Package ‘LinCal’

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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

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Contents

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)
```

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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) ...
```

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