Package ‘extremeIndex’

February 20, 2020

Title  Forecast Verification for Extreme Events
Version  0.0.2
Description  An index measuring the amount of information brought by forecasts for extreme events, subject to calibration, is computed. This index is originally designed for weather or climate forecasts, but it may be used in other forecasting contexts. This is the implementation of the index in Taillardat et al. (2019) <arXiv:1905.04022>.
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choosethres  

*Function for heuristically choosing the domain where extreme value theory can be applied*

**Description**

Function for heuristically choosing the domain where extreme value theory can be applied

**Usage**

```r
choosethres(data, thresh, guess = c(1, 0.1), plots = 1:3, R = 200, ncpus = 1)
```

**Arguments**

- `data`: a numeric vector containing the observation used for verification
- `thresh`: vector of thresholds to try
- `guess`: starting values for GPD's sigma and xi (0<xi<1)
- `plots`: which parameter plots do you want
- `R`: number of bootstrap estimates for confidence intervals
- `ncpus`: if you want to make bootstrap on several cores

**Value**

- three plots summarizing the stability of the parameters to threshold. The starting threshold admits kappa=1 and its confidence interval; according Papastathopoulos & Tawn (2013)
- a list with thresholds used, GP parameters and CIs, p-values of Cramer von Mises test (accordance of thresholded data with GP), optimal threshold and xi.

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crps  

*Observations of 6-h rainfall amount with CRPS values of 3 calibrated ensemble forecasts for one lead time across France.*

**Description**

Observations of 6-h rainfall amount with CRPS values of 3 calibrated ensemble forecasts for one lead time across France.

**Usage**

```r
crps
```
Format

A matrix with 112221 rows and 4 variables:

- **obs_rr6** observations, in mm/6h
- **crps_forecastX** CRPS values of the forecaster X, in mm/6h ...

Source

Maxime Taillardat

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**index.plot**

*Function which plots the index for different forecasts sharing the same observations*

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Description

Function which plots the index for different forecasts sharing the same observations

Usage

```r
index.plot(forecasts, col = NULL, leg = NULL, ...)
```

Arguments

- **forecasts** list of "indexfore" objects, all forecasts must be computed on the same climatology
- **col** colors of the different forecasts for the plot
- **leg** legend of the plot
- **...** other arguments for the plot

Value

A plot of the indices and a matrix containing the indexes for each threshold

Examples

```r
data("crps")
y=crps[1:500,1]
cli=indexclim(y,thresh=seq(3,quantile(y,probs=0.995),length=2),xi=0.2)
fr=crps[1:500,2]
idf=indexfore(fr,cli)
fr=crps[1:500,3]
idf2=indexfore(fr,cli)
fore=list(idf,idf2)
idxp2=index.plot(fore,col=c("red","blue"),leg=c("forecast 1","forecast 2"),main="Index plot")
```
Function which computes the index for the climatological CRPS/MAE. You must provide the observations. If you compute climatological CRPS/MAE previously, you can add the corresponding vector

**Usage**

indexclim(y, thresh = NULL, score_clim = NULL, xi = NULL, score = "crps", estim_xi = FALSE)

**Arguments**

- **y**: The observations
- **thresh**: Vector of thresholds where you want to compute the index
- **score_clim**: If not NULL, must be the time serie of the CRPS/MAE of the climatology. It is recommended to compute CRPS/MAE out of this function
- **xi**: Shape parameter of the GP
- **score**: A character string indicating if you want to work with CRPS ("crps") or MAE ("mae"), by default "crps"
- **estim_xi**: If you want xi estimated for each threshold (for numerical reasons for instance)

**Value**

An indexclim object containing xi, y, the score time serie, the score considered, the index values, and the corresponding quantiles of the observations

Function for computing the index for a forecast system vs. climatological forecast. You must provide an indexclim object.

**Usage**

indexfore(score_fore, clim)
indexfore

**Arguments**

- `score_fore` the time serie of the ensemble forecast’s CRPS/MAE. Be careful that `score_fore` is consistent with "score" in `indexclim`
- `clim` an `indexclim` object coming from `indexclim`

**Value**

an `indexfore` object with the index computed vs. climatological forecast
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