

# Package ‘ercv’

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**Type** Package

**Title** Fitting Tails by the Empirical Residual Coefficient of Variation

**Version** 1.0.1

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**Description** Provides a methodology simple and trustworthy for the analysis of extreme values and multiple threshold tests for a generalized Pareto distribution, together with an automatic threshold selection algorithm. See del Castillo, J, Daoudi, J and Lockhart, R (2014) <[doi:10.1111/sjos.12037](https://doi.org/10.1111/sjos.12037)>.

**Depends** R (>= 3.5.0)

**Suggests** powerLaw, evir

**License** GPL (>= 2)

**NeedsCompilation** no

**LazyData** true

**Repository** CRAN

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## Contents

ercv-package	2
BIFP	3
bilbao	3
ccdfplot	4
cievi	5
cvevi	6
cvplot	7
EURUSD	8
evicv	9
FFT	10

fitpot . . . . .	10
iFFT . . . . .	11
MA . . . . .	12
ppot . . . . .	13
qpot . . . . .	14
tdata . . . . .	15
thrselect . . . . .	16
Tm . . . . .	17

<b>Index</b>	<b>19</b>
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ercv-package	<i>Empirical residual coefficient of variation</i>
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## Description

Fitting tails by the empirical residual coefficient of variation.

## Details

Package:	ercv
Type:	Package
Version:	1.0.1
Date:	2019-09-19
License:	GPL version 2 or newer
LazyLoad:	yes

The package provides a methodology simple and trustworthy for the analysis of extreme values. The package contains functions for visualizing, fitting and validating the distribution of tails. Moreover, it also provides multiple threshold tests for a generalized Pareto distribution, together with an automatic threshold selection algorithm.

## Author(s)

Joan del Castillo (Universitat Autònoma de Barcelona), David Moríña Soler (Catalan Institute of Oncology (ICO)-IDIBELL) and Isabel Serra (Centre de Recerca Matemàtica)

## References

- del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.
- del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.
- del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

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BIFP

*EEMBC AutoBench suite (Benchmark 3)*

---

**Description**

This data corresponds to 1000 observations sampled from the third benchmark of the well-known suite for real-time systems EEMBC AutoBench suite (Poovey, 2007), including a number of programs used in automotive embedded systems. It corresponds to the basic integer and floating point (BIFP) algorithm.

**Usage**

BIFP

**Format**

A numeric vector.

**References**

Abella J., Padilla, M., del Castillo, J. & Cazorla, F. (2017). Measurement-Based Worst-Case Execution Time Estimation Using the Coefficient of Variation". *ACM Transactions on Design Automation of Electronic Systems (TODAES)*, **22**(4).

Poovey, J. (2007). Characterization of the EEMBC Benchmark Suite. North Carolina State University.

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bilbao

*Bilbao waves data set*

---

**Description**

This data corresponds to the Bilbao waves data set, firstly analysed by Castillo and Hadi (1997) and in del Castillo and Serra (2015) from the MLE point of view.

**Usage**

bilbao

**Format**

A numeric vector.

## References

Castillo, E. and Hadi, A. S. (1997). Fitting the Generalized Pareto Distribution to Data. *Journal of the American Statistical Association*, **92**, 1609-1620. del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

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ccdfplot	<i>Plot of complementary empirical distribution function and the complementary distribution function</i>
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## Description

Plot of complementary empirical distribution function of a sample and the complementary distribution function from peaks-over-threshold model.

## Usage

```
ccdfplot(data, pars=NA, log="y", from=NA, ci=FALSE, main="Complementary cdf",
xlab="data", ylab="ccdf", ...)
```

## Arguments

data	a numeric vector.
pars	a list with the set of parameters of peaks-over-threshold model.
log	a character string which contains x if the x axis is to be logarithmic, y if the y axis is to be logarithmic and xy or yx if both axes are to be logarithmic.
from	the origen of x-axis in the plot.
ci	should confidence bands be plotted. Defaults to FALSE.
main	an overall title for the plot.
xlab	horizontal axis label. Defaults to data.
ylab	vertical axis label. Defaults to ccdf.
...	usual graphic parameters.

## Value

Plot of complementary empirical distribution function and the complementary distribution function.

## Author(s)

Joan del Castillo, David Moriña Soler and Isabel Serra

## References

- del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.
- del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.
- del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

## See Also

[ercv-package](#), [cievi](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

## Examples

```
data(iFFT)
ccdfplot(iFFT)
```

---

cievi

*Confidence interval for extreme value index*

---

## Description

Confidence interval for extreme value index estimation by  $T_m$  method.

## Usage

```
cievi(nextremes, evi=0, conf.level=0.90, m=10, nsim=100)
```

## Arguments

<code>nextremes</code>	the number of upper extremes to be used.
<code>evi</code>	extreme value index. In particular, the shape parameter of a generalized Pareto distribution.
<code>conf.level</code>	confidence level of the interval.
<code>m</code>	number of thresholds to do multiplicial test.
<code>nsim</code>	number of simulation.

## Value

A numerical vector with two elements, containing the limits of the interval.

## Author(s)

Joan del Castillo, David Moriña Soler and Isabel Serra

## References

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. SORT Statist. Oper. Res. Trans. **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. Computational Statistics and Data Analysis, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. Scandinavian Journal of Statistics, **41**, 382-393.

## See Also

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

## Examples

```
cvevi(70, evi=0)
```

---

cvevi

*Coefficient of variation for a given extreme value index*

---

## Description

The coefficient of variation for a given extreme value index in the generalized Pareto distribution.

## Usage

```
cvevi(evi)
```

## Arguments

`evi` extreme value index. In particular, the shape parameter of a generalized Pareto distribution. It has to satisfy  $evi < 1/2$ .

## Value

A numerical value containing the coefficient of variation for the given extreme value index.

## Author(s)

Joan del Castillo, David Moriña Soler and Isabel Serra

## References

- del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.
- del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.
- del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

## See Also

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

## Examples

```
cvevi(-1)
```

---

cvplot

*Exploratory empirical residual coefficient of variation*

---

## Description

Exploratory empirical residual coefficient of variation for extreme value analysis.

## Usage

```
cvplot(data, threshold = NA, nextremes = NA, omit=4, evi=0, main="CVplot",
        conf.level=0.90, xlab="Excluded sample size",
        ylab="Coefficient of variation", col="blue", ...)
```

## Arguments

<code>data</code>	a numeric vector.
<code>threshold</code>	a threshold value (either this or <code>nextremes</code> must be given but not both).
<code>nextremes</code>	the number of upper extremes to be used (either this or <code>threshold</code> must be given but not both).
<code>omit</code>	the minimum required number of upper extremes for computing residual statistics.
<code>evi</code>	extreme value index. In particular, the shape parameter of a generalized Pareto distribution.
<code>main</code>	an overall title for the plot.
<code>conf.level</code>	confidence level of the interval (defaults to 0.90).
<code>xlab</code>	horizontal axis label. Defaults to Excluded sample size.
<code>ylab</code>	vertical axis label. Defaults to Coefficient of variation.
<code>col</code>	plot color. Defaults to blue.
<code>...</code>	Usual graphic parameters.

**Value**

Plot of the empirical residual CV and confidence intervals.

**Author(s)**

Joan del Castillo, David Morriña Soler and Isabel Serra

**References**

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

**Examples**

```
data("moby", package = "powerLaw")
cvplot(moby, main="MobyDick")

data(iFFT)
cvplot(iFFT, threshold=median(iFFT), main="iFFT")
```

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EURUSD

*Euro/Dollar daily exchange rates*

---

**Description**

This data corresponds to the euro/dollar daily exchange rates between 1999 and 2016, including the financial crisis of 2007-2008, which has been generated from the package *quantmod* (Ryan, 2016).

**Usage**

```
EURUSD
```

**Format**

A data frame with 6575 rows and 1 column.

**References**

Ryan, J. A. (2016). *quantmod: Quantitative Financial Modelling Framework*. R package version 0.4-7. <https://CRAN.R-project.org/package=quantmod>

---

`evicv`*Extreme value index*

---

**Description**

The extreme value index for a given coefficient of variation in the generalized Pareto distribution.

**Usage**

```
evicv(cv)
```

**Arguments**

`cv` coefficient of variation. It has to satisfy  $cv > 0$ .

**Value**

The extreme value index for a given coefficient of variation in the generalized Pareto distribution as a numerical value.

**Author(s)**

Joan del Castillo, David Morriña Soler and Isabel Serra

**References**

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

**Examples**

```
evicv(2)
```

---

FFT	<i>EEMBC AutoBench suite (Benchmark 2)</i>
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**Description**

This data corresponds to 1000 observations sampled from the second benchmark of the well-known suite for real-time systems EEMBC AutoBench suite (Poovey, 2007), including a number of programs used in automotive embedded systems. It corresponds to the fast fourier transform (FFT) algorithm.

**Usage**

FFT

**Format**

A numeric vector.

**References**

Abella J., Padilla, M.,del Castillo, J. & Cazorla, F. (2017). Measurement-Based Worst-Case Execution Time Estimation Using the Coefficient of Variation". *ACM Transactions on Design Automation of Electronic Systems (TODAES)*, **22**(4).

Poovey, J. (2007). Characterization of the EEMBC Benchmark Suite. North Carolina State University.

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fitpot	<i>Fits peaks-over-threshold model of a sample</i>
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**Description**

Fits peaks-over-threshold model of a sample.

**Usage**

```
fitpot(data, threshold=NA, nextremes=NA, evi=NA)
```

**Arguments**

data	a numeric vector.
threshold	a threshold value (either this or nextremes must be given but not both).
nextremes	the number of upper extremes to be used (either this or threshold must be given but not both).
evi	extreme value index. In particular, the shape parameter of a generalized Pareto distribution.

**Value**

A data.frame with the following columns:

- `evi` extreme value index. In particular, the shape parameter of a generalized Pareto distribution.
- `psi` the scale parameter of a generalized Pareto distribution.
- `threshold` a threshold value where peaks-over-threshold is applied.
- `prob` proportion of size of data corresponding to the upper extremes modelled with generalized Pareto distribution.

**Author(s)**

Joan del Castillo, David Morriña Soler and Isabel Serra

**References**

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

**Examples**

```
data("nidd.thresh", package = "evir")
fitpot(nidd.thresh)
```

---

iFFT

*EEMBC AutoBench suite (Benchmark 1)*

---

**Description**

This data corresponds to 1000 observations sampled from the first benchmark of the well-known suite for real-time systems EEMBC AutoBench suite (Poovey, 2007), including a number of programs used in automotive embedded systems. It corresponds to the inverse fast fourier transform (iFFT) algorithm.

**Usage**

```
iFFT
```

**Format**

A numeric vector.

**References**

Abella J., Padilla, M.,del Castillo, J. & Cazorla, F. (2017). Measurement-Based Worst-Case Execution Time Estimation Using the Coefficient of Variation". *ACM Transactions on Design Automation of Electronic Systems (TODAES)*, **22**(4).

Poovey, J. (2007). Characterization of the EEMBC Benchmark Suite. North Carolina State University.

---

MA

*EEMBC AutoBench suite (Benchmark 4)*

---

**Description**

This data corresponds to 1000 observations sampled from the fourth benchmark of the well-known suite for real-time systems EEMBC AutoBench suite (Poovey, 2007), including a number of programs used in automotive embedded systems. It corresponds to the matrix arithmetic (MA) algorithm.

**Usage**

MA

**Format**

A numeric vector.

**References**

Abella J., Padilla, M.,del Castillo, J. & Cazorla, F. (2017). Measurement-Based Worst-Case Execution Time Estimation Using the Coefficient of Variation". *ACM Transactions on Design Automation of Electronic Systems (TODAES)*, **22**(4).

Poovey, J. (2007). Characterization of the EEMBC Benchmark Suite. North Carolina State University.

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ppot *Cumulative distribution function*

---

### Description

Cumulative distribution function from the peaks-over-threshold model.

### Usage

```
ppot(q, pars, lower.tail=TRUE, log.p=FALSE)
```

### Arguments

q	vector of quantiles.
pars	a numeric vector with the set of parameters of peaks-over-threshold model. The names of the elements have to be <code>evi</code> , <code>psi</code> , <code>threshold</code> , <code>prob</code> .
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$ otherwise, $P[X > x]$ .
log.p	logical; if TRUE probabilities are given as $\log(p)$ .

### Value

Cumulated probability function as a numerical value.

### Author(s)

Joan del Castillo, David Morfiña Soler and Isabel Serra

### References

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

### See Also

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [qpot](#), [tdata](#), [thrselect](#), [Tm](#)

### Examples

```
ppot(1.9, c(evi=0.1, psi=0.2, threshold=0.3, prob=0.4), lower.tail=FALSE)

x<-runif(10000)
x<-c(x^-1,x)
pars<-fitpot(x,1)
ppot(10,pars$coeff,lower.tail=FALSE) #the true value is 0.5/10
```

---

qpot *Quantile function*

---

**Description**

Quantile function from the peaks-over-threshold model.

**Usage**

```
qpot(p, pars, lower.tail=TRUE, log.p=FALSE)
```

**Arguments**

p	vector of probabilities.
pars	a numeric vector with the set of parameters of peaks-over-threshold model. The names of the elements have to be <code>evi</code> , <code>psi</code> , <code>threshold</code> , <code>prob</code> .
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$ otherwise, $P[X > x]$ .
log.p	logical; if TRUE probabilities are given as $\log(p)$ .

**Value**

Quantile function as a numerical value.

**Author(s)**

Joan del Castillo, David Morfiña Soler and Isabel Serra

**References**

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [tdata](#), [thrselect](#), [Tm](#)

**Examples**

```
qpot(0.1, c(evi=0.1, psi=0.2, threshold=0.3, prob=0.4), lower.tail=FALSE)

x<-runif(10000)
x<-c(x^-1,x)
pars<-fitpot(x,1)
qpot(0.5/10,pars$coeff,lower.tail=FALSE) #the true value is 10
```

---

tdata	<i>Transforms a heavy-tailed sampled to non-heavy tailed</i>
-------	--

---

**Description**

Transformation of a sample with assumption of heavy-tail to a sample with non-heavy tail.

**Usage**

```
tdata(data, threshold = NA, nextremes = NA, sigma=NA)
```

**Arguments**

data	a numeric vector.
threshold	a threshold value (either this or nextremes must be given but not both).
nextremes	the number of upper extremes to be used (either this or threshold must be given but not both).
sigma	the scale parameter divided by shape parameter in generalized Pareto distribution.

**Value**

The transformed data as a numerical vector.

**Author(s)**

Joan del Castillo, David Morriña Soler and Isabel Serra

**References**

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [thrselect](#), [Tm](#)

**Examples**

```
data("danish", package = "evir")
tdata(danish)
```

---

thrselect	<i>Threshold selection algorithm</i>
-----------	--------------------------------------

---

### Description

Threshold selection algorithm.

### Usage

```
thrselect(data, threshold=NA, nextremes=NA, omit=16, evi=NA, m=10, nsim=100,
          conf.level=0.90, oprint=TRUE)
```

### Arguments

<code>data</code>	a numeric vector.
<code>threshold</code>	a threshold value (either this or <code>nextremes</code> must be given but not both).
<code>nextremes</code>	the number of upper extremes to be used (either this or <code>threshold</code> must be given but not both).
<code>omit</code>	the minimum required number of upper extremes for computing residual statistics.
<code>evi</code>	extreme value index. In particular, the shape parameter of a generalized Pareto distribution.
<code>m</code>	number of thresholds to do multiplicial test.
<code>nsim</code>	number of simulations.
<code>conf.level</code>	confidence level of the interval.
<code>oprint</code>	logical. If TRUE (default), the single solution is printed. In any case, the full solution is the output of the function.

### Value

A list including two `data.frame` (solution and options). Each of the `data.frame` contains the following columns:

- `m` number of thresholds for testing tail index.
- `nextremes` number of thresholds for testing tail index.
- `threshold` the threshold value
- `rcv` residual coefficient of variation for selected threshold.
- `cvopt` optimal coefficient of variation for the tail.
- `evi` the corresponding tail index for optimal coefficient of variation if `evi` parameter is NA.
- `tms` the statistic of the tail index test.
- `pvalue` p-value associated to `tms`.

**Author(s)**

Joan del Castillo, David Morriña Soler and Isabel Serra

**References**

del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.

del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.

del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [Tm](#)

**Examples**

```
data("nidd.thresh", package = "evir")
thrselect(nidd.thresh, nsim=500)
```

---

Tm

---

*Multiple threshold test for a GPD*


---

**Description**

Multiple threshold test for a GPD.

**Usage**

```
Tm(data, threshold = NA, nextremes = NA, omit = 16, evi = NA, m = 10, nsim = 100)
```

**Arguments**

<code>data</code>	a numeric vector.
<code>threshold</code>	a threshold value (either this or <code>nextremes</code> must be given but not both).
<code>nextremes</code>	the number of upper extremes to be used (either this or <code>threshold</code> must be given but not both).
<code>omit</code>	the minimum required number of upper extremes for computing residual statistics.
<code>evi</code>	extreme value index. In particular, the shape parameter of a generalized Pareto distribution.
<code>m</code>	number of thresholds to do multiplical test.
<code>nsim</code>	number of simulations.

**Value**

A data.frame containing the following columns:

- nextremes the number of upper extremes to be used.
- cvopt optimal coefficient of variation for the tail.
- evi the corresponding tail index for optimal coefficient of variation if evi parameter is NA.
- tms the statistic of the tail index test.
- pvalue p-value associated to tms.

**Author(s)**

Joan del Castillo, David Morriña Soler and Isabel Serra

**References**

- del Castillo, J. and Padilla, M. (2016). Modeling extreme values by the residual coefficient of variation. *SORT Statist. Oper. Res. Trans.* **40**(2), 303-320.
- del Castillo, J. and Serra, I. (2015). Likelihood inference for Generalized Pareto Distribution. *Computational Statistics and Data Analysis*, **83**, 116-128.
- del Castillo, J., Daoudi, J. and Lockhart, R. (2014). Methods to Distinguish Between Polynomial and Exponential Tails. *Scandinavian Journal of Statistics*, **41**, 382-393.

**See Also**

[ercv-package](#), [cievi](#), [ccdfplot](#), [cvevi](#), [cvplot](#), [evicv](#), [fitpot](#), [ppot](#), [qpot](#), [tdata](#), [thrselect](#)

**Examples**

```
data("nidd.thresh", package = "evir")
Tm(nidd.thresh, evi=0, nextremes = 75)
```

# Index

## \* datasets

BIFP, 3  
bilbao, 3  
EURUSD, 8  
FFT, 10  
iFFT, 11  
MA, 12

## \* ercv

ccdfplot, 4  
cievi, 5  
cvevi, 6  
cvplot, 7  
ercv-package, 2  
evicv, 9  
fitpot, 10  
ppot, 13  
qpot, 14  
tdata, 15  
thrselect, 16  
Tm, 17

BIFP, 3

bilbao, 3

ccdfplot, 3, 4, 6–9, 11, 13–15, 17, 18

cievi, 3, 5, 5, 6–9, 11, 13–15, 17, 18

cvevi, 3, 5, 6, 6, 7–9, 11, 13–15, 17, 18

cvplot, 3, 5–7, 7, 9, 11, 13–15, 17, 18

ercv (ercv-package), 2

ercv-package, 2

EURUSD, 8

evicv, 3, 5–8, 9, 11, 13–15, 17, 18

FFT, 10

fitpot, 3, 5–9, 10, 13–15, 17, 18

iFFT, 11

MA, 12

ppot, 3, 5–9, 11, 13, 14, 15, 17, 18

qpot, 3, 5–9, 11, 13, 14, 15, 17, 18

tdata, 3, 5–9, 11, 13, 14, 15, 17, 18

thrselect, 3, 5–9, 11, 13–15, 16, 18

Tm, 3, 5–9, 11, 13–15, 17, 17