

Package: pbox (via r-universe)

September 7, 2024

Type Package

Title Exploring Multivariate Spaces with Probability Boxes

Version 0.1.8

Maintainer Ahmed T. Hammad <ahmed.t.hammad@gmail.com>

Description Advanced statistical library offering a method to encapsulate and query the probability space of a dataset effortlessly using Probability Boxes (p-boxes). Its distinctive feature lies in the ease with which users can navigate and analyze marginal, joint, and conditional probabilities while taking into account the underlying correlation structure inherent in the data using copula theory and models. A comprehensive explanation is available in the paper ``pbox: Exploring Multivariate Spaces with Probability Boxes'' to be published in the Journal of Statistical Software.

URL <https://www.r-project.org>, <https://github.com/athammad/pbox>

BugReports <https://github.com/athammad/pbox/issues>

Depends gamlss.dist, R (>= 2.10)

Imports copula, data.table, gamlss, methods, purrr, stats, stringr, utils, tseries

Suggests ggplot2, knitr, rmarkdown, spelling, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

Encoding UTF-8

LazyData true

RoxygenNote 7.3.1

Collate 'SEAex.R' 'pbox.R' 'coefAll2.R' 'copula_families.R'
'deltaCI.R' 'final_pbox.R' 'fit_copula.R' 'fit_copula_pbox.R'
'fit_dist_pbox.R' 'fun_stats.R' 'gen_scenario.R' 'grid_pbox.R'
'make_pbox.R' 'match_maker.R' 'modify_pbox.R' 'param_dev.R'
'perProb.R' 'perturbate_params.R' 'probCI.R' 'q_parser.R'
'qpbox.R' 'scenario_pbox.R' 'set_pbox.R' 'show.R'
'stats_calc.R'

License GPL-3

Language en-US

Repository <https://athammad.r-universe.dev>

RemoteUrl <https://github.com/athammad/pbox>

RemoteRef HEAD

RemoteSha ee60f07a557fcbcf33adb4d8038d0b48db69f29e

Contents

coefAll2	3
coefAll2,ANY-method	3
copula_families	4
deltaCI	4
final_pbox	5
fit_copula	6
fit_copula_pbox	6
fit_dist_pbox	7
fun_stats	8
fun_stats,numeric-method	9
gen_scenario	9
grid_pbox	10
make_pbox	11
match_maker	12
match_maker,ANY-method	12
modify_pbox	13
param_dev	14
pbox-class	14
perProb	15
perturbate_params	16
perturbate_params,ANY-method	16
probCI	17
probCI,numeric-method	18
qpbox	18
q_parser	20
q_parser,ANY-method	20
scenario_pbox	21
SEAx	22
set_pbox	22
show	23
stats_calc	24

Index

25

coefAll2	<i>Extract Coefficients</i>
----------	-----------------------------

Description

This is an internal method to extract coefficients from the list of the fitted distributions for each variable resulting from `fit_dist_pbox`. This method handles potential issues with parameter extraction from the complex objects created by GAM-like models.

Usage

```
coefAll2(obj, deviance = FALSE)
```

Arguments

obj	An object typically resulting from <code>fit_dist_pbox</code> .
deviance	Logical value indicating whether to compute deviance for the fitted model.

Value

A list of coefficients, possibly including 'mu', 'sigma', 'nu', and 'tau', depending on the model specification in obj. If deviance is TRUE, it also includes the deviance of the model.

Examples

```
data(SEAex)
pbx <- set_pbox(SEAex)
coefAll2(pbx@fit[[1]]$allDistrs$Thailand)
```

coefAll2,ANY-method	<i>Method for extracting coefficients from GAM-like models</i>
---------------------	--

Description

Method for extracting coefficients from GAM-like models

Usage

```
## S4 method for signature 'ANY'
coefAll2(obj, deviance = FALSE)
```

Arguments

obj	A model object, typically from a GAM-like fitting procedure.
deviance	A Boolean flag that when TRUE calculates the deviance of the model.

Value

A list containing model coefficients and optionally deviance.

copula_families	<i>Define Copula Families and Parameters</i>
-----------------	--

Description

Internal list of defined copula families and their corresponding parameters.

Usage

```
.copula_families
```

Format

An object of class `list` of length 3.

deltaCI	<i>Compute Confidence Interval using Delta Method</i>
---------	---

Description

Internal method to compute the probability using delta method which approximates the variance of a function of random variables (in this case, the ratio) based on the variance of the original estimates. 'deltaCI' general method. Internal method to compute the probability using delta method which approximates the variance of a function of random variables (in this case, the ratio) based on the variance of the original estimates.

Usage

```
deltaCI(cond)

## S4 method for signature 'ANY'
deltaCI(cond)
```

Arguments

cond	list with the result of the perturbed probability for 'mj' and 'co' and correspondent CI.
------	---

Value

The Confidence Interval for the conditional probability.

Numeric vector representing the computed probability and confidence intervals using the perturbed copula and delta method.

Examples

```
cond <- list(
  c(P = 0.3597117, `2.5%` = 0.3074215, `97.5%` = 0.4075315),
  c(P = 0.5682882, `2.5%` = 0.4560553, `97.5%` = 0.6823438))
deltaCI(cond)
```

final_pbox

Build a Multivariate Distribution from Copula

Description

Combines the results from ‘fit_copula_pbox’ and ‘fit_dist_pbox’ to build a multivariate distribution from copula, selecting the best copula based on AIC and utilizing the best-fitted marginal distributions. Note that

Method to construct a ‘mvdc’ object by combining best-fit copula and marginal distribution results. The method uses the best copula model as determined by the lowest AIC and combines it with marginal distributions fitted to each variable.

Usage

```
final_pbox(results_df, allDitrs, data, verbose = TRUE)
```

```
## S4 method for signature 'ANY'
```

```
final_pbox(results_df, allDitrs, data, verbose = TRUE)
```

Arguments

results_df	A data.table with AIC and parameter estimates of evaluated copulas and families from ‘fit_copula_pbox’.
allDitrs	A list containing fitted distributions for each variable from ‘fit_dist_pbox’.
data	A data frame or data table; this will be coerced to a ‘data.table’ internally.
verbose	control verbosity of the output. Default to TRUE.

Value

An object of class ‘mvdc’ representing the combined multivariate distribution.

Examples

```
data("SEAx")
copulaFits <- fit_copula_pbox(data = SEAx, .copula_families)
distFits <- fit_dist_pbox(data = SEAx)
final_mvd <- final_pbox(copulaFits, distFits$allDitrs, SEAx)
print(final_mvd)
```

 fit_copula

Copula Fit

Description

Internal method to automatically find the best Copula given a data.frame. Wrapper around the function fitCopula.

Automatically fits a copula model using the provided pseudo-observations. This method supports various families of copulas and calculates the corresponding AIC and parameter estimates.

Usage

```
.fit_copula(copula, family, dim, u)

## S4 method for signature 'ANY'
.fit_copula(copula, family, dim, u)
```

Arguments

copula	A data.frame or data.table (the data will be coerced to a data.table internally).
family	List of copula types and their corresponding families. Currently supported families are "clayton", "frank", "amh", "gumbel", and "joe" for Archimedean Copula; "galambos", "gumbel", and "huslerReiss" for Extreme-Value copula; "normal" and "t" for Elliptical copula.
dim	number of columns of data.
u	matrix of (pseudo-)observations. Consider applying the function pobs() first in order to obtain such data.

Value

A data.table with the corresponding AIC and the parameter estimates of the evaluated copulas and families.

 fit_copula_pbox

Fit Copula Models to Data

Description

Automatically fits various copula models specified in a list to the provided data. This function is a wrapper around the underlying copula fitting function, facilitating the exploration of multiple copula families to identify the best fitting model based on criteria such as AIC.

'fit_copula_pbox' method to fit a variety of copula models to data. This method performs a grid search over specified copula families to find the best fit. It employs the pseudoinverse of the empirical distribution functions to standardize the data.

Usage

```
fit_copula_pbox(data, .copula_families)

## S4 method for signature 'ANY'
fit_copula_pbox(data, .copula_families)
```

Arguments

data A data frame or data table; the data will be coerced to a ‘data.table’ internally.

.copula_families A list specifying copula families to evaluate. The list should be structured with names corresponding to the type of copula (e.g., ‘archmCopula’, ‘evCopula’, ‘ellipCopula’) and elements being vectors of strings naming the copula families (e.g., “clayton”, “frank”).

Value

A data table summarizing the AIC and parameter estimates for each copula family evaluated.

Examples

```
data("SEAex")
.copula_families <- list(
  archmCopula = c("clayton", "frank", "gumbel", "joe"),
  evCopula = c("galambos", "gumbel", "huslerReiss"),
  ellipCopula = c("normal")
)
distFits <- fit_copula_pbox(data = SEAex, .copula_families)
print(distFits)
```

fit_dist_pbox

Fit Marginal Distributions

Description

Fits the best marginal distribution for each variable in a data frame using the ‘gamLSS::fitDist’ function from the GAMLSS package. This function is designed to evaluate multiple distributions, returning a summary of fit for each, along with the Akaike Information Criterion (AIC) for comparison.

Implements the generic function ‘fit_dist_pbox’ for data frames and data tables. This method utilizes statistical techniques to fit distributions to each column in the ‘data’ argument, evaluating fit using criteria like AIC to determine the best fitting model.

Usage

```
fit_dist_pbox(data, ...)

## S4 method for signature 'ANY'
fit_dist_pbox(data, ...)
```

Arguments

data A data frame or data table.
... Additional parameters to pass to the fitting function.

Value

A list containing two elements:

allDitrs List of the fitted distributions for each variable.
distTable A data table displaying the AIC for each tested distribution.

Examples

```
data(SEAex)
distFits <- fit_dist_pbox(data=SEAex)
print(distFits$allDitrs)
print(distFits$distTable)
```

fun_stats

Summary Statistics

Description

Computes summary statistics for a numeric vector. This function is an S4 method for the generic 'fun_stats', specifically tailored for numeric vectors. It calculates the minimum, maximum, mean, and median values.

Usage

```
fun_stats(x)
```

Arguments

x A numeric vector for which summary statistics are to be computed.

Value

A list containing the minimum, maximum, mean, and median of the input vector.

Examples

```
x <- c(1, 2, 3, 4, 5)
fun_stats(x)
```

fun_stats,numeric-method

Summary statistics method for numeric vectors

Description

This method is a specific implementation of the 'fun_stats' function for numeric vectors. It efficiently calculates and returns summary statistics including the minimum, maximum, mean, and median, excluding NA values.

Usage

```
## S4 method for signature 'numeric'  
fun_stats(x)
```

Arguments

x Numeric vector for which summary statistics are computed.

Value

A list with components min, max, mean, and median.

gen_scenario

Generate Scenarios

Description

Internal method to Generate scenarios based on parameter list variations.

Usage

```
gen_scenario(params = "list")  
  
## S4 method for signature 'ANY'  
gen_scenario(params = "list")
```

Arguments

params List of parameters where each parameter can vary across scenarios.

Value

Nested list of scenarios.

Examples

```
some_distr<-list(A=list(mu = 31.07, sigma = 0.28),
B=list(mu = c(34.4,31.4,25.6), sigma = 0.98, nu = 1.7),# note mu!
C=list(mu = 31.4, sigma = 0.34),
D=list(mu = 25.6, sigma = 0.24))
gen_scenario(some_distr)
```

grid_pbox	<i>Iterate Over a Grid of All Possible Quantiles and Calculate Probabilities</i>
-----------	--

Description

This function queries the probabilistic space of a pbox object to calculate probabilities associated with specific marginal or conditional distributions on a quantile grid. It supports conditional probability calculations as well.

This method processes the pbox object to compute probabilities based on the specified marginal and conditional parameters. It handles both simple probability calculations and complex queries involving joint and conditional distributions, with an option for bootstrap confidence interval estimation.

Usage

```
grid_pbox(pbx, mj = character(), co = NULL, probs = seq(0, 1, 0.1), ...)
```

```
## S4 method for signature 'pbox'
```

```
grid_pbox(pbx, mj = character(), co = NULL, probs = seq(0, 1, 0.1), ...)
```

Arguments

pbx	An object of class pbox from which to query the probabilistic space.
mj	A character vector specifying the variables to query.
co	A character vector specifying the variables to query
probs	A numeric vector of quantiles to calculate probabilities for (default: seq(0, 1, 0.1)).
...	Additional parameters passed to qbbox.

Value

A data.table containing estimated probabilities for each combination of quantiles and distributions queried.

A data.table containing estimated probabilities for each combination of quantiles and distributions queried.

Examples

```
data("SEAex")
pbx <- set_pbox(SEAex)
grid_pbox(pbx, mj = c("Vietnam", "Malaysia"))
```

`make_pbox`*Create a Probability Box (Pbox) Object*

Description

Constructs a probability box (Pbox) object from a given dataset and a pre-defined copula model. This auxiliary method facilitates the integration of data with a copula to form a comprehensive probabilistic model known as a Pbox.

Method for creating a 'pbox' object using a specified copula and data. This method ensures that the input data and copula are compatible in terms of dimensions and structurally fit to form a Pbox.

Usage

```
make_pbox(data, cop)

## S4 method for signature 'ANY'
make_pbox(data, cop)
```

Arguments

<code>data</code>	A dataframe or data table; this data will be coerced to a 'data.table' internally.
<code>cop</code>	An object of class 'mvdc' representing the multivariate dependency structure (copula).

Value

An object of class 'pbox' with slots: - '\$data': The data coerced into a 'data.table'. - '\$copula': The provided copula object.

Examples

```
library(copula)
data("SEAex")

cop <- normalCopula(param = 0.5, dim = 4)
distList <- c("RG", "SN1", "RG", "RG")
allDistrs <- list(list(mu = 31.07, sigma = 0.28),
                 list(mu = 34.4, sigma = 0.98, nu = 1.7),
                 list(mu = 31.4, sigma = 0.34),
                 list(mu = 25.6, sigma = 0.24))
copSEA <- mvdc(cop, distList, allDistrs)
pbx <- make_pbox(data = SEAex, cop = copSEA)
print(class(pbx))
```

match_maker	<i>Generate Query Vector</i>
-------------	------------------------------

Description

This function defines a generic function for creating a query vector to explore the probabilistic space based on provided matches and data. It is used internally to handle different types of inputs efficiently.

Usage

```
match_maker(varSet, matches, data)
```

Arguments

varSet	A data frame or list describing the variable set.
matches	A data frame describing the matches with potential additional control parameters.
data	A data frame representing the data to be queried.

Value

A modified version of 'varSet' with values updated based on 'matches'.

match_maker, ANY-method	<i>Method for match_maker</i>
-------------------------	-------------------------------

Description

This method implements the 'match_maker' function for handling specific types of 'varSet', 'matches', and 'data'. It modifies the 'varSet' based on 'matches' which can contain variable names and values to be matched or operations to be performed. It supports operations and direct value assignment.

Usage

```
## S4 method for signature 'ANY'
match_maker(varSet, matches, data)
```

Arguments

varSet	A data frame or list describing the variable set.
matches	A data frame describing the matches with variable names and corresponding values or operators.
data	A data frame representing the data to be queried.

Value

A modified version of 'varSet' that integrates conditions or values from 'matches'.

See Also

[match_maker](#) for the generic function and additional details.

modify_pbox	<i>Modify Parameters Box</i>
-------------	------------------------------

Description

Internal method to modify specific parameters in a nested list structure by applying deviations.

Usage

```
modify_pbox(all_parms, params_list, sigma = 0.05, range = seq(-3, 3, 1))

## S4 method for signature 'ANY'
modify_pbox(all_parms, params_list, sigma = 0.05, range = seq(-3, 3, 1))
```

Arguments

all_parms	nested list of parameters from the pbox object.
params_list	Named list where each name corresponds to a variable in the dataset and the value is a vector of parameter names to modify (e.g. list(Vietnam="mu")).
sigma	Standard deviation used for calculating parameter deviations.
range	Range values for generating deviations.

Value

Modified list of parameters.

Examples

```
some_distr<-list(A=list(mu = 31.07, sigma = 0.28),
B=list(mu = 34.4, sigma = 0.98, nu = 1.7),
C=list(mu = 31.4, sigma = 0.34),
D=list(mu = 25.6, sigma = 0.24))
modify_pbox(some_distr, list(A = "mu"))
```

 param_dev

Compute Parameter Deviations

Description

Internal method to calculate $\pm 1, 2, 3$ standard deviations for given parameters.

Usage

```
param_dev(param = "numeric", sigma = 0.05, range = seq(-3, 3, 1))
```

```
## S4 method for signature 'ANY'
```

```
param_dev(param = "numeric", sigma = 0.05, range = seq(-3, 3, 1))
```

Arguments

param	Numeric vector of parameters.
sigma	Numeric value representing standard deviation (default is 0.05).
range	Numeric vector specifying range of deviations (default is seq(-3, 3, 1)).

Value

Numeric vector of parameters adjusted by the specified deviations.

Examples

```
param_dev(31)
```

 pbox-class

*Class "pbox": Main S4 class of the library **pbox**.*

Description

"pbox" is a class representing the probabilistic space which combines data, copula and margins.

Slots

data The original data coerced to a data.table.

copula The copula object of class mvdc.

fit The results of the automated selection for both the marginal distribution and the copula.

perProb

Compute Probability Using a Perturbed Copula

Description

Computes the probability by applying a perturbation to the copula parameters within a 'pbox' object, and then evaluating the probability for specified query values. This method ensures that variations in the copula parameters can be assessed for their impact on the computed probabilities.

'perProb' method for objects of class 'pbox'. This method perturbs the parameters of the copula contained in the 'pbox' and then computes the probability of the vector query using the perturbed copula. The perturbation process adjusts the copula parameters and evaluates the impact on the outcome probability.

Usage

```
perProb(x, vecQuery)
```

```
## S4 method for signature 'pbox'  
perProb(x, vecQuery)
```

Arguments

x A 'pbox' object, which is expected to contain a copula.
vecQuery A numeric vector representing the query values.

Value

The probability computed using a perturbed copula.

Numeric value representing the computed probability using the perturbed copula.

See Also

[set_pbox](#), [pMvdc](#)

Examples

```
data(SEAex)  
pbx <- set_pbox(SEAex[, .(Malaysia, Thailand)])  
vecQuery <- c(31, 34)  
perProb(pbx, vecQuery)
```

`perturbate_params` *Perturb Parameters*

Description

This function defines a generic function to perturbate parameter values for each distribution within a copula, using random perturbations to simulate variability or uncertainty.

Usage

```
perturbate_params(paramMargins)
```

Arguments

`paramMargins` A list containing lists of parameter values for each distribution in the copula.

Value

A list of lists containing perturbed parameter values.

Examples

```
paramMargins <- list(list(0.2, 0.3), list(0.4, 0.5))
perturbed <- perturbate_params(paramMargins)
print(perturbed)
```

`perturbate_params, ANY-method`
Perturb Parameters Method

Description

This method implements the generic ‘`perturbate_params`’ function specifically for lists of copula distribution parameters. It applies a random perturbation to each parameter based on a normal distribution centered at zero with a standard deviation of 0.05.

Usage

```
## S4 method for signature 'ANY'
perturbate_params(paramMargins)
```

Arguments

`paramMargins` A list containing lists of parameter values for each distribution in the copula.

Value

A list of lists containing perturbed parameter values.

See Also

[perturbate_params](#) for the generic function definition.

probCI	<i>Probability Confidence Interval</i>
--------	--

Description

Calculates the confidence interval around a vector of probabilities using the quantiles based on the specified significance level.

Usage

```
probCI(probabilities, alpha=0.05)
```

Arguments

`probabilities` A numeric vector of probabilities for which the confidence interval is desired.

`alpha` The significance level used for constructing the confidence interval; default is 0.05.

Value

A list containing the lower and upper bounds of the confidence intervals for each probability.

Examples

```
probabilities <- c(0.1, 0.2, 0.3, 0.4, 0.5)
probCI(probabilities)
probCI(probabilities, alpha = 0.1)
```

probCI, numeric-method *Method to calculate confidence intervals for a vector of probabilities*

Description

This method calculates the lower and upper bounds of the confidence interval for each element in the input vector of probabilities using the given alpha level.

Usage

```
## S4 method for signature 'numeric'
probCI(probabilities, alpha = 0.05)
```

Arguments

`probabilities` A numeric vector of probabilities.

`alpha` A numeric value specifying the significance level for the confidence intervals; defaults to 0.05.

Value

A numeric vector containing the lower and upper quantile bounds for each probability in the input vector.

qpbox *Query the probabilistic space of a pbox object.*

Description

This function queries the probabilistic space of a pbox object to calculate probabilities associated with specific marginal or conditional distributions. It supports conditional probability calculations and can optionally estimate confidence intervals through bootstrapping.

This method processes the pbox object to compute probabilities based on the specified marginal and conditional parameters. It handles both simple probability calculations and complex queries involving joint and conditional distributions, with an option for bootstrap confidence interval estimation.

Usage

```
qpbox(
  pbox,
  mj = "character",
  co = "character",
  lower.tail = TRUE,
  fixed = FALSE,
  CI = FALSE,
```

```

    iter = 1000
  )

## S4 method for signature 'pbox'
qpbox(
  pbx,
  mj = "character",
  co = "character",
  lower.tail = TRUE,
  fixed = FALSE,
  CI = FALSE,
  iter = 1000
)

```

Arguments

<code>pbx</code>	An object of class <code>pbox</code> from which to query the probabilistic space.
<code>mj</code>	A character string specifying the marginal and or joint distribution of the variable. It must specify the variable and the value in the format 'Var:Val'.
<code>co</code>	A character string specifying the marginal and conditional distribution of the variable. It must specify the variable and the value in the format 'Var:Val'.
<code>lower.tail</code>	Logical; if TRUE (default), probabilities are calculated for the area to the right of the specified value.
<code>fixed</code>	Logical; if TRUE, calculates conditional probabilities with conditions treated as fixed.
<code>CI</code>	Logical; if TRUE, calculates bootstrap confidence intervals.
<code>iter</code>	Integer; the number of replications for the confidence interval calculation. Default is 1000.

Value

Estimated probabilities as a numeric value or a named vector including confidence intervals if requested.

Examples

```

data("SEaex")
pbx <- set_pbox(SEaex)
# Get marginal distribution
qpbox(pbx, mj="Malaysia:33")
# Get conditional distribution
qpbox(pbx, mj="Malaysia:33 & Vietnam:31", co="avgRegion:26")

```

q_parser	<i>Parse Query</i>
----------	--------------------

Description

This function defines a generic function to parse a string query into structured data that can be used to explore a pbox object. It extracts components of the query using regular expression matching.

Usage

```
q_parser(query)
```

Arguments

query A string representing the query.

Value

A data table with columns 'Varnames', 'Value', 'Operator', and 'Varnames2', where numeric values are converted to numeric type, and unnecessary columns are removed.

Examples

```
query <- "Vietnam:23"
q_parser(query)
```

q_parser, ANY-method	<i>Method for Parsing Queries</i>
----------------------	-----------------------------------

Description

Implements the 'q_parser' function specifically for string input. It uses a regular expression to split the query into its components, converting numeric strings to numeric values where applicable, and structuring the result as a data table for easy manipulation.

Usage

```
## S4 method for signature 'ANY'
q_parser(query)
```

Arguments

query A string representing the query.

Value

A data table with the parsed elements of the query.

See Also

[q_parser](#) for the generic function definition.

scenario_pbox

Scenario Analysis

Description

Performs scenario analysis by modifying underlying parameters of a pbox object. Query the probabilistic space under different scenarios with different combinations of parameters for a single query.

Usage

```
scenario_pbox(
  pbx,
  param_list = "list",
  sigma = 0.05,
  range = seq(-3, 3, 1),
  ...
)

## S4 method for signature 'pbox'
scenario_pbox(
  pbx,
  param_list = "list",
  sigma = 0.05,
  range = seq(-3, 3, 1),
  ...
)
```

Arguments

pbx	object of class pbox
param_list	List specifying which parameters to modify.
sigma	Standard deviation for parameter deviations, defaulting to 0.05.
range	Range of deviation multipliers, default is seq(-3, 3, 1).
...	Additional arguments passed to qpbox.

Value

Named list of results from each scenario evaluation.

Examples

```
data("SEAx")
pbx <- set_pbox(SEAx)
scenario_pbox(pbx,mj = "Vietnam:31 & avgRegion:26", param_list = list(Vietnam="mu"))
```

 SEAex

Maximum yearly temperature data from 1901 to 2022 (CRU TS v4)

Description

Maximum yearly temperature data from 1901 to 2022 in 11 countries in Southeast Asia and the average temperature of the entire region extracted from Climatic Research Unit gridded Time Series Version 4. Data contains only temperatures for Malaysia, Thailand, Vietnam and the average regional temperature.

Usage

```
SEAex
```

Format

```
## 'SEAex' A data frame with 122 rows and 4 columns:
```

Malaysia, Thailand, Vietnam Yearly max temperatures in Celsius for each country over 122 years.

avgRegion Average temperature in Celsius over the whole South East Asia region

Source

<https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_4.07/crucy.2304181636.v4.07/countries/>

Examples

```
data(SEAex)
head(SEAex)
```

 set_pbox

Create a Probability Box from Data

Description

Constructs a probability box (pbox) by automatically selecting the best marginal distribution and copula for a given dataset. This function facilitates the creation of a pbox object, which encapsulates the uncertainty and dependencies of the input data.

'set_pbox' method that utilizes data frames or data tables to configure a comprehensive pbox structure. The method involves stages of distribution fitting and copula selection, executed through external functions presumed to be available in the working environment or described in the package.

Usage

```
set_pbox(data, verbose = TRUE, ctype = "all", cfamily = "all", ...)

## S4 method for signature 'ANY'
set_pbox(data, verbose = TRUE, ctype = "all", cfamily = "all", ...)
```

Arguments

<code>data</code>	A data frame or data table. The data will be coerced to a ‘data.table’ internally.
<code>verbose</code>	control verbosity of the output. Default to TRUE.
<code>ctype</code>	Charter indicating the type of copula among archmCopula, evCopula, ellipCopula.
<code>...</code>	Other arguments to be passed to the ‘fitDist’ function.
<code>cfamily</code>	Charter indicating the family of copula among clayton, frank, gumbel, joe, galambos, huslerReiss, normal.

Value

An object of class ‘pbox’ with the following slots: - ‘@data’: The original data coerced into a ‘data.table’. - ‘@copula’: The selected copula object, typically of class ‘mvdc’. - ‘@fit’: A list containing results from the automated selection processes for both the marginal distributions and the copula.

Examples

```
data("SEAex")
pbx <- set_pbox(data = SEAex)
print(pbx)
print(class(pbx))
```

show *Methods for 'show()' in Package 'pbox'*

Description

Methods for function show in package **pbox**.

Usage

```
## S4 method for signature 'pbox'
show(object)
```

Arguments

<code>object</code>	an object of class pbox .
---------------------	----------------------------------

`stats_calc`*Calculate Basic Statistics*

Description

Computes basic statistics such as mean and median for specified variables in a data frame or data table based on a set of operations specified in the 'matches' data frame. This function updates the 'varSet' with the computed results for each variable.

Method implementation for calculating statistics using 'data.table' and 'stats'. This method allows the computation of mean and median for subsets of data defined in 'matches' and updates 'varSet' with these results.

Usage

```
stats_calc(data, matches, varSet)
```

```
## S4 method for signature 'ANY'  
stats_calc(data, matches, varSet)
```

Arguments

<code>data</code>	A data frame or data table.
<code>matches</code>	A data frame describing the operations to apply.
<code>varSet</code>	A data frame to be updated with results.

Value

Returns a modified version of 'varSet' with updated values based on the calculations.

Index

- * **datasets**
 - copula_families, 4
 - SEAx, 22
 - .copula_families (copula_families), 4
 - .fit_copula (fit_copula), 6
 - .fit_copula, ANY-method (fit_copula), 6
- coefAll2, 3
- coefAll2, ANY-method, 3
- coefAll2-method (coefAll2), 3
- copula_families, 4
- deltaCI, 4
- deltaCI, ANY-method (deltaCI), 4
- final_pbox, 5
- final_pbox, ANY-method (final_pbox), 5
- fit_copula, 6
- fit_copula_pbox, 6
- fit_copula_pbox, ANY-method (fit_copula_pbox), 6
- fit_dist_pbox, 3, 7
- fit_dist_pbox, ANY-method (fit_dist_pbox), 7
- fun_stats, 8
- fun_stats, numeric (fun_stats), 8
- fun_stats, numeric-method, 9
- gen_scenario, 9
- gen_scenario, ANY-method (gen_scenario), 9
- grid_pbox, 10
- grid_pbox, pbox-method (grid_pbox), 10
- make_pbox, 11
- make_pbox, ANY-method (make_pbox), 11
- match_maker, 12, 13
- match_maker, ANY-method, 12
- modify_pbox, 13
- modify_pbox, ANY-method (modify_pbox), 13
- param_dev, 14
- param_dev, ANY-method (param_dev), 14
- pbox-class, 14
- perProb, 15
- perProb, pbox-method (perProb), 15
- perturbate_params, 16, 17
- perturbate_params, ANY-method, 16
- pMvdc, 15
- probCI, 17
- probCI, numeric-method, 18
- probCI-method (probCI), 17
- q_parser, 20, 21
- q_parser, ANY-method, 20
- qpbox, 18
- qpbox, pbox-method (qpbox), 18
- scenario_pbox, 21
- scenario_pbox, pbox-method (scenario_pbox), 21
- SEAx, 22
- set_pbox, 15, 22
- set_pbox, ANY-method (set_pbox), 22
- show, 23
- show, pbox-method (show), 23
- show-pbox (show), 23
- stats_calc, 24
- stats_calc, ANY-method (stats_calc), 24