

Package ‘GWRM’

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Title GWRM

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Description GWRM is a package for fitting Generalized Waring
Regression Models. It includes the dataset and the example of Rodriguez-Avi, J; Conde-
Sanchez, A; Saez-Castillo, A.J., Olmo-Jimenez, M. J. and Martinez Rodriguez, A. M.(2009). A
generalized Waring regression model for count data.
Computational Statistics and Data Analysis, 53, pp. 3717-3725.

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goals

Goals scored by footballers in the first division of the Spanish league

Description

The response variable Y, is the number of goals scored by the footballers (excluding goalkeepers) in the first division of the Spanish league from the 2000/2001 to the 2006/2007 seasons. Since there are footballers who played more than one season, the season in which each one has played more matches has been selected. The covariates considered are the final classification of the team in each season, the position in the field (forward, midfielder and defender) and the number of matches played.

Usage

```
data(goals)
```

Format

A data frame with 1224 rows and 4 columns.

Source

MARCA sports paper.

References

Rodriguez-Avi, J; Conde-Sanchez, A; Saez-Castillo, A.J., Olmo-Jimenez, M. J. and Martinez Rodriguez, A. M.(2009). A generalized Waring regression model for count data. *Computational Statistics and Data Analysis*, 53, pp. 3717-3725.

GWRM.add*Add All Possible Single Terms to a Generalized Waring Regression Model (GWRM)*

Description

Computes all the single terms in the scope argument that can be added to the model, fits those models and calculates a table of the changes in fit.

Usage

```
GWRM.add(object = NULL, scope = NULL, method=1, iters = 10000)
```

Arguments

object	A fitted model object obtained with <code>GWRM.fit</code> .
scope	A formula giving the terms to be considered for adding.
iters	A positive integer specifying the maximum number of iterations to be performed in the optimization process of the log-likelihood function.
method	An integer specifying the method to be used for the log-likelihood optimization. 1 indicates optimization with <code>nlm</code> function; 2 to 6 indicate optimization with "Nelder-Mead", "BFGS", "CG", "L-BFGS-B" and "SANN" methods of <code>optim</code> function respectively.

Value

A data frame with the names of the covariates which are added to the model, the value of the chi-squared statistic in the comparison of the new models with `object` argument, the degrees of freedom and the associated p-value.

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References

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Examples

```
data(goals)

fit.0<-GWRM.fit(goals~offset(played),data=goals)
GWRM.display(fit.0)
GWRM.add(object=fit.0,scope=~clasif+position)
```

GWRM.display

Summarizing Generalized Waring Regression Model Fits

Description

Function to produce summaries of the results of `GWRM.fit` function.

Usage

```
GWRM.display(model)
```

Arguments

model A model fitted by GWRM.fit function.

Value

Table A data frame with the matrix of estimated coefficients of the regressors, standard errors, z-values and p-values.

betaII A data frame with the estimated parameters of the BetaII distribution that models proneness. First, it includes estimates of the parameters that are used in the optimization of the log-likelihood function, betak and betaro, such that $k = \exp(\text{betak})$ and $ro = 1 + \exp(\text{betaro})$. Then, k and ro estimates appear in the third column.

Fit Log-likelihood value, AIC, BIC and degrees of freedom of model.

Convergence A code that indicates successful convergence of the fitter function used (see nlm or optim helps).

Method The code of the fitter function used. See GWRM.fit help.

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References

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Examples

```
data(goals)

fit<-GWRM.fit(goals~clasif+position+log(played)+offset(played),data=goals)
GWRM.display(fit)
```

GWRM.fit

Fitting Generalized Waring Regression Models

Description

Function to fit a Generalized Waring Regression Model (GWRM), which is specified giving the response variable and a symbolic description of the linear predictor as a formula.

Usage

```
GWRM.fit(formula, f = NULL, p0k = 0, p0ro = 1, p0beta = NULL,
iters = 10000, data, method = 1)
```

Arguments

formula	An object of class "formula": a symbolic description of the model to be fitted.
f	An optional vector of frequencies or prior weights to be used in the fitting process. It should be NULL or a numeric vector.
p0k	A starting value for the parameter k in the Generalized Waring distribution.
p0ro	A starting value for the parameter ro in the Generalized Waring distribution.
p0beta	A vector of starting values for the coefficients of the regressors.
iters	A positive integer specifying the maximum number of iterations to be performed in the optimization process of the log-likelihood.
data	A data frame containing the variables in formula.
method	An integer specifying the method to be used for the log-likelihood optimization. See "Details".

Details

Method 1 indicates optimization with `nlm` function. Method 2 to 6 indicate optimization with "Nelder-Mead", "BFGS", "CG", "L-BFGS-B" and "SANN" methods of `optim` function respectively.

An offset may be included in formula. GWRM is a multiplicative model, so the offset is added as a multiplicative term. For example, if `formula=y~x+offset(z)` then, the model is $y=z*\exp(\text{beta0}+\text{beta1}*x)$.

Value

dataset	A data frame with data and vector f of frequencies or weights.
response	The response variable.
model	The formula for the model.
covars	The names of the predictors.
offset	A logical value indicating whether formula includes an offset.
optimum	The optimum of log-likelihood function.
aic	Akaike Information Criterion, minus twice the maximized log-likelihood plus twice the number of parameters.
bic	Bayesian Information Criterion, minus twice the maximized log-likelihood plus the number of parameters multiplied by the logarithm of the number of observations.
df	The degrees of freedom of the model.
coefficients	The estimates of the coefficients of the model. The last two correspond to the parameters of the BetaII distribution. It should be taken into account that they are parametrized as $k=\exp(\text{betak})$ and $ro=1+\exp(\text{betaro})$; here you'll find <code>betak</code> and <code>betaro</code> .
betaIIpars	The estimates of the parameters k and ro of the BetaII distribution that models proneness.
betascoef	The estimates of the coefficients of the linear predictor.

fitted.values	The fitted mean values.
hessian	A symmetric matrix giving an estimate of the Hessian at the solution found in the optimization of the log-likelihood function.
cov	A matrix giving an estimate of the covariance matrix of the coefficients of the model.
se	A vector of estimates of the standard errors of the estimated coefficients.
corr	A matrix giving an estimate of the correlation matrix of the coefficients of the model.
code	A code that indicates successful convergence of the fitter function used (see <code>nlm</code> and <code>optim</code> helps).
method	The name of the fitter function used.

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References

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Examples

```
data(goals)

fit<-GWRM.fit(goals~clasif+position+log(played)+offset(played),data=goals)
GWRM.display(fit)
```

GWRM.stats

Summary of the Generalized Waring Distribution of the cases specified

Description

In a Generalized Waring Regression Model (GWRM) with parameters k and ro , the probability distribution of each case is a Univariate Generalized Waring Distribution (UGWD) with parameters a , k and ro , where a is determined by the covariates values. This function calculates, for the cases specified by the arguments `covars` in `model`, the value of a , the mean, a confidence interval for the mean, the variance and the partition of the variance in terms of randomness, liability and proneness.

Usage

```
GWRM.stats(model = NULL, covars = NULL, alpha = 0.05)
```

Arguments

model	A model given by <code>GWRM.fit</code> function.
covars	A data frame whose columns must have the same names than the covariates of the GWRM specified by the argument <code>model</code> . Rows specify each case that you wish to analyze.
alpha	The confidence level intervals for the means.

Details

If any of the covariates is a factor, it must be introduced in `covars` also as a factor.

Value

params	A data frame with the estimated parameters corresponding to the UGWD of each case specified by <code>covars</code> in the GWRM indicated in <code>model</code> .
stats	A data frame with the estimated mean, the confidence interval of the mean and the variance of the UGWD of each case specified by <code>covars</code> in the GWRM indicated in <code>model</code> .
partvar	A data frame with the partition of the variance (in rates) of the UGWD of each case specified by <code>covars</code> in the GWRM indicated in <code>model</code> ; the three components of the variance are randomness, liability and proneness.

Author(s)

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References

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Examples

```
data(goals)

fit<-GWRM.fit(goals~clasif+position+log(played)+offset(played),data=goals)
GWRM.display(fit)

dem<-factor(c("Forward","Defender"),levels=c("Defender","Midfielder","Forward"))
niveles<-data.frame(clasif=c(1,4),played=c(12,15),position=dem)
GWRM.stats(model=fit,covars=niveles)
```

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