Package 'cumulcalib'

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Title Cumulative Calibration Assessment for Prediction Models

Version 0.0.1

Description Tools for visualization of, and inference on, the calibration of prediction models on the cumulative domain. This provides a method for evaluating calibration of risk prediction models without having to group the data or use tuning parameters (e.g., loess bandwidth). This package implements the methodology described in Sadatsafavi and Patkau (2024) <doi:10.1002/sim.10138>. The core of the package is cumulcalib(), which takes in vectors of binary responses and predicted risks. The plot() and summary() methods are implemented for the results returned by cumulcalib().

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URL https://github.com/resplab/cumulcalib

Imports graphics, stats

Suggests knitr, predtools, rmarkdown, markdown, spelling, testthat (>= 3.0.0)

VignetteBuilder knitr

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Contents

`cumulcalib` *Cumulative calibration assessment*

Description

This is the core function for performing cumulative calibration assessment

Usage

```
cumulcalib(y, p, method = c("BB", "BM"), ordered = FALSE, n_sim = 0)
```

Arguments

`y`	vector of binary responses
`p`	vector of predicted probabilities.
`method`	string with either BB (Brownian bridge test, default method), BM (Brownian motion test), BM2p (two-part BM test - experimental), BB1p (one-part BB test wit only the 'bridge' component). Multiple methods can be specified. The first one will be the 'main' method (e.g., when submitting the resulting object to plot()). Default is c("BB","BM")
`ordered`	if TRUE, y and p are already ordered based on ascending values of p. This is to speed up simulations.
`n_sim`	if >0, indicates a simulation-based test is requested for inference.

Value

an objective of class cumulcalib that can be printed or plotted

Examples

```
pi <- rbeta(1000,1,2)
Y <- rbinom(length(pi),1,pi)
res <- cumulcalib(Y, pi, method="BB")
summary(res)
plot(res)
```

pKolmogorov *CDF of the Kolmogorov distribution*

Description

CDF of the Kolmogorov distribution

Usage

```
pKolmogorov(q, summands = ceiling(q * sqrt(72) + 3/2))
```

Arguments

q	the quantity at which CDF will be evaluated. Currently accepts only a scalar
summands	maximum number of terms to be evaluated in the infinite series (default=ceiling(q*sqrt(72)+3/2))

Value

a scalar value

plot.cumulcalib *Generates cumulative calibration plots*

Description

Generates cumulative calibration plots

Usage

```
## S3 method for class 'cumulcalib'
plot(
  x,
  method = NULL,
  draw_stat = TRUE,
  stat_col = c("blue", "red"),
  draw_sig = TRUE,
  sig_level = c(0.95, 0.95),
  x2axis = TRUE,
  y2axis = TRUE,
  ...
)

## S3 method for class 'cumulcalib'
plot(
  x,
```

```
  method = NULL,
  draw_stat = TRUE,
  stat_col = c("blue", "red"),
  draw_sig = TRUE,
  sig_level = c(0.95, 0.95),
  x2axis = TRUE,
  y2axis = TRUE,
  ...
)
```

Arguments

x	An object of class cumulcalib generated by cumulcalib()
method	Which method to use. Options are BB (Brownian bridge test), BM (Brownian motion test), BB1p (1-part Brownian bridge test), and BM2p (2-part Brownian bridge test). If unspecified, returns the default method used in the cumulcalib() call
draw_stat	Should the statistic (terminal value an/or maximum drift, depending on method) be drawn? Default is TRUE
stat_col	The color(s) to draw the stat. Default is c('blue','red'). For single-part tests (BM and BB1p) only the first element is used
draw_sig	Whether significance lines should be drawn. Default is T. Colors will be the same as stat_col
sig_level	If to draw significance lines, at what level? Default is c(0.95,0.95). For single-part tests (BM and BB1p) only the first element is used
x2axis	If true, draws a second x-axis (on top) showing predicted risks
y2axis	If true, draws a second y-axis (on right) showing scaled partial sums
...	Parameters to be passed to plot()

Value

None

None

---

pMAD_BM *CDF of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval*

Description

CDF of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval

Usage

```
pMAD_BM(q, summands = 100)
```

Arguments

q	the quantity at which CDF will be evaluated. Currently accepts only a scalar
summands	maximum number of terms to be evaluated in the infinite series (default=100)

Value

a scalar value

---

pMAD_BM_c *CDF of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval, conditional on its terminal value*

Description

CDF of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval, conditional on its terminal value

Usage

```
pMAD_BM_c(
  q,
  w1,
  method = 1,
  exp_tolerance = -30,
  summands = ceiling(q * sqrt(72) + 3/2)
)
```

Arguments

q	the quantity at which CDF will be evaluated. Currently accepts only a scalar
w1	the terminal value
method	different infinite series to use (1,2,3)
exp_tolerance	numerical tolerance as the stopping rule when evaluating the infinite sum (default -30 on the exponential scale)
summands	number of terms to evaluate (default is ceiling(q * sqrt(72) + 3/2))

Value

a scalar value

qKolmogorov *Quantile function of the Kolmogorov distribution*

Description

Quantile function of the Kolmogorov distribution

Usage

```
qKolmogorov(p)
```

Arguments

p	the quantity at which the quantile function will be evaluated. Currently accepts only a scalar

Value

a scalar value

qMAD_BM *Quantile function of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval*

Description

Quantile function of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval

Usage

```
qMAD_BM(p)
```

Arguments

p	the quantity at which the quantile function will be evaluated. Currently accepts only a scalar

Value

a scalar value

qMAD_BM_c — *Quantile function of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval, conditional on its terminal value*

Description

Quantile function of the distribution of the maximum absolute deviation of Brownian motion in [0,1] interval, conditional on its terminal value

Usage

```
qMAD_BM_c(p, w1)
```

Arguments

p	the quantity at which the quantile function will be evaluated. Currently accepts only a scalar
w1	the terminal value

Value

a scalar value

summary.cumulcalib — *Summarizes a cumulcalib object*

Description

Summarizes a cumulcalib object

Summarizes a cumulcalib object

Usage

```
## S3 method for class 'cumulcalib'
summary(object, method = NULL, ...)

## S3 method for class 'cumulcalib'
summary(object, method = NULL, ...)
```

Arguments

object	An object of class cumulcalib generated by cumulcalib()
method	Which method to use. Options are BB (Brownian bridge test), BM (Brownian motion test), BB1p (1-part Brownian bridge test), and BM2p (2-part Brownian bridge test). If unspecified, returns the default method used in the cumulcalib() call
...	Other parameters passed to summary()

Value

None

None

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