pwmdist

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Introdcution:

pwmdist is a library dedicated to provide all the essential statistics, Risk measure, plots and simulated values related to many distributions.

CHAPTER 2

pwmdist

2.1 pwmdist package

2.1.1 gpdpwmFit module

The 'gpdpwmFit' module facilitates fitting a timeseries data with Generalized pareto distribution using probability weighted moments estimation method for parameter estimates. It also provide key distribution statistics, Risk measures and GPD simulated values.

pwmdist.gpdpwmFit.**Fitbygpdpwm**(*data*, *ci=0.95*, *threshold=None*)

1) Description: The function fits Generalized pareto distiribution to the passed dataset; a timeseries object using probability weighted moments method.

2) **Input Parameters:** data: timeseries dataframe. ci: confidence interval threshold: A float, A threshold number obtained from Peak over threshold method If the threshold value is passed than the manual threshold value is used else the quantile at a given confidence interval is used to calculate the threshold.

3) **Results:** The function returns a dicitionary, which has data, list of residuals, probability, shape parameter, scale parameter, list of exceedances (case where data[i]>threshold), threshold value, excess(case in exceedances subtracted from threshold.) This result dictionary can be used in the plot functions

4) **Example:** the example of the "data" parameter is as follows: Date log(return) 25-12-2020 0.11098978 26-12-2020 0.14787224

pwmdist.gpdpwmFit.**depd**(*x*, *location=0*, *scale=1*, *shape=0*, *log=False*)

1) **Description:** Density for the Generalized Pareto distribution function

2) **Input parameters:** scale, location, shape: parameters of GPD x is the data element obtained from Fitbygpdpwm function log= by default False

3) **Example:** fit=Fitbygpdpwm(dataframe, ci=0.95, threshold=None) depd(fit['data'], location, scale=fit['scale'],shape= fit['shape'], log=False)

pwmdist.gpdpwmFit.**gpdMoments**(*shape=1*, *location=0*, *scale=1*)

1) Description: Compute true statistics for Generalized Pareto distribution

2) **Input parameter:** shape, location, scale parameters from generalized pareto distribution

3) Value:

Returns true mean of Generalized Pareto distribution for xi < 1 else NaN Returns true variance of Generalized Pareto distribution for xi < 1 else NaN

pwmdist.gpdpwmFit.**gpdSimulation**(*shape=0.25*, *location=0*, *scale=1*, *n=1000*, *seed=None*)

1) Description: Generates random variates from a GPD distribution

2) **Input parameters:** shape, location, scale = the parameter estimates that can be either manually input or taken from Fitbygpdpwm function n = number of simulated observations seed = by default None

3) **Result:** list of simulate values from generalized pareto distribution

pwmdist.gpdpwmFit.**gpdpwmFitCheck**(*data*, *ci=0.95*, *threshold=None*)

1) **Description:** Checks the Fit of GPD with probability weighted moments

2) **Input Parameters:** data= timeseries dataframe

ci= confidence interval

threhsold=A float, A threshold number obtained from Peak over threshold method If the threshold value is passed than the manual threshold value is used else the quantile at a given confidence interval is used to calculate the threshold.

3) **Results:** A dictionary of parameter estimates, threshold and excess.

pwmdist.gpdpwmFit.**pgpd**(*q*, *location=0*, *scale=1*, *shape=1*, *lowertail=True*)

1) **Description:** Probability for the Generalized Pareto distribution function

2) **Input parameters:** scale, location, shape: parameters of GPD lowertail = by default True

pwmdist.gpdpwmFit.**qgpd**(*p*, *location=0*, *scale=1*, *shape=1*, *lowertail=True*)

1) **Description:** Quantiles for the Generalized Pareto distribution function

2) **Input parameters:** scale, location, shape: parameters of GPD lowertail = by default True

2.1.2 gpdplots module

The 'gpdplots' module facilitates the essential visualization of empirical distiribution plot, tail of the underlying distribution , tail estimates from GPD model (from 'Fitbygpdpwm' method) and residual plots.

pwmdist.gpdplots.**disttail**(*obj*, *labels=True*)

1) Description: Tail of Underlying Distribution

2) **Arguments:** x - an object of class fGPDFIT labels - a logical flag. Should labels be printed?

3) **Example:** obj= Fitbygpdpwm(data, ci, threshold) disttail(obj)

pwmdist.gpdplots.**empericalplt**(*obj*, *labels=True*)

1) **Description:** Empirical Distribution Plot

2) **Input parameters:** obj = Fitbygpdpwm function output labels = By default True

3) **Example:** obj= Fitbygpdpwm(data, ci, threshold) empericalplt(obj)

pwmdist.gpdplots.**residualplot**(*obj*, *labels=True*)

1)Description: Quantile-Quantile Plot of GPD Residuals

2) **Arguments:** obj = Fitbygpdpwm function output labels - a logical flag. checks if labels should be printed.

3) **Example:** obj = Fitbygpdpwm(data, ci, threshold) residualplot(obj)

pwmdist.gpdplots.**tailestimategpd**(*obj*, *labels=True*)

1) **Description:** Plots tail estimate from GPD model

2) **Arguments:** obj = Fitbygpdpwm function output labels = By default True

3) **Example:** obj= Fitbygpdpwm(data, ci, threshold) tailestimategpd(obj)

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