Package ‘GofKmt’

October 12, 2022

Type Package
Title Khmaladze Martingale Transformation Goodness-of-Fit Test
Version 2.2.0
Date 2020-10-17
Author Jiwoong Kim <jwboys26 at gmail.com>
Maintainer Jiwoong Kim <jwboys26@gmail.com>
Description Consider a goodness-of-fit (GOF) problem of testing whether a random sample comes from one sample location-scale model where location and scale parameters are unknown. It is well known that Khmaladze martingale transformation method - which was proposed by Khmaladze (1981) <DOI:10.1137/1126027> - provides asymptotic distribution free test for the GOF problem. This package contains one function: KhmaladzeTrans(). In this version, KhmaladzeTrans() provides test statistic and critical value of GOF test for normal, Cauchy, and logistic distributions. This package used the main algorithm proposed by Kim (2020) <DOI:10.1007/s00180-020-00971-7> and tests for other distributions will be available at the later version.

Depends R (>= 3.5.0)
License GPL-2
LazyData TRUE
Imports Rcpp (>= 1.0.3), ggplot2, stats, utils, Rsolnp
LinkingTo Rcpp, RcppArmadillo
RoxygenNote 7.1.1
NeedsCompilation yes
Repository CRAN
Date/Publication 2020-10-20 12:30:02 UTC

R topics documented:

GetCV .......................... 2
KhmaladzeTrans .................. 3
Tables .......................... 5

Index 7
GetCV

Obtain Critical Value Table

Description

Obtain critical values of the Khmaladze martingale transformation test for various significance levels and sample sizes.

Usage

GetCV(strDist, Modified)

Arguments

strDist the name of the null distribution for the hypothesis test: Normal, Cauchy, or Logistic. Other distributions such as Gumbel, Weibull and Frechet will be available in later versions.

Modified a logical value which specifies whether or not to use the modified version of the test: False calls the original version while True calls the modified version.

Value

A 10-by-6 table of critical values for various significance levels (0.1, 0.075, 0.05, 0.025, 0.01) and sample sizes (10, 20, ..., 100).

See Also

KhmaladzeTrans()

Examples

### Critical values of the original test for a normal distribution

strDist = "Normal"
Modified=FALSE
CritValue = GetCV(strDist, Modified)

### Critical values of the modified test for the logistic distribution

strDist = "Logistic"
Modified=TRUE
CritValue = GetCV(strDist, Modified)
## Critical values of the modified test for the Cauchy distribution

```r
strDist = "Cauchy"
Modified = TRUE
CritValue = GetCV(strDist, Modified)
```

---

**KhmaladzeTrans**

**Implementing Khmaladze Martingale Transformation.**

**Description**

Performs goodness-of-fit test through Khmaladze martingale transformation

**Usage**

```r
KhmaladzeTrans(X, Modified = FALSE, strDist, bGraph = FALSE, nNum = 10)
```

**Arguments**

- **X** a random sample of n observations
- **Modified** a logical value which specifies whether or not to use the modified version of the test: False calls the original version while True calls the modified version.
- **strDist** the name of the null distribution for the hypothesis test: Normal, Cauchy, or Logistic. Other distributions such as Gumbel, Weibull and Frechet will be available in later versions.
- **bGraph** a logical value which specifies whether or not to get the graph of the objective function of the martingale transformation.
- **nNum** the number of ticks on each segmented interval when drawing the graph of the objective function. The default is 10. Bigger value will result in a smoother graph.

**Value**

A list of the following values:

- **opt.x**  
  - When Modified is False, opt.x is the value of x where the optimum of the objective function - which is also the test statistic - occurs.  
  - When Modified is True, opt.x is the vector of the value of x’s where the infimum and supremum of $U_n$ occur.

- **test.stat**  
  - When Modified is False, test.stat is the test statistic obtained through Khmaladze martingale transformation.  
  - When Modified is True, test.stat is the vector of the supremum of $U_n$, the infimum of $U_n$, and the difference of them.

- **graph.data** a data frame which includes the information of the objective function.

- **graph** a ggplot object which includes the graph of the objective function.
**intervals** a list of segmented intervals over which the graph of the objective function is defined.

**mu** the point estimate for the location parameter \( \mu \)

**sigma** the point estimate for the scale parameter \( \sigma \)

**References**


**Examples**

```r
# Generate a random sample of n observations from N(1,3)
X = rnorm(n, 1, 3)
strDist = "Normal"
Modified = FALSE
lResult = KhmaladzeTrans(X, Modified, strDist, bGraph = TRUE, nNum = 10)
KMT_OptimalX = lResult$opt.x
KMT_TestStat = lResult$test.stat
KMT_DM = lResult$graph.data
KMT_Graph = lResult$graph

#### Draw the graph of the objective function
KMT_Graph

KMT_Intervals = lResult$intervals
KMT_Muhat = lResult$mu
KMT_Sigmahat = lResult$sigma
```

```r
# Generate a random sample of n observations from the logistic distribution
X = rlogis(n, 1, 2) # Generate a random sample of n observations from the logistic distribution
strDist = "Logistic"
Modified = TRUE
lResult = KhmaladzeTrans(X, Modified, strDist, bGraph = TRUE, nNum = 10)
KMT_Optimal_Positive_X = lResult$opt.x[1]
KMT_Optimal_Negative_X = lResult$opt.x[2]
KMT_Positive_TestStat = lResult$test.stat[1]
KMT_Negative_TestStat = lResult$test.stat[2]
KMT_TestStat = lResult$test.stat[3]
KMT_DM = lResult$graph.data
KMT_Graph = lResult$graph

#### Draw the graph of the objective function
```
n = 10
X = rcauchy(n, 0, 1)  # Generate a random sample of n observations from Cauchy distribution
strDist = "Cauchy"
Modified = FALSE
lResult = KhmaladzeTrans(X, Modified, strDist, bGraph=TRUE, nNum=10)
KMT_OptimalX = lResult$opt.x
KMT_TestStat = lResult$test.stat
KMT_DM = lResult$graph.data
KMT_Graph = lResult$graph

### Draw the graph of the objective function
KMT_Graph

KMT_Intervals = lResult$intervals
KMT_Muhat = lResult$mu
KMT_Sigmahat = lResult$sigma

---

### Tables of integrations and critical values

**Description**

A dataset containing integration values used for fast computation and critical values for hypothesis test

**Usage**

data(Tables)

**Details**

```r
# @format A list containing tables of integrations and critical values for normal, logistic and Cauchy distributions:

Integration.Table.Normal  2561-by-3 table for a normal distribution
Integration.Table.Logistic1 1281-by-3 table for the logistic distribution
```
Integration.Table.Logistic2  1281-by-1 table for the logistic distribution
Integration.Table.Cauchy  2561-by-3 table for the Cauchy distribution
Critical.Value.for.OriginalTest.Normal  100-by-6 table of critical values of the original test for a normal distribution
Critical.Value.for.ModifiedTest.Normal  100-by-6 table of critical values of the modified test for a normal distribution
Critical.Value.for.OriginalTest.Logistic  100-by-6 table of critical values of the original test for the logistic distribution
Critical.Value.for.ModifiedTest.Logistic  100-by-6 table of critical values of the modified test for the logistic distribution
Critical.Value.for.OriginalTest.Cauchy  100-by-6 table of critical values of the original test for the Cauchy distribution
Critical.Value.for.ModifiedTest.Cauchy  100-by-6 table of critical values of the modified test for the Cauchy distribution
Index

- datasets
  - Tables, 5

GetCV, 2

KhmaladzeTrans, 3

Tables, 5