

# Package ‘BSW’

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**Type** Package

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

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**Author** Adam Bekhit, Jakob Schöpe, Stefan Wagenpfeil

**Maintainer** Adam Bekhit <adam.bekhit@uni-saarland.de>

## 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>

**Depends** Matrix, matrixStats, quadprog

**Imports** methods

**LazyData** true

**RoxygenNote** 7.1.0

**NeedsCompilation** no

**Repository** CRAN

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bsw	<i>Fitting a log-binomial model using the Bekhit-Schöpe-Wagenpfeil (BSW) algorithm</i>
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### 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"*

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## 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

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coef,bsw-method	<i>Extracting the estimated model parameters of bsw()</i>
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**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".
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**Value**

A numeric vector containing the estimated model parameters.

**Author(s)**

Adam Bekhit, Jakob Schöpe

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confint,bsw-method	<i>Estimating confidence intervals of the estimated model parameters of bsw()</i>
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**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	<i>Setting the linear inequality constraints for bsw()</i>
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**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

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gradF	<i>Deriving the first derivatives of the log likelihood function of the log-binomial model in bsw()</i>
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**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

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

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**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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