Package ‘crossReg’

February 19, 2015

Type Package

Title Confidence intervals for crossover points of two simple regression lines

Version 1.0

Date 2014-07-08

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Description This package provides functions to calculate confidence intervals for crossover points of two simple linear regression lines using the non-linear regression, the delta method, the Fieller method, and the bootstrap methods.

Suggests boot, MASS

License GPL-2

NeedsCompilation no

Repository CRAN

Date/Publication 2014-07-09 08:18:12

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### crossReg-package

**Confidence intervals for crossover points**

#### Description

Given the linear regression model $y = b0 + b1*x1 + b2*x2 + b3*x1*x2$, the crossover point of the two simple regression lines implied by the linear regression model can be expressed as $C = -b2/b3$ (Aiken and West, 1991). This package provides functions to calculate confidence intervals for crossover points of two simple linear regression lines using the non-linear regression, the delta method, the Fieller method, and the bootstrap methods.

#### Details

- **Package**: crossReg
- **Type**: Package
- **Version**: 1.0
- **Date**: 2014-07-08
- **License**: GPL-2

#### Author(s)

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### BootC

**Confidence intervals for crossover points using the bootstrap methods**

#### Description

Calculate confidence intervals for crossover points of two simple linear regression lines using the bootstrap

#### Usage

BootC(Data)

#### Arguments

- **Data**: a dataframe containing data values for y, x1, and x2
Details

The function BootC() calculates confidence intervals for the crossover point C using the boot package in R. Bootstrap confidence intervals include Normal, Basic, Percentile, and BCa confidence intervals.

Author(s)

Sunbok Lee

References


Examples

```r
# example data
library(MASS)
out <- mvrnorm(1000, mu = c(0, 0), Sigma = matrix(c(1, 0.2, 0.2, 1), ncol = 2), empirical = TRUE)
x1 <- out[, 1]
x2 <- out[, 2]
epsilon <- rnorm(1000, 0, 1)
y <- 1 + 1*x1 + 0.5*x2 + 1*x1*x2 + epsilon  # true C = -0.5/1 = -0.5
simData <- data.frame(y, x1, x2)

# run BootC()
library(boot)
BootC(simData)
```

---

**DeltaC**

Confidence intervals for crossover points using the delta method

Description

Calculate confidence intervals for crossover points of two simple linear regression lines using the delta method.

Usage

`DeltaC(Data, order)`

Arguments

<table>
<thead>
<tr>
<th>Data</th>
<th>a dataframe containing data values for y, x1, and x2</th>
</tr>
</thead>
<tbody>
<tr>
<td>order</td>
<td>a scalar number representing the order of Delta method. 1=1st order delta method and 2=2nd order delta method</td>
</tr>
</tbody>
</table>
Details

Given a linear regression model \( y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_1 x_2 \), the crossover point of two simple regression lines can be directly calculated based on \( C = -\frac{b_2}{b_3} \). The Delta method can be used to estimate the standard error of \( C = -\frac{b_2}{b_3} \) based on the standard errors of \( b_2 \) and \( b_3 \) which can be obtained from a linear regression. The function DeltaC() calculates the confidence intervals for \( C \) based on the standard error of \( C \) obtained from the delta method.

Value

- **LowCI**: lower bound of confidence intervals for \( C \) based on the delta method
- **UpperCI**: upper bound of confidence intervals for \( C \) based on the delta method

Author(s)

Sunbok Lee

References


Examples

```r
# example data
library(MASS)
out <- mvrnorm(1000, mu = c(0,0), Sigma = matrix(c(1,0.2,0.2,1), ncol = 2), empirical = TRUE)
x1 <- out[,1]
x2 <- out[,2]
epsilon <- rnorm(1000,0,1)
y <- -1 + 1*x1 + 0.5*x2 + 1*x1*x2 + epsilon  # true C = -0.5/1 = -0.5
simData <- data.frame(y=y,x1=x1,x2=x2)

# run DeltaC()
DeltaC(simData)
```

### FiellerC

*Confidence intervals for crossover points using the Fieller method*

Description

Calculate confidence intervals for crossover points of two simple linear regression lines using the Fieller method.

Usage

FiellerC(Data)
Arguments

Data a dataframe containing data values for y, x1, and x2

Details

Fieller (1954) proposed a method for calculating the confidence interval for the ratio of two normally distributed random variables without assuming any particular form for the sampling distribution of the ratio itself. The function `FiellerC()` calculates confidence intervals for the crossover points of two simple regression lines using the Fieller method.

Value

- lowCI: lower bound of confidence intervals for C based on the Fieller method
- upperCI: upper bound of confidence intervals for C based on the Fieller method

Author(s)

Sunbok Lee

References


Examples

```r
# example data
library(MASS)
out <- mvrnorm(1000, mu = c(0,0), Sigma = matrix(c(1,0.2,0.2,1), ncol = 2), empirical = TRUE)
x1 <- out[,1]
x2 <- out[,2]
epsilon <- rnorm(1000,0,1)
y <- 1 + 1*x1 + 0.5*x2 + 1*x1*x2 + epsilon # true C = -0.5/1 = -0.5
simData <- data.frame(y=y,x1=x1,x2=x2)

# run FiellerC()
FiellerC(simData)
```

nonLinearC

Confidence intervals for crossover points using non-linear regression

Description

Calculate confidence intervals for crossover points of two simple linear regression lines using non-linear regression.

Usage

`nonLinearC(Data, startingValue)`
Arguments

Data a dataframe containing data values for y, x1, and x2
startingValue a list containing starting values for estimating parameters in non-linear regression

Details

For a crossover point \( C = -\frac{b_2}{b_3} \) of the two simple regression lines, Widaman et al. (2012) proposed to estimate \( C \) using the non-linear regression of the form \( y = A_0 + A_1*(x1-C) + A_2*(x1-C)*x2 \). The function \( \text{nonLinearC()} \) estimates \( C \) using the non-linear regression and calculates the confidence intervals for \( C \) based on the standard error of \( C \) obtained from a non-linear regression.

Value

- \( \text{C\_Hat} \): estimate of \( C \) from a non-linear regression
- \( \text{SE} \): standard error of \( C \) from a non-linear regression
- \( \text{LowCI} \): lower bound of confidence intervals for \( C \) based on a non-linear regression
- \( \text{UpperCI} \): upper bound of confidence intervals for \( C \) based on a non-linear regression

Author(s)

Sunbok Lee

References


Examples

```r
# set initial values for non-linear regression
startingValue <- list(A0 = 1, B1 = 1, B2 = 1, C = 1)

# example data
library(MASS)
out <- mvrnorm(1000, mu = c(0,0), Sigma = matrix(c(1,0.2,0.2,1), ncol = 2), empirical = TRUE)
x1 <- out[,1]
x2 <- out[,2]
epsilon <- rnorm(1000,0,1)
y <- 1 + 1*x1 + 0.5*x2 + 1*x1*x2 + epsilon  # true C = -0.5/1 = -0.5
simData <- data.frame(y=y,x1=x1,x2=x2)

# run nonLinearC()
nonLinearC(simData, startingValue)
```
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