Package ‘LIStest’

July 2, 2014

Type Package

Title Tests of independence based on the Longest Increasing Subsequence

Version 2.1

Date 2014-03-12

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Depends R (>= 2.10)

Description Tests for independence between X and Y computed from a paired sample (x1,y1),...(xn,yn) of (X,Y), using one of the following statistics (a) the Longest Increasing Subsequence (Ln), (b) JLn, a Jackknife version of Ln or (c) JLMn, a Jackknife version of the longest monotonic subsequence. This family of tests can be applied under the assumption of continuity of X and Y.

License GPL-2

LazyLoad yes

LazyData yes

NeedsCompilation no

Repository CRAN

Date/Publication 2014-03-12 23:17:20

R topics documented:

`LIStest-package` *Tests of independence based on the Longest Increasing Subsequence*

Description

Tests for independence between X and Y computed from a paired sample (x1,y1), ..., (xn,yn) of (X,Y), using one of the following statistics (a) the Longest Increasing Subsequence (Ln), (b) JLn, a Jackknife version of Ln or (c) JLMn, a Jackknife version of the longest monotonic subsequence. This family of tests can be applied under the assumption of continuity of X and Y.

Details

Package:	LIStest
Type:	Package
Version:	2.1
Date:	2014-03-12
License:	GPL-2

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez Maintainer: J. E. Garcia <jg@ime.unicamp.br>

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

`JLMn` *JLMn statistic, to test independence*

Description

It compute the JLMn-statistic, from a bivariate sample of continuous random variables X and Y.

Usage

```
JLMn(x, y)
```

Arguments

x, y numeric vectors of data values. x and y must have the same length.

Details

See subsection 3.3-Main reference. For sample sizes less than 20, the correction introduced in subsection 3.2 from main reference, with c = 0.4 was avoided.

Value

The value of the JLMn-statistic.

Author(s)

J. E. Garcia, V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

Examples

```
# mixture of two bivariate normal, one with correlation 0.9 and
# the other with correlation -0.9
#
N <-100
ro<- 0.90
Z1<-rnorm(N)
Z2<-rnorm(N)
X2<-X1<-Z1
I<-(1:floor(N*0.5))
I2<-((floor(N*0.5)+1):N)
X1[I]<-Z1[I]
X2[I]<-(Z1[I]*ro+Z2[I]*sqrt(1-ro*ro))
X1[I2]<-Z1[I2]
X2[I2]<-(Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1,X2)

#calculate the statistic
a<-JLMn(X1,X2)
a
```

JLn *JLn statistic, to test independence*

Description

It compute the JLn-statistic, from a bivariate sample of continuous random variables X and Y.

Usage

```
JLn(x, y)
```

Arguments

`x, y`	numeric vectors of data values. x and y must have the same length.

Details

See subsection 3.2.-Main reference. For sample sizes less than 20, the correction introduced in subsection 3.2 from main reference, with c = 0.4 was avoided.

Value

The value of the JLn-statistic.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

Examples

```
## mixture of two bivariate normal, one with correlation 0.9 and
## the other with correlation -0.9
#
N <-100
ro<- 0.90
Z1<-rnorm(N)
Z2<-rnorm(N)
X2<-X1<-Z1
I<-(1:floor(N*0.5))
I2<-((floor(N*0.5)+1):N)
X1[I]<-Z1[I]
X2[I]<-(Z1[I]*ro+Z2[I]*sqrt(1-ro*ro))
X1[I2]<-Z1[I2]
```

```
X2[I2]<-(Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1,X2)

# calculate the statistic
a<-JLn(X1,X2)
a
```

---

lis — *Longest increasing subsequence for a univariate sample*

Description

It compute the size of the longest increasing subsequence from a sample of a (continuous) random variable.

Usage

```
lis(x)
```

Arguments

`x`	numeric vector of data values.

Details

See example 2.1-Main reference.

Value

Integer, the size of the longest increasing subsequence.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

Examples

```
#see Example 2.1 (reference)
a<-lis(c(3,6,1,7,4,2,5,8))
a
```

`lis.test` *Test for independence between paired samples*

Description

Test for independence between X and Y computed from a paired sample (x1,y1),...(xn,yn) of (X,Y), using one of the following statistics (a) the Longest Increasing Subsequence (Ln), (b) JLn, a Jackknife version of Ln or (c) JLMn, a Jackknife version of the longest monotonic subsequence. This family of tests can be applied under the assumption of continuity of X and Y.

Usage

```
lis.test(x, y, alternative = c("two.sided", "less", "greater"),
method = c("JLMn", "Ln", "JLn"))
```

Arguments

`x, y`	numeric vectors of data values. x and y must have the same length.
`alternative`	indicates the alternative hypothesis and must be one of "two.sided"(default), "greater" or "less".
`method`	a character string indicating which statistics is to be used for the test. One of "Ln", "JLn", or "JLMn"(default).

Details

For sample sizes less than 20, the correction introduced in subsection 3.2 from main reference, with c = 0.4 was avoided.

Value

`sample.estimate`	the value of the 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 Lis-test was performed.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

Examples

```
# Example 1
# mixture of two bivariate normal, one with correlation 0.9
# and the other with correlation -0.9

N <-100
ro<- 0.90
Z1<-rnorm(N)
Z2<-rnorm(N)
X2<-X1<-Z1
I<-(1:floor(N*0.5))
I2<-((floor(N*0.5)+1):N)
X1[I]<-Z1[I]
X2[I]<-(Z1[I]*ro+Z2[I]*sqrt(1-ro*ro))
X1[I2]<-Z1[I2]
X2[I2]<-(Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1,X2)
# calculate the p.value using the default settings (method="JLMn"
# and alternative="two.sided")
lis.test(X1,X2)
# calculate the p.value using method="JLn" and
# alternative="two.sided".
lis.test(X1,X2,method="JLn")
#
# Example 2: see subsection 4.3.2-Application 2 from main reference.
# (It requires the package VGAM)
#
#require(VGAM)
#plot(coalminers$BW, coalminers$nBW)
#lis.test(coalminers$BW, coalminers$nBW,
#alternative = "greater", method = "Ln")
#lis.test(coalminers$BW, coalminers$nBW,
#alternative = "greater", method = "JLn")
#
```

`Ln` *Ln (Longest Increasing Subsequence) statistic, to test independence*

Description

It compute the Ln-statistic, from a bivariate sample of continuous random variables X and Y.

Usage

```
Ln(x, y)
```

Arguments

`x, y`	numeric vectors of data values. x and y must have the same length.

Details

See Section 2.-Main reference.

Value

The value of the Ln-statistic.

Author(s)

J. E. Garcia and V. A. Gonzalez-Lopez

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

Examples

```
## mixture of two bivariate normal, one with correlation
## 0.9 and  the other with correlation -0.9
#
N <-100
ro<- 0.90
Z1<-rnorm(N)
Z2<-rnorm(N)
X2<-X1<-Z1
I<-(1:floor(N*0.5))
I2<-((floor(N*0.5)+1):N)
X1[I]<-Z1[I]
X2[I]<-(Z1[I]*ro+Z2[I]*sqrt(1-ro*ro))
X1[I2]<-Z1[I2]
X2[I2]<-(Z1[I2]*(-ro)+Z2[I2]*sqrt(1-ro*ro))
plot(X1,X2)

# calculate the statistic
a<-Ln(X1,X2)
a
```

TJLMN *Simulated values for the JLMn statistic*

Description

Simulated values for the JLMn statistic under the hypothesis of independence

Format

The format is: List of 200 tables

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

TJLN *Simulated values for the JLn statistic*

Description

Simulated values for the JLn statistic under the hypothesis of independence.

Format

The format is: List of 200 tables

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

TLN *Simulated values for the Ln statistic*

Description

Simulated values for the Ln statistic under the hypothesis of independence

Format

The format is: List of 200 tables

References

J. E. Garcia, V. A. Gonzalez-Lopez, Independence tests for continuous random variables based on the longest increasing subsequence, Journal of Multivariate Analysis (2014), http://dx.doi.org/10.1016/j.jmva.2014.02.010

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