Package 'gPdtest'

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Type Package

Title Bootstrap goodness-of-fit test for the generalized Pareto distribution

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Description This package computes the bootstrap goodness-of-fit test for the generalized Pareto distribution by Villasenor-Alva and Gonzalez-Estrada (2009). The null hypothesis includes heavy and non-heavy tailed gPd's. A function for fitting the gPd to data using the parameter estimation methods proposed in the same article is also provided.

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gpd.fit *Fitting the generalized Pareto distribution to data*

Description

This function fits a generalized Pareto distribution (gPd) to a data set using either the asymptotic maximum likelihood method (amle) or the combined method proposed by Villasenor-Alva and Gonzalez-Estrada (2009).

Usage

```
gpd.fit(x,method)
```

Arguments

x	numeric data vector containing a random sample from a distribution function with support on the positive real numbers.
method	a character string giving the name of the parameter estimation method to be used. There are two available methods: "combined" and "amle". Use "combined" for fitting a gPd with shape parameter <0. Use "amle" for fitting a gPd with shape parameter >= 0.

Details

The distribution function of the gPd is given in the details section of the function gpd.test.

Value

The parameter estimates.

Author(s)

Elizabeth Gonzalez Estrada, Jose A. Villasenor Alva

References

Villasenor-Alva, J.A. and Gonzalez-Estrada, E. (2009). A bootstrap goodness of fit test for the generalized Pareto distribution. *Computational Statistics and Data Analysis*,**53**,11,3835-3841.

See Also

gpd.test for testing the gPd hypothesis, rgp for generating gPd random numbers.

Examples

```
x <-  rgp(20,shape = 1)    ## Random sample of size 20
gpd.fit(x,"amle")           ## Fitting a gPd to  x  using the "amle" method
```

gpd.test *Bootstrap goodness-of-fit test for the generalized Pareto distribution*

Description

This function computes the bootstrap goodness-of-fit test by Villasenor-Alva and Gonzalez-Estrada (2009) for testing the null hypothesis H_0 : a random sample has a generalized Pareto distribution (gPd) with unknown shape parameter γ, which is a real number.

Usage

```
gpd.test(x,J)
```

Arguments

x	numeric data vector containing a random sample from a distribution function with support on the positive real numbers.
J	number of bootstrap samples. This is an optional argument. Default J=999.

Details

The bootstrap goodness-of-fit test for the gPd is an intersection-union test for the hypotheses H_0^- : a random sample has a gPd with $\gamma < 0$, and H_0^+ : a random sample has a gPd with $\gamma >= 0$. Thus, heavy and non-heavy tailed gPd's are included in the null hypothesis. The parametric bootstrap is performed on γ for each of the two hypotheses.

We consider the distribution function of the gPd with shape and scale parameters γ and σ given by

$$F(x) = 1 - \left[1 + \frac{\gamma x}{\sigma}\right]^{-1/\gamma}$$

where γ is a real number, $\sigma > 0$ and $1 + \gamma x/\sigma > 0$. When $\gamma = 0$, we have the exponential distribution with scale parameter σ:

$$F(x) = 1 - exp\,(-x/\sigma)$$

Value

A list with the following components.

boot.test	a list with class "htest" containing the p-value of the test, the name of the data set, and the character string "Bootstrap goodness-of-fit test for the generalized Pareto distribution".
p.values	the p-values of the tests of the hypotheses H_0^- and H_0^+ described above.

Author(s)

Elizabeth Gonzalez Estrada <egonzalez@colpos.mx>, Jose A. Villasenor Alva

References

Villasenor-Alva, J.A. and Gonzalez-Estrada, E. (2009). A bootstrap goodness of fit test for the generalized Pareto distribution. *Computational Statistics and Data Analysis*,**53**,11,3835-3841.

See Also

`gpd.fit` for fitting a gPd to data, `rgp` for generating gPd random numbers.

Examples

```
x <-  rgp(20,shape = 1)    ## Random sample of size 20
gpd.test(x)                 ## Testing the gPd hypothesis on x
```

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rgp *Generalized Pareto random numbers*

Description

This function generates pseudo random numbers from a generalized Pareto distribution (gPd).

Usage

```
rgp(n,shape,scale)
```

Arguments

n	sample size.
shape	shape parameter.
scale	scale parameter. Default scale=1.

Details

The distribution function of the gPd with shape and scale parameters γ and σ is

$$F(x) = 1 - \left[1 + \frac{\gamma x}{\sigma}\right]^{-1/\gamma}$$

where γ is a real number, $\sigma > 0$ and $1 + \gamma x/\sigma > 0$. When $\gamma = 0$, we have the exponential distribution with scale parameter σ.

Value

A vector of length n.

Author(s)

Elizabeth Gonzalez Estrada, Jose A. Villasenor Alva

See Also

gpd.test for testing the gPd hypothesis

Examples

```
rgp(30,shape=1.5)    ## Generates 30 random numbers from a gPd with shape parameter 1.5.
```

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