Package 'BPmodel'

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Type Package

Title Beta-Prime Regression Model

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Description A new regression model for positive random variables with skewed and long tail.

License GPL-3

URL https://github.com/santosneto/BPmodel

BugReports https://github.com/santosneto/BPmodel/issues

Depends R (>= 3.1.2)

Imports base, extraDistr, gamlss, gamlss.dist, ggplot2, Deriv, dplyr, graphics, pracma

Suggests testthat

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BP *Reparameterized Beta Prime (BP) distribution for fitting a GAMLSS*

Description

The function BP() defines the BP distribution, a two parameter distribution, for a gamlss.family object to be used in GAMLSS fitting using using the function gamlss(), with mean equal to the parameter mu and sigma equal the precision parameter. The functions dBP, pBP, qBP and rBP define the density , distribution function, quantile function and random generation for the BP parameterization of the BP distribution.

Usage

```
BP(mu.link = "log", sigma.link = "log")

dBP(x, mu = 1, sigma = 1, log = FALSE)

pBP(q, mu = 1, sigma = 1, lower.tail = TRUE, log.p = FALSE)

rBP(n = 1, mu = 1, sigma = 1)

qBP(p, mu = 1, sigma = 1, lower.tail = TRUE, log.p = FALSE)
```

Arguments

mu.link	object for which the extraction of model residuals is meaningful.
sigma.link	type of residual to be used.
x, q	vector of quantiles.
mu	vector of scale parameter values.
sigma	vector of shape parameter values.
log	logical; if TRUE, quantiles are given as log.
lower.tail	logical; if TRUE (default), probabilities are P[X <= x], otherwise, P[X > x].
log.p	log.p logical; if TRUE, probabilities p are given as log(p).
n	number of observations. If length(n) > 1, the length is taken to be the number required.
p	vector of probabilities.

Value

returns a gamlss.family object which can be used to fit a BP distribution in the gamlss() function.

Note

For the function BP(), mu is the mean and sigma is the precision parameter of the BP distribution.

Author(s)

Manoel Santos-Neto <manoel.ferreira at professor.ufcg.edu.br>

References

Rigby, R.A., Stasinopoulos, D.M., Heller, G.Z., and De Bastiani, F. Distributions for modeling location, scale, and shape: Using GAMLSS in R, London: Chapman and Hall/CRC, 2019.

Stasinopoulos D.M., Rigby R.A., Heller G., Voudouris V., and De Bastiani F. Flexible Regression and Smoothing: Using GAMLSS in R, London: Chapman and Hall/CRC, 2017

Bourguignon, M., Santos-Neto, M. and Castro, M. A new regression model for positive random variables with skewed and long tail. *METRON*, v. 79, p. 33–55, 2021. doi: 10.1007/s40300021-00203y

Examples

```
y <- rBP(n = 100)
hist(y)
plot(function(x) dBP(x), 0.0001, 8)
gamlss::gamlss(y ~ 1, family = BP)
```

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diag.BP *Diagnostic Analysis - Local Influence*

Description

Diagnostics for the BP, GA, IG and WEI regression models

Usage

```
diag.BP(model, mu.link = "log", sigma.link = "log", scheme = "case.weight")

diag.GA(
  model,
  mu.link = "log",
  sigma.link = "identity",
  scheme = "case.weight"
)

diag.IG(
  model,
  mu.link = "log",
  sigma.link = "identity",
  scheme = "case.weight"
)

diag.WEI(
```

```
  model,
  mu.link = "log",
  sigma.link = "identity",
  scheme = "case.weight"
)

res_pearson(model)
```

Arguments

model	Object of class gamlss holding the fitted model.
mu.link	Defines the mu.link, with "identity" link as the default for the mu parameter.
sigma.link	Defines the sigma.link, with "identity" link as the default for the sigma parameter.
scheme	Default is "case.weight". But, can be "response".

Value

Local influence measures.

Author(s)

Manoel Santos-Neto <manoel.ferreira at professor.ufcg.edu.br>

References

Bourguignon, M., Santos-Neto, M. and Castro, M. A new regression model for positive random variables with skewed and long tail. *METRON*, v. 79, p. 33–55, 2021. doi: 10.1007/s40300021-00203y

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envelope *Envelopes*

Description

Computes simulation envelopes.

Usage

```
envelope(
  model,
  k = 100,
  color = "grey50",
  xlabel = "Theorical Quantile",
  ylabel = "Empirical Quantile",
  font = "serif"
)
```

Arguments

model	object of class gamlss.
k	number of replications for envelope construction. Default is 19.
color	a specification for the default envelope color.
xlabel	a label for the x axis.
ylabel	a label for the y axis.
font	the name of a font family for x and y axis.

Value

A simulated envelope.

Author(s)

Manoel Santos-Neto <manoel.ferreira at professor.ufcg.edu.br>

References

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

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Santos-Neto, M., Cysneiros, F.J.A., Leiva, V., Barros, M. Reparameterized Birnbaum-Saunders regression models with varying precision. *Electronic Journal of Statistics*, v. 10, p. 2825–2855, 2016. doi: 10.1214/16EJS1187.

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test *Precision test*

Description

Tests the null hypothesis of precision fixed in RBS models against the alternative of precision variable.

Usage

```
grad_test_bp(modelh0,modelh1)

grad_test_ga(modelh0, modelh1)

grad_test_ig(modelh0, modelh1)
```

```
grad_test_wei(modelh0, modelh1)

dRBS(x, mu = 1, sigma = 1, log = FALSE)

score_test_bp(modelh0, modelh1)

score_test_rbs(modelh0, modelh1)

score_test_ga(modelh0, modelh1)

score_test_ig(modelh0, modelh1)

score_test_wei(modelh0, modelh1)

wald_test(modelh1)
```

Arguments

`modelh0`	model under null hypothesis.
`modelh1`	model under alternative hypothesis.
`x`	vector of quantiles.
`mu, sigma`	the (positive) location and precision parameter.
`log`	logical; The logarithm of the density is returned if the value is TRUE.

Value

A list with class "htest" containing the following components:

`statistic` the value of the test statistic.

`parameter` the degrees of freedom for the test statistic.

`p.value` the p-value for the test.

`method` a character string indicating what type of likelihood ratio test was performed.

`data.name` a character string giving the name(s) of the data

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