Package ‘moments’

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Description Functions to calculate: moments, Pearson's kurtosis, Geary's kurtosis and skewness; tests related to them (Anscombe-Glynn, D'Agostino, Bonett-Seier).
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**agostino.test**

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**D’Agostino test of skewness**

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**Description**

Performs D’Agostino test for skewness in normally distributed data.

**Usage**

```r
agostino.test(x, alternative = c("two.sided", "less", "greater"))
```

**Arguments**

- `x`: a numeric vector of data values.
- `alternative`: a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less". You can specify just the initial letter.

**Details**

Under the hypothesis of normality, data should be symmetrical (i.e. skewness should be equal to zero). This test has such null hypothesis and is useful to detect a significant skewness in normally distributed data.

**Value**

A list with class htest containing the following components:

- `statistic`: the list containing skewness estimator and its transformation.
- `p.value`: the p-value for the test.
- `alternative`: a character string describing the alternative hypothesis.
- `method`: a character string indicating what type of test was performed.
- `data.name`: name of the data argument.

**Author(s)**

Lukasz Komsta

**References**


**See Also**

`skewness`
all.cumulants

Examples

set.seed(1234)
x = rnorm(1000)
skewness(x)
agostino.test(x)

all.cumulants  Statistical Cumulants

Description

This function calculates the cumulants for all orders specified in the given vector, matrix or data frame of raw moments.

Usage

all.cumulants(mu.raw)

Arguments

mu.raw  A numeric vector, matrix or data frame of raw moments. For a vector, mu.raw[0] is the order 0 raw moment, mu.raw[1] is the order 1 raw moment and so forth. For a matrix or data frame, row vector mu.raw[0,] contains the order 0 raw moments, row vector mu.raw[1,] contains the order 1 raw moments and so forth.

Details

No details are currently described.

Value

A vector matrix or data frame of cumulants. For matrices and data frame, column vectors correspond to different random variables.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

moment, all.moments
Examples

```r
set.seed(1234)
x <- rnorm(10000)
mu.raw.x <- all.moments( x, order.max=6 )
all.cumulants( mu.raw.x )
M <- matrix( x, nrow=1000, ncol=10 )
mu.raw.M <- all.moments( M, order.max=6 )
all.cumulants( mu.raw.M )
D <- data.frame( M )
mu.raw.D <- all.moments( D, order.max=6 )
all.cumulants( mu.raw.D )
```

---

### Statistical Moments

**Description**

This function computes all the sample moments of the chosen type up to a given order.

**Usage**

```r
all.moments(x, order.max = 2, central = FALSE, absolute = FALSE, na.rm = FALSE)
```

**Arguments**

- `x` A numeric vector, matrix or data frame of data. For matrices and data frames, each column is a random variable
- `order.max` the maximum order of the moments to be computed with a default value of 2.
- `central` a logical value, if TRUE, central moments are computed. Otherwise, raw moments are computed
- `absolute` a logical value, if TRUE, absolute moments are computed. Otherwise, standard moments are computed
- `na.rm` a logical value, if TRUE, remove NA values. Otherwise, keep NA values

**Details**

The minimum value for order.max is 2. The function stops running for values less than 2 and the message "maximum order would be at least 2" is displayed on standard output.

**Value**

A vector, matrix or data frame of moments depending on the nature of the argument `x`. If `x` is a vector, then the value returned is a vector, say `mu`, where `mu[1]` is the order 0 moment, `mu[2]` is the order 1 moment and so forth. If `x` is a matrix or data frame, then the value returned is a matrix or data frame, respectively. In this case, suppose `mu` is the value returned. Then, row vector `mu[1,]` contains the order 0 moments, `mu[2,]` contains the order 1 moments and so forth.
**Anscombe-Glynn test of kurtosis**

**Description**

Performs Anscombe-Glynn test of kurtosis for normal samples

**Usage**

`anscombe.test(x, alternative = c("two.sided", "less", "greater"))`

**Arguments**

- `x`  
  a numeric vector of data values.

- `alternative`  
  a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less". You can specify just the initial letter.
Details

Under the hypothesis of normality, data should have kurtosis equal to 3. This test has such null hypothesis and is useful to detect a significant difference of kurtosis in normally distributed data.

Value

A list with class htest containing the following components:

- statistic: the list containing kurtosis estimator and its transformation.
- p.value: the p-value for the test.
- alternative: a character string describing the alternative hypothesis.
- method: a character string indicating what type of test was performed.
- data.name: name of the data argument.

Author(s)

Lukasz Komsta

References


See Also

kurtosis

Examples

```r
set.seed(1234)
x = rnorm(1000)
kurtosis(x)
anscombe.test(x)
```

bonett.test  
Bonett-Seier test of Geary's kurtosis

Description

This function performs Bonett-Seier test of Geary's measure of kurtosis for normally distributed data.

Usage

```r
bonett.test(x, alternative = c("two.sided", "less", "greater"))
```
Arguments

x a numeric vector of data values.
alternative a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less". You can specify just the initial letter.

Details

Under the hypothesis of normality, data should have Geary's kurtosis equal to $\sqrt{2/\pi}$ (0.7979). This test has such null hypothesis and is useful to detect a significant difference of Geary's kurtosis in normally distributed data.

Value

A list with class htest containing the following components:

statistic the list containing Geary's kurtosis estimator and its transformation.
p.value the p-value for the test.
alternative a character string describing the alternative hypothesis.
method a character string indicating what type of test was performed.
data.name name of the data argument.

Author(s)

Lukasz Komsta

References


See Also

geary

Examples

set.seed(1234)
x = rnorm(1000)
geary(x)
bonett.test(x)
central2raw

Central to raw moments

Description

This function transforms a vector, matrix or data frame of central moments to a vector, matrix or
data frame of raw moments.

Usage

central2raw(mu.central, eta)

Arguments

mu.central A numeric vector, matrix or data frame of central moments. For a vector, 
mu.central[0] is the order 0 central moment, mu.central[1] is the order 1 cen-
tral moment and so forth. For a matrix or data frame, row vector mu.central[0,] 
contains the order 0 central moments, row vector mu.central[1,] contains the 
order 1 central moments and so forth.

eta A numeric vector of sample mean or expected values

Value

A vector matrix or data frame of raw moments. For matrices and data frame, column vectors 
correspond to different random variables.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

moment, all.moments, raw2central

Examples

set.seed(1234)
x <- rnorm(10000)
mu.raw.x <- all.moments( x, order.max=4 )
eta.x <- mu.raw.x[2]
mu.central.x <- all.moments( x, central=TRUE, order.max=4 )
central2raw( mu.central.x, eta.x )
mu.raw.x
```r
M <- matrix( x, nrow=1000, ncol=10 )
mu.raw.M <- all.moments( M, order.max=4 )
etas.M <- mu.raw.M[2,]
mu.central.M <- all.moments( M, central=TRUE, order.max=4 )
central2raw( mu.central.M, eta.M )
mu.raw.M
D <- data.frame( M )
mu.raw.D <- all.moments( D, order.max=4 )
etas.D <- mu.raw.D[2,]
mu.central.D <- all.moments( D, central=TRUE, order.max=4 )
central2raw( mu.central.D, eta.D )
mu.raw.D
```

---

**geary**  

*Geary’s measure of kurtosis*

**Description**

This function computes an estimator of Geary’s measure of kurtosis.

**Usage**

```r
geary(x, na.rm = FALSE)
```

**Arguments**

- **x**: a numeric vector, matrix or data frame.
- **na.rm**: logical. Should missing values be removed?

**Details**

The Geary’s kurtosis is computed by dividing average difference between observation and the mean by standard deviation of the sample.

**Author(s)**

Lukasz Komsta

**References**


**See Also**

[kurtosis, bonett.test]
Examples

\begin{verbatim}
set.seed(1234)
geary(rnorm(1000))
\end{verbatim}

\begin{verbatim}
jarque.test
\end{verbatim}

Description

This function performs the Jarque-Bera test on the given data sample to determine if the data are sample drawn from a normal population.

Usage

\begin{verbatim}
jarque.test(x)
\end{verbatim}

Arguments

\begin{verbatim}
x a numeric vector of data
\end{verbatim}

Details

Under the hypothesis of normality, data should be symmetrical (i.e. skewness should be equal to zero) and have skewness close to three. The Jarque-Bera statistic is chi-square distributed with two degrees of freedom.

Value

A list with class htest containing the following components:

\begin{verbatim}
statistic the list containing the Jarque-Bera statistic
p.value the p-value for the test.
alternative a character string describing the alternative hypothesis.
method a character string indicating what type of test was performed.
data.name name of the data argument.
\end{verbatim}

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References

Examples

set.seed( 1234 )
x <- rnorm( 1000 )
jarque.test( x )

---

kurtosis | Pearson’s measure of kurtosis

Description

This function computes the estimator of Pearson’s measure of kurtosis.

Usage

kurtosis(x, na.rm = FALSE)

Arguments

x | a numeric vector, matrix or data frame.
na.rm | logical. Should missing values be removed?

Author(s)

Lukasz Komsta

See Also

geary, anscombe.test

Examples

set.seed(1234)
kurtosis(rnorm(1000))

---

moment | Statistical Moments

Description

This function computes the sample moment of specified order.

Usage

moment(x, order = 1, central = FALSE, absolute = FALSE, na.rm = FALSE)
Arguments

- **x**: a numeric vector of data.
- **order**: order of the moment to be computed
- **central**: a logical value - if central moments are to be computed.
- **absolute**: a logical value - if absolute moments are to be computed.
- **na.rm**: a logical value - remove NA values?

Author(s)

Lukasz Komsta

Examples

```r
set.seed(1234)
x <- rnorm(10)
moment(x)
moment(x, order=3, absolute=TRUE)
```

---

**raw2central**

*Raw to central moments*

Description

This function transforms a vector, matrix or data frame of raw moments to a vector, matrix or data frame of central moments.

Usage

```r
raw2central(mu.raw)
```

Arguments

- **mu.raw**: A numeric vector, matrix or data frame of raw moments. For a vector, mu.raw[0] is the order 0 raw moment, mu.raw[1] is the order 1 raw moment and so forth. For a matrix or data frame, row vector mu.raw[0,] contains the order 0 raw moments, row vector mu.raw[1,] contains the order 1 raw moments and so forth.

Value

A vector matrix or data frame of central moments. For matrices and data frame, column vectors correspond to different random variables.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>
References


See Also

moment, all.moments, central2raw

Examples

```r
set.seed(1234)
x <- rnorm(10000)
mu.raw.x <- all.moments( x, order.max=4 )
mu.central.x <- all.moments( x, central=TRUE, order.max=4 )
raw2central( mu.raw.x )
mu.central.x
M <- matrix( x, nrow=1000, ncol=10 )
mu.raw.M <- all.moments( M, order.max=4 )
mu.central.M <- all.moments( M, central=TRUE, order.max=4 )
raw2central( mu.raw.M )
mu.central.M
D <- data.frame( M )
mu.raw.D <- all.moments( D, order.max=4 )
mu.central.D <- all.moments( D, central=TRUE, order.max=4 )
raw2central( mu.raw.D )
mu.central.D
```

skewness

*Skewness of the sample*

Description

This function computes skewness of given data.

Usage

```r
skewness(x, na.rm = FALSE)
```

Arguments

- **x**: a numeric vector, matrix or data frame.
- **na.rm**: logical. Should missing values be removed?

Author(s)

Lukasz Komsta
See Also

`agostino.test`

Examples

```r
set.seed(1234)
skewness(rnorm(1000))
```
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