Package 'BSW'

January 20, 2025

Type Package

Title Fitting a Log-Binomial Model using the Bekhit-Schöpe-Wagenpfeil (BSW) Algorithm

Version 0.1.1

Date 2021-03-19

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Description
Implements a modified Newton-type algorithm (BSW algorithm) for solving the maximum likelihood estimation problem in fitting a log-binomial model under linear inequality constraints.

License GPL (>= 3)

Encoding UTF-8

URL https://github.com/adam-bec/BSW

BugReports https://github.com/adam-bec/BSW/issues

VignetteBuilder knitr

Depends Matrix, matrixStats, quadprog

Suggests knitr, rmarkdown, testthat

Imports methods

LazyData true

RoxygenNote 7.1.1

NeedsCompilation no

Repository CRAN

Date/Publication 2021-03-22 16:20:09 UTC

Contents

`bsw` *Fitting a log-binomial model using the Bekhit-Schöpe-Wagenpfeil (BSW) algorithm*

Description

`bsw()` fits a log-binomial model using a modified Newton-type algorithm (BSW algorithm) for solving the maximum likelihood estimation problem under linear inequality constraints.

Usage

```
bsw(formula, data, maxit = 200L)
```

Arguments

`formula`	An object of class `"formula"` (or one that can be coerced to that class): a symbolic description of the model to be fitted.
`data`	A data frame containing the variables in the model.
`maxit`	A positive integer giving the maximum number of iterations.

Value

An object of S4 class `"bsw"` containing the following slots:

`call`	An object of class `"call"`.
`formula`	An object of class `"formula"`.
`coefficients`	A numeric vector containing the estimated model parameters.
`iter`	A positive integer indicating the number of iterations.
`converged`	A logical constant that indicates whether the model has converged.
`y`	A numerical vector containing the dependent variable of the model.
`x`	The model matrix.
`data`	A data frame containing the variables in the model.

Author(s)

Adam Bekhit, Jakob Schöpe

References

Wagenpfeil S (1996) Dynamische Modelle zur Ereignisanalyse. Herbert Utz Verlag Wissenschaft, Munich, Germany

Wagenpfeil S (1991) Implementierung eines SQP-Verfahrens mit dem Algorithmus von Ritter und Best. Diplomarbeit, TUM, Munich, Germany

Examples

```
set.seed(123)
x <- rnorm(100, 50, 10)
y <- rbinom(100, 1, exp(-4 + x * 0.04))
fit <- bsw(formula = y ~ x, data = data.frame(y = y, x = x))
summary(fit)
```

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bsw-class *S4 Class* "bsw"

Description

S4 Class "bsw"

Slots

`call` An object of class "call".

`formula` An object of class "formula".

`coefficients` A numeric vector containing the estimated model parameters.

`iter` A positive integer indicating the number of iterations.

`converged` A logical constant that indicates whether the model has converged.

`y` A numeric vector containing the dependent variable of the model.

`x` The model matrix.

`data` A data frame containing the variables in the model.

Author(s)

Adam Bekhit, Jakob Schöpe

coef,bsw-method *Extracting the estimated model parameters of* bsw()

Description

For objects of class "bsw", coef() extracts the estimated model parameters of bsw().

Usage

```
## S4 method for signature 'bsw'
coef(object)
```

Arguments

object	An object of class "bsw".

Value

A numeric vector containing the estimated model parameters.

Author(s)

Adam Bekhit, Jakob Schöpe

confint,bsw-method *Estimating confidence intervals of the estimated model parameters of* bsw()

Description

For objects of class "bsw", confint() estimates confidence intervals of the estimated model parameters of bsw().

Usage

```
## S4 method for signature 'bsw'
confint(object, parm, level = 0.95, method = "wald", R = 1000L)
```

Arguments

object	An object of class "bsw".
parm	A specification of which model parameters are to be given confidence intervals, either a vector of numbers or a vector of names. If missing, all model parameters are considered.
level	A numeric value that indicates the level of confidence.
method	A character giving the estimation method of the confidence intervals ("bca" or "wald").
R	A positive integer giving the number of bootstrap replicates.

Details

confint provides Wald (default) and bias-corrected accelerated bootstrap confidence intervals of the estimated model parameters of bsw().

Value

A matrix with columns giving the lower and upper confidence limits of each estimated model parameter.

Author(s)

Adam Bekhit, Jakob Schöpe

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constr *Setting the linear inequality constraints for* bsw()

Description

constr() sets the linear inequality constraints for bsw().

Usage

```
constr(x)
```

Arguments

x	A model matrix.

Value

A matrix containing the linear inequality constraints for bsw().

Author(s)

Adam Bekhit, Jakob Schöpe

gradF — *Deriving the first derivatives of the log likelihood function of the log-binomial model in* bsw()

Description

gradF() derives the first derivatives of the log likelihood function of the log-binomial model.

Usage

```
gradF(theta, y, x)
```

Arguments

theta	A numeric vector containing the initial values of the model parameters.
y	A numeric vector containing the dependent variable of the model.
x	The model matrix.

Value

A numeric vector containing the first derivatives of the log likelihood function of the log-binomial model.

Author(s)

Adam Bekhit, Jakob Schöpe

hess — *Deriving the second partial derivatives of the log likelihood function of the log-binomial model in* bsw() *(Hessian matrix)*

Description

hess() derives the second partial derivatives of the log likelihood function of the log-binomial model.

Usage

```
hess(theta, y, x)
```

Arguments

theta	A numeric vector containing the initial values of the model parameters.
y	A numeric vector containing the dependent variable of the model.
x	The model matrix.

Value

A numeric matrix containing the second partial derivatives of the log likelihood function of the log-binomial model (Hessian matrix).

Author(s)

Adam Bekhit, Jakob Schöpe

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summary,bsw-method *Summarizing the estimated model parameters of* bsw()

Description

For objects of class "bsw", summary() summarizes the estimated model parameters of bsw().

Usage

```
## S4 method for signature 'bsw'
summary(object)
```

Arguments

object	An object of class "bsw".

Value

A list containing the following elements:

coefficients	A numeric vector containing the estimated model parameters.
std.err	A numeric vector containing the estimated standard errors of the model parameters.
z.value	A numeric vector containing the estimated z test statistic of the model parameters.
p.value	A numeric vector containing the estimated p values of the model parameters.

Author(s)

Adam Bekhit, Jakob Schöpe

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