Package 'MLEce'

November 14, 2022

Type Package

Title Statistical Inference for Asymptotic Efficient Closed-Form Estimators

Version 1.0.1

Description Estimate asymptotic efficient closed-form estimators and provide goodness of fit, estimates, plot and etc.
Yue, S. (2001) <doi:10.1002/hyp.259>.
Mosimann, James E. (1962) <doi:10.1093/biomet/49.1-2.65>.

Depends R (>= 4.2.0)

License GPL-2

Encoding UTF-8

LazyData true

RoxygenNote 7.2.1

Imports nleqslv, LaplacesDemon, sirt, ggplot2, reshape ,mvtnorm

NeedsCompilation no

Author Yu-Kwang Kim [aut, cre, com],
Yu-Hyeong Jang [aut],
Jae Ho Chang [aut],
Sang Kyu Lee [aut],
Jun Zhao [aut],
Hyoung-Moon Kim [aut, ths]

Maintainer Yu-Kwang Kim <lumiere_profuse@naver.com>

Repository CRAN

Date/Publication 2022-11-14 17:30:11 UTC

R topics documented:

`BiGam_CE` *Get closed-form estimator for Bivariate gamma*

Description

Get closed-form estimator for Bivariate gamma

Usage

```
BiGam_CE(pars, dat, type = "MLECE", log = TRUE)
```

Arguments

`pars`	parameters of bivariate gamma (alpha1, alpha2, beta).
`dat`	data of bivariate gamma
`type`	output type (MLECE, hessian, score). Default is MLECE
`log`	log-transformation of data. Default is TRUE

BiGam_MME *MME for Bivariate gamma*

Description

MME for Bivariate gamma

Usage

```
BiGam_MME(dat, scaletype = "first")
```

Arguments

dat	data of bivariate gamma
scaletype	scale type for bivariate gamma MME

BiWei_CE *Get root-n consistent closed-form estimator by correlation method and MLE.*

Description

Get root-n consistent closed-form estimator by correlation method and MLE.

Usage

```
BiWei_CE(data)
```

Arguments

data	data of bivariate weibull

BiWei_info *Calculating MLEce for Bivariate weibull*

Description

Calculating MLEce for Bivariate weibull

Usage

```
BiWei_info(par_vec, dat, type)
```

Arguments

par_vec	parameters of bivariate weibull (alpha1, beta1, alpha2, beta2, delta).
dat	data of bivariate weibull
type	output type (hessian, MLEce, del, mar)

BiWei_ML *Get MLE for Bivariate weibull*

Description

Get MLE for Bivariate weibull

Usage

```
BiWei_ML(data, inits, tol = 1e-07)
```

Arguments

data	data of bivariate weibull
inits	initial values of iterative algorithm for MLE
tol	tolerance for difference.

CD2 *CD2 statistics for GCVM gof test*

Description

CD2 statistics for GCVM gof test

Usage

```
CD2(dat)
```

Arguments

dat	data of bivariate weibull

coef.MLEce *Extracting estimates.* coef *extracts estimated parameters.*

Description

Extracting estimates. coef extracts estimated parameters.

Usage

```
## S3 method for class 'MLEce'
coef(object, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'coef.MLEce'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

object	an object of class "MLEce" made by the function MLEce.
digits	a numeric number of significant digits.
...	not used, but exists because of the compatibility.
x	an object of class "MLEce".

Value

estimated parameters are extracted from the "MLEce" class.

computeTime *compute MLEce and MLE*

Description

computeTime performs a benchmark of MLEce and MLE on a given dataset.

Usage

```
computeTime(data, distribution, coef_out = FALSE)
```

Arguments

data	a data set.
distribution	a character string of a distribution assuming that data set comes from.
coef_out	if TRUE, estimated parameters are printed. Default is False.

Value

a numeric matrix. This matrix include estimated parameters and time.

Examples

```
dat <- rBiWei(n=30, c(4,3,3,4,0.6))
computeTime(dat, "BiWei")
```

cor_method *Get root-n consistent estimator by correlation method.*

Description

Get root-n consistent estimator by correlation method.

Usage

```
cor_method(dat)
```

Arguments

dat	data of bivariate weibull

dBiGam *log-likelihood for Bivariate gamma*

Description

log-likelihood for Bivariate gamma

Usage

```
dBiGam(pars, dat1, dat2, log = TRUE)
```

Arguments

pars	parameters of bivariate gamma (alpha1, alpha2, beta).
dat1	data of marginal column (univariate gamma).
dat2	other data of marginal column (univariate gamma).
log	log-transformation of data. Default is TRUE

dBiWei *Evaluating bivariate Weibull distribution of Gumbel-type*

Description

Evaluating bivariate Weibull distribution of Gumbel-type

Usage

```
dBiWei(par_vec, dat, log = TRUE)
```

Arguments

par_vec	parameters of bivariate weibull (alpha1, beta1, alpha2, beta2, delta).
dat	data of bivariate weibull
log	log-transformation for data. Default is TRUE.

`delta_score_probit` *Calculating delta score*

Description

Calculating delta score

Usage

```
delta_score_probit(par_vec, dat)
```

Arguments

`par_vec`	parameters of bivariate weibull (alpha1, beta1, alpha2, beta2, delta).
`dat`	data of bivariate weibull

`Diri_CE` *Get MLEce for dirichlet*

Description

Get MLEce for dirichlet

Usage

```
Diri_CE(x)
```

Arguments

`x`	data for estimating MLEce

`Diri_CE_bt` *beta tilde: root-n consistent estimator*

Description

beta tilde: root-n consistent estimator

Usage

```
Diri_CE_bt(x)
```

Arguments

`x`	data for estimating MLEce

Diri_MLE *Get MLE for dirichlet*

Description

Get MLE for dirichlet

Usage

```
Diri_MLE(x, eps = 1e-10, mxit = 1e+05)
```

Arguments

x	data for estimating MLEce
eps	epsilon for iterative algorithm.
mxit	maximum iteration for MLE. Default is 1e5

Diri_MME *Get MME for dirichlet*

Description

Get MME for dirichlet

Usage

```
Diri_MME(x)
```

Arguments

x	data for estimating MME.

flood — *The flood events data of the Madawaska basin.*

Description

It represents the flood events data of the Madawaska basin from 1911 to 1995. (Yue, 2001).

Usage

```
data(flood, package = "MLEce")
```

Format

A 2 variables data frame with 77 observations.

References

Yue, S. (2001). doi:10.1002/hyp.259.

fossil_pollen — *The counts data of the frequency of occurrence of different kinds of pollen grains.*

Description

It represents the counts data of the frequency of occurrence of different kinds of pollen grains. (Mosimann, 1962).

Usage

```
data(fossil_pollen, package = "MLEce")
```

Format

A 4 variables data frame with 73 observations.

References

Mosimann, James E. (1962) doi:10.1093/biomet/49.1-2.65.

gof *test goodness of fit*

Description

test goodness of fit

Usage

```
gof(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'gof'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

x	an object of class "MLEce" made by the function MLEce.
digits	a numeric number of significant digits.
...	not used, but exists because of the compatibility.

Details

The null hypothesis of the GCVM test is that "data follows the Bivariate Weibull distribution".

Value

gof returns the p-value of the GCVM test.

Examples

```
datt = rBiGam(100, c(1,4,5))
res = MLEce(datt, "BiGam", boots = 50)
gof(res)
```

llk *Negative Log likelihood function for dirichlet data*

Description

Negative Log likelihood function for dirichlet data

Usage

```
llk(x, alp)
```

Arguments

x	data for loglikelihood
alp	estimated values for the dirichlet parameters

MLEce *Calculating a value of MLEce according to a distribution*

Description

Provide a function that numerically computes the closed-form estimator which is asymptotically efficient and can be computed faster than the maximum likelihood estimator.

Usage

```
MLEce(data, distrib, boots = 1000, CI.alpha = 0.05, ...)

## S3 method for class 'MLEce'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

data	a numeric vector or matrix.
distrib	a character string "name" naming a distribution for which the corresponding density function dname and the corresponding distribution function pname must be classically defined.
boots	a number of iteration for calculating CI-parametric intervals.
CI.alpha	a significance level of confidence intervals. default is 0.05.
...	not used, but exists because of the compatibility.
x	an object of class "MLEce".
digits	a numeric number of significant digits.

Details

The closed-form estimation procedure is based on root n-consistent estimators and a Fisher scoring step or a Newton step on the loglikelihood function. The estimator is obtained by solving the linear equation By E.L. Lehmann. This estimator follows the multivariate normal distribution with mean vector of 0 and variance matrix of inverse of Fisher Information matrix and has the properties of a multivariate normal distribution.

Value

an object of class “MLEce”. It is a list with the following components:

estimation	the parameter estimates.
distribution	a character string of a distribution assuming that data set comes from.
stat_summary	a numeric vector with min, 1st quantile, median, 3rd quantile, and max.
CI	a matrix with confidence intervals of Estimates obtained by CI-parametric bootstrapping.
n	a numeric value of data length.
data	the data set.

Examples

```
datt = rBiGam(100, c(1,4,5))
res = MLEce(datt, "BiGam", boots = 50)
```

MLEce_est *Estimate MLEce*

Description

Estimate MLEce

Usage

```
MLEce_est(data, distname, boots, CI.alpha)
```

Arguments

data	a numeric vector or matrix.
distname	a character string "name" naming a distribution for which the corresponding density function dname and the corresponding distribution function pname must be classically defined.
boots	a number of iteration for calculating CI-parametric intervals.
CI.alpha	a significance level of confidence intervals. default is 0.05.

MLE_est *Statistical inference of MLE*

Description

Provide value of maximum likelihood estimator, a result of GOF test, and information on the CI of MLE.

Usage

```
MLE_est(data, distname, inits, boots = 1000, CI.alpha = 0.05)
```

Arguments

data	a numeric vector or matrix.
distname	a character string of a distribution assuming that data set comes from (Currently, only Biweibull distribution can be input)
inits	a initial vector for MLE.
boots	a number of iteration for parametric bootstrapping compute confidence intervals.
CI.alpha	a significance level of confidence intervals. default is 0.05.

Value

MLE_est returns a list include maximum likelihood estimators and confidence interval of estimated parameters.

plot.MLEce *Providing some plots for MLEce*

Description

plot method for a class "MLEce".

Usage

```
## S3 method for class 'MLEce'
plot(
  x,
  which = c(1, 2, 3, 4),
  ask = prod(par("mfcol")) < length(which) && dev.interactive(),
  ...
)
```

Arguments

x	an object of class "MLEce" made by the function MLEce.
which	if a subset of the plots is required, specify a subset of 1:4
ask	logical; if TRUE, the user is asked before each plot.
...	not used, but exists because of the compatibility.

Details

The first figure is a boxplot for given data. The second figure is a contour line drawn by the probability density function of the estimated parameter based on MLEce. the x-axis is the first column of data and the y-axis is the second column of data. The third figure is a marginally fitted probability density plot for the first column of input data. It provides a fitted line for each of CME, MLE and MLEce. The fourth figure is a marginally fitted probability density plot for the second column of input data. It can also provide a fitted line for each of CME, MLE and MLEce.

Value

returns plots for MLEce which describe "details".

Examples

```
datt = rBiGam(100, c(1,4,5))
res = MLEce(datt, "BiGam", boots = 50)
plot(res, c(1))
```

---

rBiGam *random generation for the Bivariate Gamma distribution with (shape1, shape2, scale).*

Description

random generation for the Bivariate Gamma distribution with (shape1, shape2, scale).

Usage

```
rBiGam(n, pars)
```

Arguments

n	number of observations.
pars	parameters of BiWeibull (shape1, shape2, scale).

Details

These functions implement formulas given in Hyoung-Moon Kim. et al. (2020). (will be revised.)

Value

rBiGam generates random deviates.

Examples

```
datt = rBiGam(n=50, c(4,3,3))
```

---

rBiWei *Generating random number for the bivariate Weibull distribution with (alpha1, beta1, alpha2, beta2, delta).*

Description

Generating random number for the bivariate Weibull distribution with (alpha1, beta1, alpha2, beta2, delta).

Usage

```
rBiWei(n, par_vec)
```

Arguments

n	number of observations.
par_vec	parameters of BiWeibull (alpha1, beta1, alpha2, beta2, delta).

Details

rBiWei generates random number data for bivariate weibull distribution.

Value

rBiWei generates random deviates.

Examples

```
datt = rBiWei(n=50, c(4,3,3,4,0.6))
```

RNCE_est *Statistical inference of root-n consistent estimator*

Description

Provide value of root-n consistent estimator

Usage

```
RNCE_est(data, distname)
```

Arguments

data	a numeric vector or matrix.
distname	a character string of a distribution assuming that data set

Value

a numeric vector of estimated parameters.

Rosen *Rosen's transformation for GCVM gof test*

Description

Rosen's transformation for GCVM gof test

Usage

```
Rosen(dat, pars)
```

Arguments

dat	data of bivariate weibull
pars	parameters of bivariate weibull (alpha1, beta1, alpha2, beta2, delta).

SD2fun.diri *SD2 statistics for GCVM gof test*

Description

SD2 statistics for GCVM gof test

Usage

```
SD2fun.diri(Data, EST)
```

Arguments

Data	data for gof test
EST	estimates for gof test

SD2fun.gam *SD2 statistics for GCVM gof test*

Description

SD2 statistics for GCVM gof test

Usage

```
SD2fun.gam(Data, EST)
```

Arguments

Data	data for gof test
EST	estimates for gof test

stbz *stabilization*

Description

stabilization

Usage

```
stbz(x, eps = 1e-10)
```

Arguments

x	data for stabilization.
eps	epsion for stabilization. It is very small number to extremely small data points

summary.MLEce *Summarizing MLEce function*

Description

summary method for a class "MLEce".

Usage

```
## S3 method for class 'MLEce'
summary(object, ...)

## S3 method for class 'summary.MLEce'
print(x, digits = max(3, getOption("digits") - 3), ...)
```

Arguments

object	an object of class "MLEce" made by the function MLEce.
...	not used, but exists because of the compatibility.
x	an object of class "MLEce".
digits	a numeric number of significant digits.

Value

summary describes information about MLEce. (quantile statistics, correlation, estimates)

Examples

```
datt = rBiGam(100, c(1,4,5))
res = MLEce(datt, "BiGam", boots = 50)
summary(res)
```

Index