Package ‘hytest’

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Type Package

Title Hypothesis Testing Based on Neyman-Pearson Lemma and Likelihood Ratio Test

Version 0.1.1

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Description Error type I and Optimal critical values to test statistical hypothesis based on Neyman-Pearson Lemma and Likelihood ratio test
based on random samples from several distributions. The families of distributions are Bernoulli, Exponential, Geometric, Inverse Normal,
Normal, Gamma, Gumbel, Lognormal, Poisson, and Weibull.
This package is an ideal resource to help with the teaching of Statistics.
The main references for this package are Casella G. and Berger R. (2003,ISBN:0-534-24312-6 , ``Statistical Inference. Second Edition'', Duxbury Press) and
Hogg, R., McKean, J., and Craig, A. (2019,ISBN:013468699, ``Introduction to Mathematical Statistic. Eighth edition'', Pearson).

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`ber_c_opt` *Critical Value Given a Nominal Error Type I Associated with a Bernoulli Distribution*

Description

`ber_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Bernoulli distribution.

Usage

```
ber_c_opt(
  alpha = 0.1,
  n = 150,
  theta0 = 1,
  c1 = 0.001,
  c2 = 0.99,
  R = 15000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Bernoulli distribution. Default value is 0.5.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.

`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 15000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 100 from a Bernoulli distribution
# given a nominal error type I equals to 0.1 and R = 12000
# to test H_0: theta = 0.7 vs H_1: theta != 0.7
ber_c_opt(alpha=0.1,n=100,theta0=0.7,R=12000)
```

`ber_errorI` *Empirical Error Type I Associated with a Bernoulli Distribution*

Description

`ber_errorI` is used to obtain an empirical error type I when we use a random sample from a Bernoulli distribution.

Usage

```
ber_errorI(c = 1, n = 150, theta0 = 0.5, R = 12000)
```

Arguments

`c`	numeric, represents a positive value that defines a critical region. Default value is 1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Bernoulli distribution. Default value is 0.5.
`R`	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 200 from a Bernoulli distribution,
# a critical value c = 0.45 and R = 20000 to test H_0: theta = 0.7 vs H_1: theta != 0.7
ber_errorI(0.45,n=100,theta0=0.7,R=20000)
```

---

exp_c_opt — *Critical Value Given a Nominal Error Type I Associated with a Exponential Distribution*

Description

`exp_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Exponential distribution.

Usage

```
exp_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 1,
  c1 = 0.001,
  c2 = 0.99,
  R = 15000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Exponential distribution. Default value is 0.5.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 15000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 200 from a Exponential distribution
# given a nominal error type I equals to 0.1 and R = 15000
# to test H_0: theta = 2 vs H_1: theta != 2
exp_c_opt(alpha=0.1,n=200,theta0=2,R=15000)
```

`exp_errorI` *Empirical Error Type I Associated with an Exponential Distribution*

Description

`exp_errorI` is used to obtain an empirical error type I when we use a random sample from an Exponential distribution.

Usage

```
exp_errorI(c = 1, n = 100, theta0 = 1, R = 15000)
```

Arguments

`c`	numeric, represents a positive value that defines a critical region. Default value is 1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from an Exponential distribution. Default value is 1.
`R`	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 200 from an Exponential distribution,
# a critical value c = 0.24 and R = 20000 to test H_0: theta = 2 vs H_1: theta != 2
exp_errorI(c=0.24,n=200,theta0=2,R=20000)
```

---

gamma_c_opt — *Critical Value Given a Nominal Error Type I Associated with a Gamma Distribution*

Description

`gamma_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Gamma distribution.

Usage

```
gamma_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 1,
  beta = 1,
  c1 = 0.001,
```

```
  c2 = 0.999,
  R = 1000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents a location under the null hypothesis of a sample from a Gamma distribution. Default value is 1.
`beta`	numeric, represents the scale parameter of a Gamma distribution. It is assumed known and its default value is 1.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 1000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 50 from a Gamma distribution
# given a nominal error type I equals to 0.1 and R = 100
# to test H_0: theta = 3 vs H_1: theta != 3
gamma_c_opt(alpha=0.1,n=50,theta0=3,beta=1,R=100)
```

gamma_errorI — *Empirical Error Type I Associated with a Gamma Distribution*

Description

gamma_errorI is used to obtain an empirical error type I when we use a random sample from a Gamma distribution.

Usage

```
gamma_errorI(c = 1, n = 150, theta0 = 1, beta = 1, R = 15000)
```

Arguments

c	numeric, represents a positive value that defines a critical region. Default value is 1.
n	numeric, represents the size of the sample. Default value is 100.
theta0	numeric, represents the shape parameter under the null hypothesis of a sample from a Gamma distribution. Default value is 1.
beta	numeric, represents the scale parameter of a Gamma distribution. It is assumed known and its default value is 1.
R	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 120 from a Gamma distribution,
# a critical value c = 0.5 and R = 200 to test H_0: theta = 1.5 vs H_1: theta != 1.5
gamma_errorI(0.5,n=120,theta0=1.5,R=200)
```

geom_c_opt *Critical Value Given a Nominal Error Type I Associated with a Geometric Distribution*

Description

geom_c_opt is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Geometric distribution.

Usage

```
geom_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 0.5,
  c1 = 0.001,
  c2 = 0.999,
  R = 15000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

alpha	numeric, represents a nominal error type I. Default value is 0.1.
n	numeric, represents the size of the sample. Default value is 100.
theta0	numeric, represents the probability parameter under the null hypothesis of a sample from a Geometric distribution. Default value is 0.5.
c1	numeric, represents a lower bound to the critical value. Default value is 1e-03.
c2	numeric, represents an upper bound to the critical value. Default value is 0.99.
R	numeric, represents the number of replicates. Default value is 15000.
delta	numeric, represents a precision parameter. Default value is 0.005.
tolerance	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
max_iter	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 80 from a Geometric distribution
# given a nominal error type I equals to 0.1 and R = 10000
# to test H_0: theta = 0.25 vs H_1: theta != 0.25
geom_c_opt(alpha=0.1,n=80,theta0=0.25,R=10000)
```

---

geom_errorI *Empirical Error Type I Associated with a Geometric Distribution*

Description

geom_errorI is used to obtain an empirical error type I when we use a random sample from a Geometric distribution.

Usage

```
geom_errorI(c = 1, n = 150, theta0 = 0.5, R = 15000)
```

Arguments

c	numeric, represents a positive value that defines a critical region. Default value is 1.
n	numeric, represents the size of the sample. Default value is 100.
theta0	numeric, represents the probability parameter under the null hypothesis of a sample from a Geometric distribution. Default value is 0.5.
R	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 60 from a Geometric distribution,
# a critical value c = 0.01 and R = 20000 to test H_0: theta = 0.5 vs H_1: theta != 0.5
geom_errorI(0.01,n=60,theta0=0.5,R=20000)
```

`gumbel_c_opt` *Critical Value Given a Nominal Error Type I Associated with a Gumbel Distribution*

Description

`gumbel_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Gumbel distribution.

Usage

```
gumbel_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 1,
  sigma = 1,
  c1 = 0.001,
  c2 = 0.999,
  R = 1000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents a location under the null hypothesis of a sample from a Gumbel distribution. Default value is 0.5.
`sigma`	numeric, represents the scale parameter of a Gumbel distribution. It is assumed known and its default value is 1.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 1000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 50 from a Gumbel distribution
# given a nominal error type I equals to 0.1 and R = 100
# to test H_0: theta = 3 vs H_1: theta != 3
gumbel_c_opt(alpha=0.1,n=50,theta0=3,sigma=1,R=100)
```

---

gumbel_errorI *Empirical Error Type I Associated with a Gumbel Distribution*

Description

`gumbel_errorI` is used to obtain an empirical error type I when we use a random sample from a Gumbel distribution.

Usage

```
gumbel_errorI(c = 1, n = 150, theta0 = 0, sigma = 1, R = 15000)
```

Arguments

`c`	numeric, represents a positive value that defines a critical region. Default value is 1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Gumbel distribution. Default value is 0.
`sigma`	numeric, represents the scale parameter of a Gumbel distribution. It is assumed known and its default value is 1.
`R`	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 150 from a Gumbel distribution,
# a critical value c = 0.5 and R = 500 to test H_0: theta = 3 vs H_1: theta != 3
library(gamlss.dist)
gumbel_errorI(0.5,n=150,theta0=3,R=500)
```

---

invnormal_c_opt — *Critical Value Given a Nominal Error Type I Associated with a Inverse Normal Distribution*

Description

`invnormal_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Inverse Normal distribution.

Usage

```
invnormal_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 1,
  sigma = 1,
  c1 = 0.001,
  c2 = 0.999,
  R = 1000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents a location under the null hypothesis of a sample from a Inverse Normal distribution. Default value is 0.5.
`sigma`	numeric, represents the scale parameter of a Inverse Normal distribution. It is assumed known and its default value is 1.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 1000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 40 from a Inverse Normal distribution
# given a nominal error type I equals to 0.1 and R = 80
# to test H_0: theta = 3 vs H_1: theta != 3
invnormal_c_opt(alpha=0.1,n=40,theta0=3,sigma=1,R=80)
```

`invnormal_errorI` *Empirical Error Type I Associated with a Inverse Normal Distribution*

Description

`invnormal_errorI` is used to obtain an empirical error type I when we use a random sample from a Inverse Normal distribution.

Usage

```
invnormal_errorI(c = 1, n = 150, theta0 = 1, sigma = 1, R = 15000)
```

Arguments

`c`	numeric, represents a positive value that defines a critical region. Default value is 1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Inverse Normal distribution. Default value is 1.
`sigma`	numeric, represents the scale parameter of a Inverse Normal distribution. It is assumed known and its default value is 1.
`R`	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 50 from a Inverse Normal distribution,
# a critical value c = 0.5 and R = 100 to test H_0: theta = 3 vs H_1: theta != 3
library(gamlss.dist)
invnormal_errorI(0.5,n=50,theta0=3,R=100)
```

`lognorm_c_opt` *Critical Value Given a Nominal Error Type I Associated with a Log Normal Distribution*

Description

`lognorm_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Log Normal distribution.

Usage

```
lognorm_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 1,
  sdlog = 1,
  c1 = 0.001,
  c2 = 0.999,
  R = 1000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents a location under the null hypothesis of a sample from a Log Normal distribution. Default value is 1.
`sdlog`	numeric, represents the scale parameter of a Log Normal distribution. It is assumed known and its default value is 1.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 1000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 100 from a Log Normal distribution
# given a nominal error type I equals to 0.1 and R = 200
# to test H_0: theta = 3 vs H_1: theta != 3
lognorm_c_opt(alpha=0.1,n=100,theta0=3,sdlog=1,R=200)
```

---

lognorm_errorI *Empirical Error Type I Associated with a Log Normal Distribution*

Description

`lognorm_errorI` is used to obtain an empirical error type I when we use a random sample from a Log Normal distribution.

Usage

```
lognorm_errorI(c, n = 150, theta0 = 0, sdlog = 1, R = 15000)
```

Arguments

`c`	numeric, represents a positive value that defines a critical region. Default value is 1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the natural logarithm of location parameter under the null hypothesis of a sample from a Log Normal distribution. Default value is 0.
`sdlog`	numeric, represents the natural logarithm of scale parameter of a Log normal distribution. It is assumed known and its default value is 1.
`R`	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 50 from an Log Normal distribution,
# a critical value c = 0.5 and R = 500 to test H_0: theta = 0 vs H_1: theta != 0
lognorm_errorI(c=0.5,n=50,theta0=0,sdlog=1,R=500)
```

---

norm_c_opt *Critical Value Given a Nominal Error Type I Associated with a Normal Distribution*

Description

norm_c_opt is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Normal distribution.

Usage

```
norm_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 0,
  sd = 1,
  c1 = 0.001,
  c2 = 0.999,
  R = 15000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

alpha	numeric, represents a nominal error type I. Default value is 0.1.
n	numeric, represents the size of the sample. Default value is 100.
theta0	numeric, represents the probability parameter under the null hypothesis of a sample from a Normal distribution. Default value is 0.5.
sd	numeric, represents the scale parameter of a]Normal distribution. It is assumed known and its default value is 1.
c1	numeric, represents a lower bound to the critical value. Default value is 1e-03.
c2	numeric, represents an upper bound to the critical value. Default value is 0.99.

R	numeric, represents the number of replicates. Default value is 15000.
delta	numeric, represents a precision parameter. Default value is 0.005.
tolerance	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
max_iter	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 100 from a Normal distribution
# given a nominal error type I equals to 0.1 and R = 10000
# to test H_0: theta = 0 vs H_1: theta != 0
norm_c_opt(alpha=0.1,n=100,theta0=0,sd=1,R=10000)
```

---

norm_errorI *Empirical Error Type I Associated with a Normal Distribution*

Description

norm_errorI is used to obtain an empirical error type I when we use a random sample from a Normal distribution.

Usage

```
norm_errorI(c = 1, n = 100, theta0 = 0, sd = 1, R = 15000)
```

Arguments

c	numeric, represents a positive value that defines a critical region. Default value is 1.
n	numeric, represents the size of the sample. Default value is 100.
theta0	numeric, represents the location parameter under the null hypothesis of a sample from a Normal distribution. Default value is 0.
sd	numeric, represents the scale parameter of a Normal distribution. It is assumed known and its default value is 1.
R	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 70 from an Normal distribution,
# a critical value c = 0.65 and R = 20000 to test H_0: theta = 0 vs H_1: theta != 0
norm_errorI(0.65,70,theta0=0,sd=1,R=20000)
```

---

pois_c_opt   *Critical Value Given a Nominal Error Type I Associated with a Poisson Distribution*

Description

pois_c_opt is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Poisson distribution.

Usage

```
pois_c_opt(
  alpha = 0.1,
  n = 150,
  theta0 = 1,
  c1 = 0.001,
  c2 = 0.99,
  R = 15000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Poisson distribution. Default value is 1.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 15000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 200 from a Poisson distribution
# given a nominal error type I equals to 0.1 and R = 15000
# to test H_0: theta = 2 vs H_1: theta != 2
pois_c_opt(alpha=0.1,n=200,theta0=2,R=15000)
```

`pois_errorI` *Empirical Error Type I Associated with a Poisson Distribution*

Description

`pois_errorI` is used to obtain an empirical error type I when we use a random sample from a Poisson distribution.

Usage

```
pois_errorI(c = 1, n = 100, theta0 = 1, R = 15000)
```

Arguments

`c`	numeric, represents a positive value that defines a critical region. Default value is 1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents the location parameter under the null hypothesis of a sample from a Poisson distribution. Default value is 1.
`R`	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 200 from an Poisson distribution,
# a critical value c = 0.85 and R = 20000 to test H_0: theta = 2 vs H_1: theta != 2
pois_errorI(0.85,n=100,theta0=2,R=20000)
```

`weibull_c_opt` *Critical Value Given a Nominal Error Type I Associated with a Weibull Distribution*

Description

`weibull_c_opt` is used to obtain a critical value to achieve a nominal error type I when we use a random sample from a Weibull distribution.

Usage

```
weibull_c_opt(
  alpha = 0.1,
  n = 100,
  theta0 = 1,
  sigma = 1,
  c1 = 0.001,
  c2 = 0.999,
  R = 1000,
  delta = 0.005,
  tolerance = 0.01,
  max_iter = 100
)
```

Arguments

`alpha`	numeric, represents a nominal error type I. Default value is 0.1.
`n`	numeric, represents the size of the sample. Default value is 100.
`theta0`	numeric, represents a location under the null hypothesis of a sample from a Weibull distribution. Default value is 0.5.
`sigma`	numeric, represents the scale parameter of a Weibull distribution. It is assumed known and its default value is 1.
`c1`	numeric, represents a lower bound to the critical value. Default value is 1e-03.
`c2`	numeric, represents an upper bound to the critical value. Default value is 0.99.
`R`	numeric, represents the number of replicates. Default value is 1000.
`delta`	numeric, represents a precision parameter. Default value is 0.005.
`tolerance`	numeric, represents a relative precision with respect a given alpha. Default value is 0.01.
`max_iter`	integer, represents the maximum number of iterations. Default value is 100.

Value

A list with number of replicates, sample size, nominal error type I, and empirical critical value obtained associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Critical value when we use a random sample of size 50 from a Weibull distribution
# given a nominal error type I equals to 0.1 and R = 100
# to test H_0: theta = 3 vs H_1: theta != 3
weibull_c_opt(alpha=0.1,n=50,theta0=3,sigma=1,R=100)
```

---

weibull_errorI *Empirical Error Type I Associated with a Weibull Distribution*

Description

`weibull_errorI` is used to obtain an empirical error type I when we use a random sample from a Weibull distribution.

Usage

```
weibull_errorI(c = 1, n = 150, theta0 = 1, sigma = 1, R = 15000)
```

Arguments

c	numeric, represents a positive value that defines a critical region. Default value is 1.
n	numeric, represents the size of the sample. Default value is 100.
theta0	numeric, represents the location parameter under the null hypothesis of a sample from a Weibull distribution. Default value is 1.
sigma	numeric, represents the scale parameter of a Weibull distribution. It is assumed known and its default value is 1.
R	numeric, represents the number of replicates. Default value is 15000.

Value

A list with number of replicates, sample size, and critical value that were used in the calculation of error type I associated with a likelihood ratio statistic.

Author(s)

Carlos Alberto Cardozo Delgado <cardozorpackages@gmail.com>.

References

Casella, G. and Berger, R. (2003). Statistical Inference, Second Edition. Duxbury Press.

Hogg, R., McKean, J., and Craig, A. (2019) Introduction to Mathematical Statistic. Eighth edition. Pearson.

Examples

```
# Error type I when we use a random sample of size 150 from a Weibull distribution,
# a critical value c = 0.5 and R = 500 to test H_0: theta = 3 vs H_1: theta != 3
library(gamlss.dist)
weibull_errorI(0.5,n=150,theta0=3,R=500)
```

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