test.
- method the character string "Hegazy-Green test for exponentiality".
- data.name a character string giving the name(s) of the data.
Author(s)
Alexey Novikov and Ruslan Pusev

References

Examples
hegazy1.exp.test(rexp(100))
hegazy1.exp.test(rweibull(100,1.5))

hegazy2.exp.test Hegazy-Green test for exponentiality

Description
Performs Hegazy-Green test for the composite hypothesis of exponentiality, see e.g. Hegazy and Green (1975).

Usage
hegazy2.exp.test(x, nrepl=2000)

Arguments
x a numeric vector of data values.
nrepl the number of replications in Monte Carlo simulation.

Details
The Hegazy-Green test for exponentiality is based on the following statistic:

\[ T_2 = n^{-1} \sum \left( X_{(i)} + \ln \left( 1 - \frac{i}{n+1} \right) \right)^2. \]

The p-value is computed by Monte Carlo simulation.

Value
A list with class "htest" containing the following components:

statistic the value of the Hegazy-Green statistic.
p.value the p-value for the test.
method the character string "Hegazy-Green test for exponentiality".
data.name a character string giving the name(s) of the data.
Author(s)
Alexey Novikov and Ruslan Pusev

References

Examples
hegazy2.exp.test(rexp(100))
hegazy2.exp.test(rweibull(100,1.5))

hollander.exp.test  Hollander-Proshan test for exponentiality

Description
Performs Hollander-Proshan test for the composite hypothesis of exponentiality, see Hollander and
Proshan (1972).

Usage
hollander.exp.test(x, simulate.p.value=FALSE, nrepl=2000)

Arguments
x  a numeric vector of data values.
simulate.p.value  a logical value indicating whether to compute p-values by Monte Carlo simula-
tion.
nrepl  the number of replications in Monte Carlo simulation.

Details
The test is based on the following statistic:

\[ J_n = \frac{1}{n(n-1)(n-2)} \sum_{i \neq j,k : j < k} 1\{x_i > x_j + x_k\}. \]

Under exponentiality, one has

\[ \sqrt{n}(J_n - \frac{1}{4}) \xrightarrow{d} N(0, \frac{5432}{4}). \]

(see Hollander and Proshan (1972)).
Value
A list with class "htest" containing the following components:

- statistic: the value of the test statistic.
- p.value: the p-value for the test.
- method: the character string "Hollander-Proshan test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)
Alexey Novikov and Ruslan Pusev

References

Examples
hollander.exp.test(rexp(25))
hollander.exp.test(rgamma(25,2))

Description
Performs Kimber-Michael test for the composite hypothesis of exponentiality, see e.g. Michael (1983), Kimber (1985).

Usage
kimber.exp.test(x, nrepl=2000)

Arguments
- x: a numeric vector of data values.
- nrepl: the number of replications in Monte Carlo simulation.

Details
The Kimber-Michael test for exponentiality is based on the following statistic:

\[ D = \max_i |r_i - s_i|, \]

where

\[ s_i = \frac{2}{\pi} \arcsin \sqrt{1 - \exp(-X(i)/\bar{X})}, \quad r_i = \frac{2}{\pi} \arcsin \sqrt{(i - 0.5)/n}. \]

The p-value is computed by Monte Carlo simulation.
kochar.exp.test

Value

A list with class "htest" containing the following components:

- statistic: the value of the Kimber-Michael statistic.
- p.value: the p-value for the test.
- method: the character string "Kimber-Michael test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov and Ruslan Pusev

References


Examples

- Kimber.exp.test(rexp(100))
- Kimber.exp.test(rchisq(100,2))

---

kochar.exp.test Kochar test for exponentiality

Description

Performs Kochar test for the composite hypothesis of exponentiality, see e.g. Kochar (1985).

Usage

kochar.exp.test(x, simulate.p.value=FALSE, nrepl=2000)

Arguments

- x: a numeric vector of data values.
- simulate.p.value: a logical value indicating whether to compute p-values by Monte Carlo simulation.
- nrepl: the number of replications in Monte Carlo simulation.
Details

The Kochar test for exponentiality is based on the following statistic:

\[
T = \sqrt{\frac{108n}{17n(n+1)} \sum_{i=1}^{n} J\left(\frac{i}{n+1}\right) \frac{X(i)}{\sum_{i=1}^{n} X(i)}},
\]

where

\[
J(u) = 2(1-u)[1-\log (1-u)] - 1.
\]

The statistic \(T\) is asymptotically standard normal.

Value

A list with class "htest" containing the following components:

- statistic: the value of the Kochar statistic.
- p.value: the p-value for the test.
- method: the character string "Kochar test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)

Alexey Novikov and Ruslan Pusev

References


Examples

kochar.exp.test(rexp(100))
kochar.exp.test(rchisq(100, 1))

ks.exp.test  Kolmogorov-Smirnov test for exponentiality

Description

Performs Kolmogorov-Smirnov test for the composite hypothesis of exponentiality, see e.g. Henze and Meintanis (2005, Sec. 2.1).

Usage

ks.exp.test(x, nrepl=2000)
lorenz.exp.test

Arguments

  x  a numeric vector of data values.
  nrepl  the number of replications in Monte Carlo simulation.

Details

  The Kolmogorov-Smirnov test for exponentiality is based on the following statistic:

  $$KS_n = \sup_{x \geq 0} |F_n(x) - (1 - \exp(-x))|,$$

  where $F_n$ is the empirical distribution function of the scaled data $Y_j = X_j/X$. The p-value is computed by Monte Carlo simulation.

Value

  A list with class "htest" containing the following components:

  statistic  the value of the Kolmogorov-Smirnov statistic.
  p.value  the p-value for the test.
  method  the character string "Kolmogorov-Smirnov test for exponentiality".
  data.name  a character string giving the name(s) of the data.

Author(s)

  Ruslan Pusev and Maxim Yakovlev

References


Examples

  ks.exp.test(rexp(100))
  ks.exp.test(runif(100, min = 50, max = 100))

Description

  Performs Lorenz test for the composite hypothesis of exponentiality, see e.g. Gail and Gastwirth (1978).

Usage

  lorenz.exp.test(x, p=0.5, simulate.p.value=FALSE, nrepl=2000)
Arguments

x a numeric vector of data values.
p a parameter of the test (see below).
simulate.p.value a logical value indicating whether to compute p-values by Monte Carlo simulation.
nrepl the number of replications in Monte Carlo simulation.

Details

The Lorenz test for exponentiality is based on the following statistic:

\[ L = \sum_{i=1}^{np} X(i)/\sum_{i=1}^{n} X(i) \]

The statistic \( \sqrt{n}(L - p - (1 - p) \log(1 - p)) \) is asymptotically standard normal.

Value

A list with class "htest" containing the following components:

- statistic the value of the Lorenz statistic.
- p.value the p-value for the test.
- method the character string "Lorenz test for exponentiality".
- data.name a character string giving the name(s) of the data.

Author(s)

Alexey Novikov and Ruslan Pusev

References


Examples

lorenz.exp.test(rexp(100))
lorenz.exp.test(rchisq(100,7))
Description

Performs Moran test for the composite hypothesis of exponentiality, see e.g. Moran (1951) and Tchirina (2005).

Usage

moran.exp.test(x, simulate.p.value=FALSE, nrepl=2000)

Arguments

x a numeric vector of data values.
simulate.p.value a logical value indicating whether to compute p-values by Monte Carlo simulation.
nrepl the number of replications in Monte Carlo simulation.

Details

The Moran test for exponentiality is based on the following statistic:

\[ T_n^+ = \gamma + \frac{1}{n} \sum_{i=1}^{n} \log \frac{X_i}{\bar{X}}, \]

where \( \gamma \) is Euler-Mascheroni constant. The statistic is asymptotically normal:

\[ \sqrt{n} T_n^+ \rightarrow N \left( 0, \frac{\pi^2}{6} - 1 \right). \]

Value

A list with class "htest" containing the following components:

- statistic the value of the Moran statistic.
- p.value the p-value for the test.
- method the character string "Moran test for exponentiality".
- data.name a character string giving the name(s) of the data.

Author(s)

Alexey Novikov and Ruslan Pusev
pietra.exp.test

Test for exponentiality based on the Pietra statistic

Description
Performs test for the composite hypothesis of exponentiality based on the Pietra statistic, see e.g. Ascher (1990).

Usage

pietra.exp.test(x, nrepl=2000)

Arguments

x a numeric vector of data values.
nrepl the number of replications in Monte Carlo simulation.

Details
The test is based on the Pietra statistic

\[ P_n = \frac{1}{2nX} \sum_{i=1}^{n} |X_i - \bar{X}|. \]

The p-value is computed by Monte Carlo simulation.

Value
A list with class "htest" containing the following components:

statistic the value of the Pietra statistic.
p.value the p-value for the test.
method the character string "Test for exponentiality based on the Pietra statistic".
data.name a character string giving the name(s) of the data.
Author(s)
Ruslan Pusev and Maxim Yakovlev

References

Examples
```r
pietra.exp.test(rexp(100))
pietra.exp.test(runif(100, min = 50, max = 100))
```

Rossberg.exp.test
Test for exponentiality based on Rossberg characterization

Description
Performs test for the composite hypothesis of exponentiality based on the Rossberg characterization, see Volkova (2010).

Usage
```r
rossberg.exp.test(x)
```

Arguments
- `x` a numeric vector of data values.

Details
The test is based on the following statistic:

\[
S_n = \int_0^{\infty} (H_n(t) - G_n(t))dF_n(t),
\]

where \(F_n\) is the empirical distribution function,

\[
H_n(t) = \left(\frac{C^3_n}{n^3}\right)^{-1} \sum_{1 \leq i < j < k \leq n} 1\{X_{2,{i,j,k}} - X_{1,{i,j,k}} < t\}, \quad t \geq 0,
\]

\[
G_n(t) = \left(\frac{C^2_n}{n^2}\right)^{-1} \sum_{1 \leq i < j \leq n} 1\{\min(X_i, X_j) < t\}, \quad t \geq 0.
\]

Here \(X_{s,{i,j,k}}, s = 1, 2\), denotes the \(s\)th order statistic of \(X_i, X_j, X_k\). The p-value is computed from the limit null distribution. Under exponentiality, one has

\[
\sqrt{n}S_n \xrightarrow{d} \mathcal{N}\left(0, \frac{52}{1125}\right)
\]
(see, Volkova (2010)).
Value

A list with class "htest" containing the following components:

- **statistic**: the value of the test statistic.
- **p.value**: the p-value for the test.
- **method**: the character string "Test for exponentiality based on Rossberg characterization".
- **data.name**: a character string giving the name(s) of the data.

Author(s)

Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
rossberg.exp.test(rexp(25))
rossberg.exp.test(runif(25, min = 50, max = 100))
```

Description

Performs Shapiro-Wilk test for the composite hypothesis of exponentiality, see e.g. Shapiro and Wilk (1972).

Usage

```r
shapiro.exp.test(x, nrepl=2000)
```

Arguments

- **x**: a numeric vector of data values.
- **nrepl**: the number of replications in Monte Carlo simulation.

Details

The Shapiro-Wilk test for exponentiality is based on the following statistic:

\[
W = \frac{n(\bar{X} - X_{(1)})^2}{(n - 1) \sum_{i=1}^{n} (X_i - \bar{X})^2}
\]

The p-value is computed by Monte Carlo simulation.
we.exp.test

Value
A list with class "htest" containing the following components:

- statistic: the value of the Shapiro-Wilk statistic.
- p.value: the p-value for the test.
- method: the character string "Shapiro-Wilk test for exponentiality".
- data.name: a character string giving the name(s) of the data.

Author(s)
Alexey Novikov and Ruslan Pusev

References

Examples

shapiro.exp.test(rexp(100))
shapiro.exp.test(rchisq(100,1))

---

we.exp.test

We test for exponentiality

Description
Performs the WE test for the composite hypothesis of exponentiality, see e.g. Ascher (1990).

Usage

we.exp.test(x, nrepl=2000)

Arguments

- x: a numeric vector of data values.
- nrepl: the number of replications in Monte Carlo simulation.

Details
The test is based on the following statistic

\[ WE = \sum_{i=1}^{n} (X_i - \bar{X})^2 \left( \sum_{i=1}^{n} X_i \right)^2. \]

The p-value is computed by Monte Carlo simulation.
Value

A list with class "htest" containing the following components:

- **statistic**: the value of the WE test statistic.
- **p.value**: the p-value for the test.
- **method**: the character string "WE test for exponentiality".
- **data.name**: a character string giving the name(s) of the data.

Author(s)

Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
we.exp.test(rexp(100))
we.exp.test(runif(100, min = 50, max = 100))
```

Description

Performs Wong and Wong test for the composite hypothesis of exponentiality, see e.g. Ascher (1990).

Usage

```r
ww.exp.test(x, nrepl=2000)
```

Arguments

- **x**: a numeric vector of data values.
- **nrepl**: the number of replications in Monte Carlo simulation.

Details

The test is based on the following statistic:

\[ Q = \frac{X_{(n)}}{X_{(1)}} \]

where \( X_{(1)} \) and \( X_{(n)} \) are the smallest and the largest order statistics respectively. The p-value is computed by Monte Carlo simulation.
Value

A list with class "htest" containing the following components:

- **statistic**: the value of the statistic of the test.
- **p.value**: the p-value for the test.
- **method**: the character string "Wong and Wong test for exponentiality".
- **data.name**: a character string giving the name(s) of the data.

Author(s)

Ruslan Pusev and Maxim Yakovlev

References


Examples

```r
ww.exp.test(rexp(100))
ww.exp.test(abs(rcauchy(100)))
```
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