Package 'LinCal'

April 30, 2022

Title Static Univariate Frequentist and Bayesian Linear Calibration

Version 1.0.1

Author Derick L. Rivers <riversdl@alumni.vcu.edu> and Edward L. Boone

Maintainer Derick L. Rivers <riversdl@alumni.vcu.edu>

Description Estimate and confidence/credible intervals for an unknown regressor x0 given an observed y0.

Depends R (>= 3.0.2)

License GPL-2

LazyData yes

NeedsCompilation no

Repository CRAN

RoxygenNote 7.1.2

Date/Publication 2022-04-29 22:40:15 UTC

R topics documented:

`LinCal-package` *Static Univariate Frequentist and Bayesian Linear Calibration*

Description

A collection of R functions for conducting linear statistical calibration.

Details

Package:	LinCal
Type:	Package
Version:	1.0.1
Date:	2022-04-27
License:	GPL-2

Author(s)

Derick L. Rivers and Edward L. Boone

Maintainer: Derick L. Rivers <riversdl@alumni.vcu.edu>

References

Eisenhart, C. (1939). The interpretation of certain regression methods and their use in biological and industrial research. Annals of Mathematical Statistics. 10, 162-186.

Krutchkoff, R. G. (1967). Classical and Inverse Regression Methods of Calibration. Technometrics. 9, 425-439.

Hoadley, B. (1970). A Bayesian look at Inverse Linear Regression. Journal of the American Statistical Association. 65, 356-369.

Hunter, W., and Lamboy, W. (1981). A Bayesian Analysis of the Linear Calibration Problem. Technometrics. 3, 323-328.

Examples

```
library(LinCal)

data(wheat)

plot(wheat[,6],wheat[,2])

## Classical Approach
class.calib(wheat[,6],wheat[,2],0.05,105)

## Inverse Approach
inver.calib(wheat[,6],wheat[,2],0.05,105)

## Bayesian Inverse Approach
hoad.calib(wheat[,6],wheat[,2],0.05,105)

##Bayesian Classical Approach
huntlam.calib(wheat[,6],wheat[,2],0.05,105)
```

`class.calib` *Classical Linear Calibration Function*

Description

`class.calib` uses the classical frequentist approach to estimate an unknown X given observed vector y0 and calculates confidence interval estimates.

Usage

```
class.calib(x, y, alpha, y0)
```

Arguments

`x`	numerical vector of regressor measurments
`y`	numerical vector of observation measurements
`alpha`	the confidence interval to be calculated
`y0`	vector of observed calibration value

References

Eisenhart, C. (1939). The interpretation of certain regression methods and their use in biological and industrial research. Annals of Mathematical Statistics. 10, 162-186.

Examples

```
X <- c(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10)
Y <- c(1.8,1.6,3.1,2.6,3.6,3.4,4.9,4.2,6.0,5.9,6.8,6.9,8.2,7.3,8.8,8.5,9.5,9.5,10.6,10.6)

class.calib(X,Y,0.05,6)
```

`hoad.calib` *Bayesian Inverse Linear Calibration Function*

Description

`hoad.calib` uses an inverse Bayesian approach to estimate an unknown X given observed vector y0 and calculates credible interval estimates.

Usage

```
hoad.calib(x, y, alpha, y0)
```

Arguments

`x`	numerical vector of regressor measurments
`y`	numerical vector of observation measurements
`alpha`	the confidence interval to be calculated
`y0`	vector of observed calibration value

References

Hoadley, B. (1970). A Bayesian look at Inverse Linear Regression. Journal of the American Statistical Association. 65, 356-369.

Examples

```
X <- c(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10)
Y <- c(1.8,1.6,3.1,2.6,3.6,3.4,4.9,4.2,6.0,5.9,6.8,6.9,8.2,7.3,8.8,8.5,9.5,9.5,10.6,10.6)

hoad.calib(X,Y,0.05,6)
```

`huntlam.calib` *Bayesian Classical Linear Calibration Function*

Description

`huntlam.calib` uses the classical Bayesian approach to estimate an unknown X given observed vector y0 and calculates credible interval estimates.

Usage

```
huntlam.calib(x, y, alpha, y0)
```

Arguments

`x`	numerical vector of regressor measurments
`y`	numerical vector of observation measurements
`alpha`	the confidence interval to be calculated
`y0`	vector of observed calibration value

References

Hunter, W., and Lamboy, W. (1981). A Bayesian Analysis of the Linear Calibration Problem. Technometrics. 3, 323-328.

Examples

```
X <- c(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10)
Y <- c(1.8,1.6,3.1,2.6,3.6,3.4,4.9,4.2,6.0,5.9,6.8,6.9,8.2,7.3,8.8,8.5,9.5,9.5,10.6,10.6)

huntlam.calib(X,Y,0.05,6)
```

inver.calib — *Inverse Linear Calibration Function*

Description

`inver.calib` uses the inverse frequentist approach to estimate an unknown X given observed vector y0 and calculates confidence interval estimates.

Usage

```
inver.calib(x, y, alpha, y0)
```

Arguments

`x`	numerical vector of regressor measurments
`y`	numerical vector of observation measurements
`alpha`	the confidence interval to be calculated
`y0`	vector of observed calibration value

References

Krutchkoff, R. G. (1967). Classical and Inverse Regression Methods of Calibration. Technometrics. 9, 425-439.

Examples

```
X <- c(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10)
Y <- c(1.8,1.6,3.1,2.6,3.6,3.4,4.9,4.2,6.0,5.9,6.8,6.9,8.2,7.3,8.8,8.5,9.5,9.5,10.6,10.6)

inver.calib(X,Y,0.05,6)
```

wheat — *Percentage Water, Percentage Protein, and Infrared Reflectance Measurements of Hard Wheat*

Description

A dataset containing 21 samples of hard wheat. The variables are as follows:

Usage

```
data("wheat")
```

Format

A data frame with 21 observations on the following 6 variables.

- `Y1` infrared reflectance vector
- `Y2` infrared reflectance vector
- `Y3` infrared reflectance vector
- `Y4` infrared reflectance vector
- `X1` percentage water vector
- `X2` percentage protein vector

Source

Brown, P. J. (1982). Multivariate calibration. Journal of the Royal Statistical Society B. 44, 287-321.

Examples

```
data(wheat)
## maybe str(wheat) ; plot(wheat) ...
```

Index