

Practising with extremes

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First LARS-IASC School on Computational Statistics and Data Science
Federal University of Bahia, Salvador, Brazil
November 16th, 2018



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of Glasgow

Univariate block maxima

The dataset `ftcanmax` in the `extRemes` package includes the annual maximum precipitation (inches) for one rain gauge in Fort Collins, Colorado from 1900 through 1999.

Fit a GEV distribution to this data using the `extRemes` package (recall the function `fevd`) and interpret the result. Also produce diagnostic plots and interpret the return levels.

Univariate peaks over threshold

The dataset `euroex` in the `ismev` package includes the daily exchange rates between the Euro and UK sterling.

Fit a GPD to the exceedances over a high threshold to the daily negative log-returns (recall the function `diff` to compute returns). Produce diagnostics to guide the choice of the threshold and interpret the results of the fitting given a threshold you consider good.

Bivariate annual maxima

The `wind` data in the `ismev` package has 40 rows and 3 columns. The second and third columns contain annual maximum wind speeds at Albany, New York and Hartford, Connecticut respectively, over the period 1944 to 1983. The first column gives the corresponding years.

Fit a bivariate GEV distribution using different models (recall the function `fbvevd`) and various extreme value copulae (using the function `fitCopula`). Produce measures of model choice and plot both the empirical and estimated Pickands dependence function.

Bivariate exceedances

The `exchange` data frame in the `ismev` package has 975 rows and 2 columns. The columns contain daily exchange rates; UK sterling against the US dollar (first column) and UK sterling against the Canadian dollar (second column). The rownames contain the corresponding dates in a character string with the format "2000/05/26".

- Fit a bivariate GPD to the exceedances over a given threshold (using `fbvspot`) using the censored approach and various models: produce model choice measures and diagnostic plots.
- Fit the non-parametric estimate of the angular density (using `angdensity`) and interpret the result.
- Assess the level of extreme dependence by creating chiplots and barchiplots.

Non-stationary dependence

Consider again the the canopy cover vs. open field dataset available in the file `canopy_dependence.csv`.

Use to code given to implement the SERR and AoAS estimators to explore the extreme dependence surface for the included covariates.