

Package ‘LinCal’

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Title Static Univariate Frequentist and Bayesian Linear Calibration

Version 1.0.1

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Description Estimate and confidence/credible intervals for an unknown regressor x_0 given an observed y_0 .

Depends R ($\geq 3.0.2$)

License GPL-2

LazyData yes

NeedsCompilation no

Repository CRAN

RoxygenNote 7.1.2

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Contents

LinCal-package	2
class.calib	3
hoad.calib	4
huntlam.calib	4
inver.calib	5
wheat	6
Index	7

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)

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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 y_0 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 y_0 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	<i>Percentage Water, Percentage Protein, and Infrared Reflectance Measurements of Hard Wheat</i>
-------	--

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

- * **calibration**

- class.calib, [3](#)
 - hoad.calib, [4](#)
 - huntlam.calib, [4](#)
 - inver.calib, [5](#)

- * **datasets**

- wheat, [6](#)

- * **linear**

- class.calib, [3](#)
 - hoad.calib, [4](#)
 - huntlam.calib, [4](#)
 - inver.calib, [5](#)

- * **package**

- LinCal-package, [2](#)

class.calib, [3](#)

hoad.calib, [4](#)

huntlam.calib, [4](#)

inver.calib, [5](#)

LinCal (LinCal-package), [2](#)

LinCal-package, [2](#)

wheat, [6](#)