Package 'discretefit'

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Title Simulated Goodness-of-Fit Tests for Discrete Distributions

Version 0.1.1

Description Implements Monte Carlo simulations for goodness-of-fit (GOF) tests for discrete distributions. This includes tests based on the Chi-squared statistic, the log-likelihood-ratio (G^2) statistic, the Freeman-Tukey (Hellinger-distance) statistic, the Kolmogorov-Smirnov statistic, the Cramer-von Mises statistic as described in Choulakian, Lockhart and Stephens (1994) <doi:10.2307/3315828>, and the root-mean-square statistic, see Perkins, Tygert, and Ward (2011) <doi:10.1016/j.amc.2011.03.124>.

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LinkingTo Rcpp

Imports Rcpp

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Config/testthat/edition 3

VignetteBuilder knitr

SystemRequirements C++11

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R topics documented:

`chisq_gof` *Simulated Chi-squared goodness-of-fit test*

Description

The `chisq_gof()` function implements Monte Carlo simulations to calculate p-values based on the Chi-squared statistic for goodness-of-fit tests for discrete distributions.

Usage

```
chisq_gof(x, p, reps = 10000, tolerance = 64 * .Machine$double.eps)
```

Arguments

`x`	a numeric vector that contains observed counts for each bin/category.
`p`	a vector of probabilities of the same length of x. An error is given if any entry of p is negative or if the sum of p does not equal one.
`reps`	an integer specifying the number of Monte Carlo simulations. The default is set to 10,000 which may be appropriate for exploratory analysis. A higher number of simulation should be selected for more precise results.
`tolerance`	sets an upper bound for rounding errors when evaluating whether a statistic for a simulation is greater than or equal to the statistic for the observed data. The default is identical to the tolerance set for simulations in the `chisq.test` function from the `stats` package in base R.

Value

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

`statistic`	the value of the Chi-squared test statistic
`p.value`	the simulated p-value for the test
`method`	a character string describing the test
`data.name`	a character string give the name of the data

Examples

```
x <- c(15, 36, 17)
p <- c(0.25, 0.5, 0.25)

chisq_gof(x, p)
```

cvm_gof *Simulated Cramer-von Mises goodness-of-fit test*

Description

The cvm_gof() function implements Monte Carlo simulations to calculate p-values based on the Cramer-von Mises statistic (W^2) for goodness-of-fit tests for discrete distributions.

Usage

```
cvm_gof(x, p, reps = 10000, tolerance = 64 * .Machine$double.eps)
```

Arguments

x	a numeric vector that contains observed counts for each bin/category.
p	a vector of probabilities of the same length of x. An error is given if any entry of p is negative or if the sum of p does not equal one.
reps	an integer specifying the number of Monte Carlo simulations. The default is set to 10,000 which may be appropriate for exploratory analysis. A higher number of simulation should be selected for more precise results.
tolerance	sets an upper bound for rounding errors when evaluating whether a statistic for a simulation is greater than or equal to the statistic for the observed data. The default is identical to the tolerance set for simulations in the chisq.test function from the stats package in base R.

Value

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

statistic	the value of the Cramer-von Mises test statistic (W2)
p.value	the simulated p-value for the test
method	a character string describing the test
data.name	a character string give the name of the data

Examples

```
x <- c(15, 36, 17)
p <- c(0.25, 0.5, 0.25)

cvm_gof(x, p)
```

ft_gof *Simulated Freeman-Tukey (Hellinger-distance) goodness-of-fit test*

Description

The ft_gof() function implements Monte Carlo simulations to calculate p-values based on the Freeman-Tukey statistic for goodness-of-fit tests for discrete distributions. This statistic is also referred to as the Hellinger-distance. Asymptotically, the Freeman-Tukey GOF test is identical to the Chi-squared GOF test, but for smaller n, results may vary significantly.

Usage

```
ft_gof(x, p, reps = 10000, tolerance = 64 * .Machine$double.eps)
```

Arguments

x	a numeric vector that contains observed counts for each bin/category.
p	a vector of probabilities of the same length of x. An error is given if any entry of p is negative or if the sum of p does not equal one.
reps	an integer specifying the number of Monte Carlo simulations. The default is set to 10,000 which may be appropriate for exploratory analysis. A higher number of simulation should be selected for more precise results.
tolerance	sets an upper bound for rounding errors when evaluating whether a statistic for a simulation is greater than or equal to the statistic for the observed data. The default is identical to the tolerance set for simulations in the chisq.test function from the stats package in base R.

Value

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

statistic	the value of the Freeman-Tukey test statistic (W2)
p.value	the simulated p-value for the test
method	a character string describing the test
data.name	a character string give the name of the data

Examples

```
x <- c(15, 36, 17)
p <- c(0.25, 0.5, 0.25)

ft_gof(x, p)
```

g_gof *Simulated log-likelihood-ratio (G^2) goodness-of-fit test*

Description

The g_gof() function implements Monte Carlo simulations to calculate p-values based on the log-likelihood-ratio statistic for goodness-of-fit tests for discrete distributions. In this context, the log-likelihood-ratio statistic is often referred to as the G^2 statistic. Asymptotically, the G^2 GOF test is identical to the Chi-squared GOF test, but for smaller n, results may vary significantly.

Usage

```
g_gof(x, p, reps = 10000, tolerance = 64 * .Machine$double.eps)
```

Arguments

x	a numeric vector that contains observed counts for each bin/category.
p	a vector of probabilities of the same length of x. An error is given if any entry of p is negative or if the sum of p does not equal one.
reps	an integer specifying the number of Monte Carlo simulations. The default is set to 10,000 which may be appropriate for exploratory analysis. A higher number of simulation should be selected for more precise results.
tolerance	sets an upper bound for rounding errors when evaluating whether a statistic for a simulation is greater than or equal to the statistic for the observed data. The default is identical to the tolerance set for simulations in the chisq.test function from the stats package in base R.

Value

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

statistic	the value of the log-likelihood-ratio test statistic (G2)
p.value	the simulated p-value for the test
method	a character string describing the test
data.name	a character string give the name of the data

Examples

```
x <- c(15, 36, 17)
p <- c(0.25, 0.5, 0.25)

g_gof(x, p)
```

ks_gof *Simulated Kolmogorov-Smirnov goodness-of-fit test*

Description

The ks_gof() function implements Monte Carlo simulations to calculate p-values based on the Kolmogorov-Smirnov statistic for goodness-of-fit tests for discrete distributions. The p-value expressed by ks_gof() is based on a two-sided alternative hypothesis.

Usage

```
ks_gof(x, p, reps = 10000, tolerance = 64 * .Machine$double.eps)
```

Arguments

x	a numeric vector that contains observed counts for each bin/category.
p	a vector of probabilities of the same length of x. An error is given if any entry of p is negative or if the sum of p does not equal one.
reps	an integer specifying the number of Monte Carlo simulations. The default is set to 10,000 which may be appropriate for exploratory analysis. A higher number of simulation should be selected for more precise results.
tolerance	sets an upper bound for rounding errors when evaluating whether a statistic for a simulation is greater than or equal to the statistic for the observed data. The default is identical to the tolerance set for simulations in the chisq.test function from the stats package in base R.

Value

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

statistic	the value of the Kolmogorov-Smirnov test statistic
p.value	the simulated p-value for the test
method	a character string describing the test
data.name	a character string give the name of the data

Examples

```
x <- c(15, 36, 17)
p <- c(0.25, 0.5, 0.25)

ks_gof(x, p)
```

rms_gof *Simulated root-mean-square goodness-of-fit test*

Description

The rms_gof() function implements Monte Carlo simulations to calculate p-values based on the root-mean-square statistic for goodness-of-fit tests for discrete distributions.

Usage

```
rms_gof(x, p, reps = 10000, tolerance = 64 * .Machine$double.eps)
```

Arguments

x	a numeric vector that contains observed counts for each bin/category.
p	a vector of probabilities of the same length of x. An error is given if any entry of p is negative or if the sum of p does not equal one.
reps	an integer specifying the number of Monte Carlo simulations. The default is set to 10,000 which may be appropriate for exploratory analysis. A higher number of simulation should be selected for more precise results.
tolerance	sets an upper bound for rounding errors when evaluating whether a statistic for a simulation is greater than or equal to the statistic for the observed data. The default is identical to the tolerance set for simulations in the chisq.test function from the stats package in base R.

Value

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

statistic	the value of the root-mean-square test statistic
p.value	the simulated p-value for the test
method	a character string describing the test
data.name	a character string give the name of the data

Examples

```
x <- c(15, 36, 17)
p <- c(0.25, 0.5, 0.25)

rms_gof(x, p)
```

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