

Package ‘ewp’

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Type Package

Title An Empirical Model for Underdispersed Count Data

Version 0.1.2

Description Count regression models for underdispersed small counts ($\lambda < 20$) based on the three-parameter exponentially weighted Poisson distribution of Ridout & Besbeas (2004) <[DOI:10.1191/1471082X04st064oa](https://doi.org/10.1191/1471082X04st064oa)>.

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LinkingTo BH, Rcpp

Imports Rcpp, mvtnorm

Suggests covr, DHARMA, testthat ($\geq 3.0.0$)

Config/testthat/edition 3

NeedsCompilation yes

Author Philipp Boersch-Supan [aut, cre] (ORCID: <<https://orcid.org/0000-0001-6723-6833>>),
James Clarke [aut] (ORCID: <<https://orcid.org/0000-0003-1826-2060>>)

Maintainer Philipp Boersch-Supan <pboesu@gmail.com>

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coef.ewp	<i>Extract coefficients</i>
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Description

Extract coefficients

Usage

```
## S3 method for class 'ewp'
coef(object, ...)
```

Arguments

object	an object of class ewp
...	ignored

Value

a vector of coefficient values. Beware that the lambda parameters are on the log-link scale, whereas the betas are estimated using an identity link.

dewp3	<i>Probability mass function of the three-parameter EWP</i>
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Description

Probability mass function of the three-parameter EWP

Usage

```
dewp3(x, lambda, beta1, beta2, sum_limit = max(x) * 3)
```

Arguments

x	vector of (positive integer) quantiles.
lambda	centrality parameter
beta1	lower-tail dispersion parameter
beta2	upper tail dispersion parameter
sum_limit	summation limit for the normalizing factor

Value

a vector of probabilities

dewp3_cpp	<i>Probability mass function of the three-parameter EWP</i>
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Description

Probability mass function of the three-parameter EWP

Usage

```
dewp3_cpp(x, lambda, beta1, beta2, sum_limit)
```

Arguments

x	vector of (positive integer) quantiles.
lambda	centrality parameter
beta1	lower-tail dispersion parameter
beta2	upper tail dispersion parameter
sum_limit	summation limit for the normalizing factor

Value

a probability mass

ewp_reg

*Exponentially weighted Poisson regression model***Description**

Exponentially weighted Poisson regression model

Usage

```
ewp_reg(
  formula,
  family = "ewp3",
  data,
  verbose = TRUE,
  method = "Nelder-Mead",
  hessian = TRUE,
  autoscale = TRUE,
  maxiter = 500,
  sum_limit = round(max(Y) * 3),
  start_val = NULL
)
```

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.
family	choice of "ewp2" or "ewp3"
data	a data frame containing the variables in the model.
verbose	logical, defaults to TRUE; print model fitting progress
method	string, passed to optim, defaults to 'BFGS'
hessian	logical, defaults to TRUE; calculate Hessian?
autoscale	logical, defaults to TRUE; automatically scale model parameters inside the optimisation routine based on initial estimates from a Poisson regression.
maxiter	numeric, maximum number of iterations for optim
sum_limit	numeric, defaults to 3*maximum count; upper limit for the sum used for the normalizing factor.
start_val	list, defaults to fitting a Poisson regression; specify starting values

Value

an ewp model

fitted.ewp	<i>Extract fitted values</i>
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Description

Extract fitted values

Usage

```
## S3 method for class 'ewp'  
fitted(object, ...)
```

Arguments

object	an object of class ewp
...	ignored

Value

a vector of fitted values on the response scale

linnet	<i>Linnet clutch sizes</i>
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Description

A dataset containing the clutch sizes for linnet, recreated from Ridout & Besbeas 2004

Usage

```
linnet
```

Format

A data frame with 5414 rows and 3 variables:

eggs clutch size

cov1 a synthetic random noise covariate

cov2 a synthetic covariate that is positively correlated with the outcome

Source

Ridout & Besbeas 2004, P. Boersch-Supan

logLik.ewp	<i>Extract log likelihood</i>
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Description

Extract log likelihood

Usage

```
## S3 method for class 'ewp'
logLik(object, ...)
```

Arguments

object	an object of class ewp
...	ignored

Value

a numeric

mmean	<i>Estimate marginal means</i>
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Description

Estimate marginal means

Usage

```
mmean(object, cov, ci = TRUE, nsamples = 250, ...)
```

Arguments

object	ewp model object
cov	character, covariate to find marginal mean for
ci	logical, defaults to TRUE, whether or not to include confidence intervals
nsamples	numeric, defaults to 250, number of samples for use in obtaining the confidence intervals
...	ignored

Value

printout of the marginal means

predict.ewp	<i>Predict from fitted model</i>
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Description

Predict from fitted model

Usage

```
## S3 method for class 'ewp'  
predict(object, newdata, type = c("response"), na.action = na.pass, ...)
```

Arguments

object	ewp model object
newdata	optional data.frame
type	character; default="response", no other type implemented
na.action	defaults to na.pass()
...	ignored

Value

a vector of predictions

print.ewp	<i>Print ewp model object</i>
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Description

Print ewp model object

Usage

```
## S3 method for class 'ewp'  
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

x	ewp model object
digits	digits to print
...	ignored

Value

a summary printout of the ewp model call and fitted coefficients.

```
print.summary.ewp      Print ewp model summary
```

Description

Print ewp model summary

Usage

```
## S3 method for class 'summary.ewp'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

x	ewp model summary
digits	number of digits to print
...	additional arguments to printCoefmat()

Value

printout of the summary object

```
rewp3      Random samples from the three-parameter EWP
```

Description

Random samples from the three-parameter EWP

Usage

```
rewp3(n, lambda, beta1, beta2, sum_limit = 30)
```

Arguments

n	number of observations
lambda	centrality parameter
beta1	lower-tail dispersion parameter
beta2	upper tail dispersion parameter
sum_limit	summation limit for the normalizing factor

Value

random deviates from the EWP_3 distribution

simulate.ewp	<i>simulate from fitted model</i>
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Description

simulate from fitted model

Usage

```
## S3 method for class 'ewp'  
simulate(object, nsim = 1, ...)
```

Arguments

object	ewp model object
nsim	number of response vectors to simulate. Defaults to 1.
...	ignored

Value

a data frame with 'nsim' columns.

summary.ewp	<i>Model summary</i>
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Description

Model summary

Usage

```
## S3 method for class 'ewp'  
summary(object, ...)
```

Arguments

object	ewp model fit
...	ignored

Value

The function 'summary.ewp' computes and returns a list of summary statistics of the fitted ewp model.

`vcov.ewp`*Extract estimated variance-covariance matrix*

Description

Extract estimated variance-covariance matrix

Usage

```
## S3 method for class 'ewp'  
vcov(object, ...)
```

Arguments

<code>object</code>	an object of class <code>ewp</code>
<code>...</code>	ignored

Value

a matrix

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