

Package: pgam (via r-universe)

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Author Washington Junger <wjunger@ims.uerj.br>

Maintainer Washington Junger <wjunger@ims.uerj.br>

Depends R (>= 3.0.0),stats,utils

Title Poisson-Gamma Additive Models

Description This work is an extension of the state space model for Poisson count data, Poisson-Gamma model, towards a semiparametric specification. Just like the generalized additive models (GAM), cubic splines are used for covariate smoothing. The semiparametric models are fitted by an iterative process that combines maximization of likelihood and backfitting algorithm.

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NeedsCompilation yes

Repository <https://wjunger.r-universe.dev>

RemoteUrl <https://github.com/wjunger/pgam>

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Contents

| | |
|-------------------------|----|
| AIC.pgam | 2 |
| aihrio | 3 |
| coef.pgam | 5 |
| deviance.pgam | 6 |
| envelope.pgam | 7 |
| f | 8 |
| fitted.pgam | 9 |
| g | 10 |
| logLik.pgam | 11 |
| periodogram | 12 |

| | |
|------------------------------|----|
| pgam | 13 |
| plot.pgam | 15 |
| predict.pgam | 16 |
| print.pgam | 18 |
| print.summary.pgam | 19 |
| residuals.pgam | 19 |
| summary.pgam | 21 |
| tbl2tex | 22 |

| | |
|--------------|-----------|
| Index | 24 |
|--------------|-----------|

| | |
|----------|-----------------------|
| AIC.pgam | <i>AIC extraction</i> |
|----------|-----------------------|

Description

Method for approximate Akaike Information Criterion extraction.

Usage

```
## S3 method for class 'pgam'
AIC(object, k = 2, ...)
```

Arguments

| | |
|--------|---|
| object | object of class pgam holding the fitted model |
| k | default is 2 for AIC. If $k = \log(n)$ then an approximation for BIC is obtained. Important to note that these are merely approximations. |
| ... | further arguments passed to method |

Details

An approximate measure of parsimony of the Poisson-Gama Additive Models can be achieved by the expression

$$AIC = (D(y; \hat{\mu}) + 2gle) / (n - \tau)$$

where *gle* is the number of degrees of freedom of the fitted model and τ is the index of the first non-zero observation.

Value

The approximate AIC value of the fitted model.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

- Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417
- Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.
- Hastie, T. J., Tibshirani, R. J. (1990) *Generalized Additive Models*. Chapman and Hall, London

See Also

[pgam](#), [deviance.pgam](#), [logLik.pgam](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

AIC(m)
```

aihrio

Sample dataset

Description

This is a dataset for Poisson-Gamma Additive Models functions testing.

Usage

```
data(aihrio)
```

Format

A data frame with 365 observations on the following 33 variables.

DATE a factor with levels

TIME a numeric vector

ITRESP65 a numeric vector

ITCIRC65 a numeric vector

ITDPOC65 a numeric vector

ITPNM65 a numeric vector

ITAVC65 a numeric vector

ITIAM65 a numeric vector

ITDIC65 a numeric vector
ITTCA65 a numeric vector
ITRESP5 a numeric vector
ITPNEU5 a numeric vector
ITDPC5 a numeric vector
WEEK a numeric vector
MON a numeric vector
TUE a numeric vector
WED a numeric vector
THU a numeric vector
FRI a numeric vector
SAT a numeric vector
SUN a numeric vector
HOLIDAYS a numeric vector
MONTH a numeric vector
warm.season a numeric vector
tmpmed a numeric vector
tmpmin a numeric vector
tmpmax a numeric vector
wet a numeric vector
rain a numeric vector
rainy a numeric vector
PM a numeric vector
SO2 a numeric vector
CO a numeric vector

Details

This is a reduced dataset of those used to estimate possible effects of air pollution on hospital admissions outcomes in Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

Source

Secretary for the Environment of the Rio de Janeiro City, Brazilian Ministry of Defense and Brazilian Ministry of Health

| | |
|-----------|--------------------------------|
| coef.pgam | <i>Coefficients extraction</i> |
|-----------|--------------------------------|

Description

Method for parametric coefficients extraction.

Usage

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

Arguments

| | |
|--------|---|
| object | object of class pgam holding the fitted model |
| ... | further arguments passed to method |

Details

This function only retrieves the estimated coefficients from the model object returned by pgam.

Value

Vector of coefficients estimates of the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

[pgam](#), [pgam.fit](#), [predict.pgam](#)

Examples

```
library(pgam)  
data(aihrio)  
attach(aihrio)  
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)  
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")
```

coef(m)

deviance.pgam

Deviance extraction

Description

Method for total deviance value extraction.

Usage

```
## S3 method for class 'pgam'  
deviance(object, ...)
```

Arguments

object object of class pgam holding the fitted model
... further arguments passed to method

Details

See [predict.pgam](#) for further information on deviance extraction in Poisson-Gamma models.

Value

The sum of deviance components.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

[pgam](#), [pgam.fit](#), [pgam.likelihood](#)

Examples

```

library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

deviance(m)

```

envelope.pgam

Normal plot with simulated envelope of the residuals.

Description

A normal plot with simulated envelope of the residual is produced.

Usage

```

## S3 method for class 'pgam'
envelope(object, type = "deviance", size = 0.95,
rep = 19, optim.method = NULL, epsilon = 0.001, maxit = 100,
plot = TRUE, title="Simulated Envelope of Residuals", verbose = FALSE, ...)

```

Arguments

| | |
|--------------|--|
| object | object of class pgam holding the fitted model |
| type | type of residuals to be extracted. Default is deviance. Options are described in residuals.pgam |
| size | value giving the size of the envelope. Default is .95 which is equivalent to a 95% band |
| rep | number of replications for envelope construction. Default is 19 , that is the smallest 95% band that can be build |
| optim.method | optimization method to be passed to pgam and therefore to optim |
| epsilon | convergence control to be passed to pgam |
| maxit | convergence control to be passed to pgam |
| plot | if TRUE a plot of the envelope is produced |
| title | title for the plot |
| verbose | if TRUE a sort of information is printed during the running time |
| ... | further arguments to plot function |

Details

Method for the generic function [envelope](#).

Sometimes the usual Q-Q plot shows an unsatisfactory pattern of the residuals of a model fitted and we are led to think that the model is badly specified. The normal plot with simulated envelope indicates that under the distribution of the response variable the model is OK if only a few points fall off the envelope.

If object is of class `pgam` the envelope is estimated and optionally plotted, else if is of class `envelope` then it is only plotted.

Value

An object of class `envelope` holding the information needed to plot the envelope.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Atkinson, A. C. (1985) Plots, transformations and regression : an introduction to graphical methods of diagnostic regression analysis. Oxford Science Publications, Oxford.

See Also

[pgam](#), [predict.pgam](#), [residuals.pgam](#)

f

Utility function

Description

Generate the partition of design matrix regarded to the seasonal factor in its argument. Used in the model formula.

Usage

```
f(factorvar)
```

Arguments

`factorvar` variable with the seasonal levels

Value

List containing data matrix of dummy variables, level names and seasonal periods.

Note

This function is intended to be called from within a model formula.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br>

See Also

[pgam](#), [formparser](#)

fitted.pgam

Fitted values extraction

Description

Method for fitted values extraction.

Usage

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

Arguments

| | |
|--------|---|
| object | object of class pgam holding the fitted model |
| ... | further arguments passed to method |

Details

Actually, the fitted values are worked out by the function `predict.pgam`. Thus, this method is supposed to turn fitted values extraction easier. See [predict.pgam](#) for details on one-step ahead prediction.

Value

Vector of predicted values of the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417

Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

[pgam](#), [pgam.fit](#), [predict.pgam](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

f <- fitted(m)
```

g

Utility function

Description

Collect information to smooth the term in its argument. Used in the model formula.

Usage

```
g(var, df = NULL)
```

Arguments

| | |
|-----|--|
| var | variable to be smoothed |
| df | equivalent degrees of freedom to be passed to the smoother. If NULL, smoothing parameter is selected by cross-validation |

Details

This function only sets things up for model fitting. The smooth terms are actually fitted by [bkfsmooth](#).

Value

List containing the same elements of its argument.

Note

This function is intended to be called from within a model formula.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br>

References

- Green, P. J., Silverman, B. W. (1994) Nonparametric Regression and Generalized Linear Models: a roughness penalty approach. Chapman and Hall, London
- Hastie, T. J., Tibshirani, R. J.(1990) Generalized Additive Models. Chapman and Hall, London
- Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

[pgam](#), [formparser](#)

logLik.pgam

Loglik extraction

Description

Method for loglik value extraction.

Usage

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

Arguments

object object of class pgam holding the fitted model

... further arguments passed to method

Details

See [pgam.likelihood](#) for more information on log-likelihood evaluation in Poisson-Gamma models.

Value

The maximum value achieved by the likelihood optimization process.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

- Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417
- Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.

See Also

[pgam](#), [pgam.fit](#), [pgam.likelihood](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

logLik(m)
```

periodogram

Raw Periodogram

Description

A raw periodogram is returned and optionally plotted.

Usage

```
periodogram(y, rows = trunc(length(na.omit(y))/2-1), plot = TRUE, ...)
```

Arguments

| | |
|-------------------|--|
| <code>y</code> | time series |
| <code>rows</code> | number of rows to be returned. Default and largest is $n/2 - 1$, where n is the number of valid observations of the time series y |
| <code>plot</code> | if TRUE a raw periodogram is plotted |
| <code>...</code> | further arguments to plot function |

Details

The raw periodogram is an estimator of the spectrum of a time series, it still is a good indicator of unresolved seasonality patterns in residuals of the fitted model. Check the function `intensity` for frequencies extraction.

This function plots a fancy periodogram where the intensities of the angular frequencies are plotted resembling tiny lollipops.

Value

Periodogram ordered by intensity.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

Box, G., Jenkins, G., Reinsel, G. (1994) Time Series Analysis : Forecasting and Control. 3rd edition, Prentice Hall, New Jersey.

Diggle, P. J. (1989) Time Series : A Biostatistical Introduction. Oxford University Press, Oxford.

See Also

[pgam](#)

pgam

Poisson-Gamma Additive Models

Description

Fit Poisson-Gamma Additive Models using the roughness penalty approach

Usage

```
pgam(formula, dataset, omega = 0.8, beta = 0.1, offset = 1, digits = getOption("digits"),
na.action="na.exclude", maxit = 100, eps = 1e-06, lfn.scale=1, control = list(),
optim.method = "L-BFGS-B", bkf.eps = 0.001, bkf.maxit = 100, se.estimation = "numerical",
verbose = TRUE)
```

Arguments

| | |
|-----------|--|
| formula | a model formula. See formparser for details |
| dataset | a data set in the environment search path. Missing data is temporarily not handled |
| omega | initial value for the discount factor |
| beta | vector of initial values for covariates coefficients. If a single value is supplied it is replicated to fill in the whole vector |
| offset | default is 1. Other value can be supplied here |
| digits | number of decimal places for printing information out |
| na.action | action to be taken if missing values are found. Default is "na.exclude" and residuals and predictions are padded to fit the length of the data. If "na.fail" then the process will stop if missing values are found. If "na.omit" the process will continue without padding though. If "na.pass" the process will stop due to errors |
| maxit | convergence control iterations |
| eps | convergence control criterion |
| lfn.scale | scales the likelihood function and is passed to control in optim . Value must be positive to ensure maximization |
| control | convergence control of optim . See its help for details |

| | |
|---------------|--|
| optim.method | optimization method passed to <code>optim</code> . Different methods can lead to different results, so the user must attempt to the trade off between speed and robustness. For example, BFGS is faster but sensitive to starting values and L-BFGS-B is more robust but slower. See its help for details. |
| bkf.eps | convergence control criterion for the backfitting algorithm |
| bkf.maxit | convergence control iterations for the backfitting algorithm |
| se.estimation | if <code>numerical</code> numerical standard error of parameters are returned. If <code>analytical</code> then analytical extraction of the standard errors is performed. By setting it to <code>none</code> standard error estimation is avoided |
| verbose | if <code>TRUE</code> information during estimation process is printed out |

Details

The formula is parsed by `formparser` in order to extract all the information necessary for model fit. Split the model into two parts regarding the parametric nature of the model. A model can be specified as following:

$$Y \sim f(sf_r) + V1 + V2 + V3 + g(V4, df_4) + g(V5, df_5)$$

where sf_r is a seasonal factor with period r and df_i is the degree of freedom of the smoother of the i -th covariate. Actually, two new formulae will be created:

$$sf_1 + \dots + sf_r + V1 + V2 + V3$$

and

$$V4 + V5$$

These two formulae will be used to build the necessary datasets for model estimation. *Dummy* variables reproducing the seasonal factors will be created also.

Models without explanatory variables must be specified as in the following formula

$$Y \sim NULL$$

There are a lot of details to be written. It will be very soon.

Specific information can be obtained on functions help.

This algorithm fits fully parametric Poisson-Gamma model also.

Value

List containing an object of class `pgam`.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

- Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.
- Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417
- Green, P. J., Silverman, B. W. (1994) *Nonparametric Regression and Generalized Linear Models: a roughness penalty approach*. Chapman and Hall, London

See Also

[predict.pgam](#), [formparser](#), [residuals.pgam](#), [backfitting](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

summary(m)
```

plot.pgam

Plot of estimated curves

Description

Plot of the local level and, when semiparametric model is fitted, the estimated smooth terms.

Usage

```
## S3 method for class 'pgam'
plot(x, rug = TRUE, se = TRUE, at.once = FALSE, scaled = FALSE, ...)
```

Arguments

| | |
|---------|--|
| x | object of class pgam holding the fitted model |
| rug | if TRUE a density rug is drawn on the bottom of the graphic |
| se | if TRUE error band is drawn around the fitted values |
| at.once | if TRUE each plot goes to a separate window, else the user is prompted to continue |
| scaled | if TRUE the same scale will be used for plots of smoothed functions |
| ... | further arguments passed to method |

Details

Error band of smooth terms is approximated.

Value

No value returned.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

See Also

[pgam](#), [pgam.fit](#), [pgam.likelihood](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

plot(m,at.once=TRUE)
```

predict.pgam

Prediction

Description

Prediction and forecasting of the fitted model.

Usage

```
## S3 method for class 'pgam'
predict(object, forecast = FALSE, k = 1, x = NULL, ...)
```

Arguments

| | |
|----------|--|
| object | object of class pgam holding the fitted model |
| forecast | if TRUE the function tries to forecast |
| k | steps for forecasting |
| x | covariate values for forecasting if the model has covariates. Must have the k rows and p columns |
| ... | further arguments passed to method |

Details

It estimates predicted values, their variances, deviance components, generalized Pearson statistics components, local level, smoothed prediction and forecast.

Considering a Poisson process and a gamma priori, the predictive distribution of the model is negative binomial with parameters $a_{t|t-1}$ and $b_{t|t-1}$. So, the conditional mean and variance are given by

$$E(y_t|Y_{t-1}) = a_{t|t-1}/b_{t|t-1}$$

and

$$Var(y_t|Y_{t-1}) = a_{t|t-1} (1 + b_{t|t-1}) / b_{t|t-1}^2$$

Deviance components are estimated as follow

$$D(y; \hat{\mu}) = 2 \sum_{t=\tau+1}^n a_{t|t-1} \log \left(\frac{a_{t|t-1}}{y_t b_{t|t-1}} \right) - (a_{t|t-1} + y_t) \log \frac{(y_t + a_{t|t-1})}{(1 + b_{t|t-1}) y_t}$$

Generalized Pearson statistics has the form

$$X^2 = \sum_{t=\tau+1}^n \frac{(y_t b_{t|t-1} - a_{t|t-1})^2}{a_{t|t-1} (1 + b_{t|t-1})}$$

Approximate scale parameter is given by the expression

$$\hat{\phi} = \text{frac} X^2 \text{edf}$$

where *edf* is the number o degrees of reedom of the fitted model.

Value

List with those described in **Details**

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

- Green, P. J., Silverman, B. W. (1994) Nonparametric Regression and Generalized Linear Models: a roughness penalty approach. Chapman and Hall, London
- Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. Journal of Business and Economic Statistics, 7(4):407–417
- Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSc Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.
- Harvey, A. C. (1990) Forecasting, structural time series models and the Kalman Filter. Cambridge, New York
- Hastie, T. J., Tibshirani, R. J. (1990) Generalized Additive Models. Chapman and Hall, London
- McCullagh, P., Nelder, J. A. (1989). Generalized Linear Models. Chapman and Hall, 2nd edition, London

See Also

[pgam](#), [residuals.pgam](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

p <- predict(m)$yhat
plot(ITRESP5)
lines(p)
```

print.pgam

Model output

Description

Print model information

Usage

```
## S3 method for class 'pgam'
print(x, digits, ...)
```

Arguments

| | |
|--------|--|
| x | object of class <code>summary.pgam</code> holding the fitted model information |
| digits | number of decimal places for output |
| ... | further arguments passed to method |

Details

This function only prints out the information.

Value

No value is returned.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

See Also

[pgam](#), [predict.pgam](#)

print.summary.pgam *Summary output*

Description

Print output of model information

Usage

```
## S3 method for class 'pgam'  
print.summary(x, digits, ...)
```

Arguments

| | |
|--------|--|
| x | object of class <code>summary.pgam</code> holding the fitted model information |
| digits | number of decimal places for output |
| ... | further arguments passed to method |

Details

This function actually only prints out the information.

Value

No value is returned.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

See Also

[pgam](#), [predict.pgam](#)

residuals.pgam *Residuals extraction*

Description

Method for residuals extraction.

Usage

```
## S3 method for class 'pgam'  
residuals(object, type = "deviance", ...)
```

Arguments

| | |
|--------|---|
| object | object of class pgam holding the fitted model |
| type | type of residuals to be extracted. Default is deviance. Options are described in Details |
| ... | further arguments passed to method |

Details

The types of residuals available and a brief description are the following:

response

These are raw residuals of the form $r_t = y_t - E(y_t|Y_{t-1})$.

pearson

Pearson residuals are quite known and for this model they take the form $r_t = (y_t - E(y_t|Y_{t-1})) / \text{Var}(y_t|Y_{t-1})$.

deviance

Deviance residuals are estimated by $r_t = \text{sign}(y_t - E(y_t|Y_{t-1})) * \text{sqr}t(d_t)$, where d_t is the deviance contribution of the t -th observation. See [deviance.pgam](#) for details on deviance component estimation.

std_deviance

Same as deviance, but the deviance component is divided by $(1 - h_t)$, where h_t is the t -th element of the diagonal of the pseudo hat matrix of the approximating linear model. So they turn into $r_t = \text{sign}(y_t - E(y_t|Y_{t-1})) * \text{sqr}t(d_t / (1 - h_t))$.

The element h_t has the form $h_t = \omega \exp(\eta_{t+1}) / \sum_{j=0}^{t-1} \omega^j \exp(\eta_{t-j})$, where η is the predictor of the approximating linear model.

std_scl_deviance

Just like the last one except for the dispersion parameter in its expression, so they have the form $r_t = \text{sign}(y_t - E(y_t|Y_{t-1})) * \text{sqr}t(d_t / \phi * (1 - h_t))$, where ϕ is the estimated dispersion parameter of the model. See [summary.pgam](#) for ϕ estimation.

Value

Vector of residuals of the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

- Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417
- Junger, W. L. (2004) Semiparametric Poisson-Gamma models: a roughness penalty approach. MSC Dissertation. Rio de Janeiro, PUC-Rio, Department of Electrical Engineering.
- McCullagh, P., Nelder, J. A. (1989). *Generalized Linear Models*. Chapman and Hall, 2nd edition, London
- Pierce, D. A., Schafer, D. W. (1986) Residuals in generalized linear models. *Journal of the American Statistical Association*, 81(396),977-986

See Also

[pgam](#), [pgam.fit](#), [predict.pgam](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

r <- resid(m,"pearson")
plot(r)
```

summary.pgam

Summary output

Description

Output of model information

Usage

```
## S3 method for class 'pgam'
summary(object, smo.test = FALSE, ...)
```

Arguments

| | |
|----------|---|
| object | object of class pgam holding the fitted model |
| smo.test | Approximate significance test of smoothing terms. It can take long, so default is FALSE |
| ... | further arguments passed to method |

Details

Hypothesis tests of coefficients are based on t distribution. Significance tests of smooth terms are approximate for model selection purpose only. Be very careful about the later.

Value

List containing all the information about the model fitted.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br> and Antonio Ponce de Leon <ponce@ims.uerj.br>

References

- Harvey, A. C., Fernandes, C. (1989) Time series models for count data or qualitative observations. *Journal of Business and Economic Statistics*, 7(4):407–417
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- Hastie, T. J., Tibshirani, R. J. (1990) *Generalized Additive Models*. Chapman and Hall, London
- McCullagh, P., Nelder, J. A. (1989). *Generalized Linear Models*. Chapman and Hall, 2nd edition, London
- Pierce, D. A., Schafer, D. W. (1986) Residuals in generalized linear models. *Journal of the American Statistical Association*, 81(396),977-986

See Also

[pgam](#), [predict.pgam](#)

Examples

```
library(pgam)
data(aihrio)
attach(aihrio)
form <- ITRESP5~f(WEEK)+HOLIDAYS+rain+PM+g(tmpmax,7)+g(wet,3)
m <- pgam(form,aihrio,omega=.8,beta=.01,maxit=1e2,eps=1e-4,optim.method="BFGS")

summary(m)
```

tbl2tex

LaTeX table exporter

Description

Export a data frame to a fancy LaTeX table environment.

Usage

```
tbl2tex(tbl, label = "tbl:label(must_be_changed!)",
caption = "Table generated with tbl2tex.", centered = TRUE,
alignment = "center", digits = getOption("digits"), hline = TRUE,
vline = TRUE, file = "", topleftcell = " ")
```

Arguments

| | |
|-------------|--|
| tbl | object of type data frame or matrix |
| label | label for LaTeX cross reference |
| caption | caption for LaTeX tabular environment |
| centered | logical. TRUE for centered cells |
| alignment | alignment of the object on the page |
| digits | decimal digits after decimal point |
| hline | logical. TRUE for horizontal borders |
| vline | logical. TRUE for vertical borders |
| file | filename for outputting. If none is provided, LaTeX code is routed through the console |
| topleftcell | text for the top-left cell of the table |

Details

This is a utility function intended to ease conversion of *R* objects to LaTeX format. It only exports data frame or data matrix nonetheless.

Value

LaTeX code is routed through file or console for copying and pasting.

Note

For now, it handles only numerical data.

Author(s)

Washington Leite Junger <wjunger@ims.uerj.br>

See Also

[pgam](#)

Examples

```
library(pgam)
data(aihrrio)
m <- aihrrio[1:10,4:10]
tbl2tex(m,label="tbl:r_example",caption="R example of tbl2tex",digits=4)
```

Index

* datasets

aihrio, 3

* regression

AIC.pgam, 2

coef.pgam, 5

deviance.pgam, 6

envelope.pgam, 7

f, 8

fitted.pgam, 9

g, 10

logLik.pgam, 11

periodogram, 12

pgam, 13

plot.pgam, 15

predict.pgam, 16

print.pgam, 18

print.summary.pgam, 19

residuals.pgam, 19

summary.pgam, 21

tbl2tex, 22

* smooth

AIC.pgam, 2

coef.pgam, 5

deviance.pgam, 6

envelope.pgam, 7

f, 8

fitted.pgam, 9

g, 10

logLik.pgam, 11

periodogram, 12

pgam, 13

plot.pgam, 15

predict.pgam, 16

print.pgam, 18

print.summary.pgam, 19

residuals.pgam, 19

summary.pgam, 21

tbl2tex, 22

* ts

AIC.pgam, 2

coef.pgam, 5

deviance.pgam, 6

envelope.pgam, 7

f, 8

fitted.pgam, 9

g, 10

logLik.pgam, 11

periodogram, 12

pgam, 13

plot.pgam, 15

predict.pgam, 16

print.pgam, 18

print.summary.pgam, 19

residuals.pgam, 19

summary.pgam, 21

tbl2tex, 22

AIC.pgam, 2

aihrio, 3

backfitting, 15

bkfsmooth, 10

coef.pgam, 5

deviance.pgam, 3, 6, 20

envelope, 8

envelope.pgam, 7

f, 8

fitted.pgam, 9

formparser, 9, 11, 13–15

g, 10

logLik.pgam, 3, 11

optim, 7, 13, 14

periodogram, 12

`pgam`, [3](#), [5–13](#), [13](#), [16](#), [18](#), [19](#), [21–23](#)
`pgam.fit`, [5](#), [6](#), [10](#), [12](#), [16](#), [21](#)
`pgam.likelihood`, [6](#), [11](#), [12](#), [16](#)
`plot`, [7](#), [12](#)
`plot.pgam`, [15](#)
`predict.pgam`, [5](#), [6](#), [8–10](#), [15](#), [16](#), [18](#), [19](#), [21](#),
[22](#)
`print.pgam`, [18](#)
`print.summary.pgam`, [19](#)
`residuals.pgam`, [7](#), [8](#), [15](#), [18](#), [19](#)
`summary.pgam`, [20](#), [21](#)
`tbl2tex`, [22](#)