Package 'ComRiskModel'

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Type Package

Title Fitting of Complementary Risk Models

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Depends R (>= 2.0)

Imports AdequacyModel, graphics, stats

Description Evaluates the probability density function (PDF), cumulative distribution function (CDF), quantile function (QF), random numbers and maximum likelihood estimates (MLEs) of well-known complementary binomial-G, complementary negative binomial-G and complementary geometric-G families of distributions taking baseline models such as exponential, extended exponential, Weibull, extended Weibull, Fisk, Lomax, Burr-XII and Burr-X. The functions also allow computing the goodness-of-fit measures namely the Akaike-information-criterion (AIC), the Bayesian-information-criterion (BIC), the minimum value of the negative log-likelihood (-2L) function, Anderson-Darling (A) test, Cramer-Von-Mises (W) test, Kolmogorov-Smirnov test, P-value and convergence status. Moreover, some commonly used data sets from the fields of actuarial, reliability, and medical science are also provided. Related works include:
a) Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35. <doi:10.1186/s40488-016-0052-1>.

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`ComRiskModel-package` *Fitting of Complementary risk models*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs of eight well-known probability distributions in connection with complementary G binomial, complementary G negative binomial and complementary G geomatric family of distributions. Moreover, some commonly used data sets from the fields of actuarial, reliability, and medical science are also provided.

Details

Package:	ComRiskModel
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Maintainers

Muhammad Imran <imranshakoor84@yahoo.com>

Author(s)

Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35. <doi.org/10.1186/s40488-016-0052-1>.

`Actuarial data` *The mortality of retired people*

Description

The function allows to provide the distributional behavior of the mortality of retired people on disability of the Mexican Institute of Social Security.

Usage

```
data_actuarialm
```

Arguments

`data_actuarialm`
A vector of (non-negative integer) values.

Details

The data describes the distributional behavior of the mortality of retired people on disability of the Mexican Institute of Social Security. Recently, it is used by Tahir et al. (2021) and fitted the Kumaraswamy Pareto IV distribution.

Value

data_actuarialm gives the mortality of retired people.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., Cordeiro, G. M., Mansoor, M., Zubair, M., & Alzaatreh, A. (2021). The Kumaraswamy Pareto IV Distribution. Austrian Journal of Statistics, 50(5), 1-22.

Balakrishnan, N., Leiva, V., Sanhueza, A., & Cabrera, E. (2009). Mixture inverse Gaussian distributions and its transformations, moments and applications. Statistics, 43(1), 91-104.

Examples

```
x<-data_actuarialm
summary(x)
```

Acute Bone Cancer *The survival times of 73 patients with acute bone cancer*

Description

The function allows to provide the survival times (in days) of 73 patients who diagnosed with acute bone cancer.

Usage

```
data_acutebcancer
```

Arguments

`data_acutebcancer`
A vector of (non-negative integer) values.

Details

The data represents the survival times (in days) of 73 patients who diagnosed with acute bone cancer. Recently, the data set is used by Klakattawi, H. S. (2022) and fitted a new extended Weibull distribution.

Value

data_acutebcancer gives the survival times (in days) of 73 patients who diagnosed with acute bone cancer.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Klakattawi, H. S. (2022). Survival analysis of cancer patients using a new extended Weibull distribution. Plos one, 17(2), e0264229.

Alanzi, A. R., Imran, M., Tahir, M. H., Chesneau, C., Jamal, F., Shakoor, S., & Sami, W. (2023). Simulation analysis, properties and applications on a new Burr XII model based on the Bell-X functionalities.

Mansour, M., Yousof, H. M., Shehata, W. A., & Ibrahim, M. (2020). A new two parameter Burr XII distribution: properties, copula, different estimation methods and modeling acute bone cancer data. Journal of Nonlinear Science and Applications, 13(5), 223-238.

Examples

```
x<-data_acutebcancer
summary(x)
```

Air Conditioning Failure

The data set consists of the failure times of the air conditioning system of an airplane (in hours)

Description

The function allows to provide the failure times of the air conditioning system of an airplane (in hours).

Usage

```
data_acfailure
```

Arguments

`data_acfailure` A vector of (non-negative integer) values.

Details

The data set consists of the failure times of the air conditioning system of an airplane (in hours). Recently, it is used by Bantan et al. (2020) and fitted the unit-Rayleigh distribution.

Value

data_acfailure gives the failure times of the air conditioning system of an airplane (in hours).

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Bantan, R. A., Chesneau, C., Jamal, F., Elgarhy, M., Tahir, M. H., Ali, A., ... & Anam, S. (2020). Some new facts about the unit-Rayleigh distribution with applications. Mathematics, 8(11), 1954.

Linhart, H., & Zucchini, W. (1986). Model selection. John Wiley & Sons.

Examples

```
x<-data_acfailure
summary(x)
```

Air Conditioning Failure Unit Interval

The unit interval data set consists of the failure times of the air conditioning system of an airplane (in hours)

Description

The function allows to provide the unit interval failure times of the air conditioning system of an airplane (in hours).

Usage

```
data_acfailureunit
```

Arguments

`data_acfailureunit`
: A vector of (non-negative integer) values.

Details

The unit interval data set consists of the failure times of the air conditioning system of an airplane (in hours). Recently, it is used by Bantan et al. (2020) and fitted the unit-Rayleigh distribution.

Value

data_acfailureunit gives the failure times of the air conditioning system of an airplane (in hours).

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Bantan, R. A., Chesneau, C., Jamal, F., Elgarhy, M., Tahir, M. H., Ali, A., ... & Anam, S. (2020). Some new facts about the unit-Rayleigh distribution with applications. Mathematics, 8(11), 1954.

Linhart, H., & Zucchini, W. (1986). Model selection. John Wiley & Sons.

Examples

```
x<-data_acfailureunit
summary(x)
```

`Airborne Variations` *Variations in airborne exposure on the concentration of urinary metabolites*

Description

The function allows to provide the effects of variations in airborne exposure on the concentration of urinary metabolites.

Usage

```
data_airborne
```

Arguments

`data_airborne` A vector of (non-negative integer) values.

Details

The data relates to the effects of variations in airborne exposure on the concentration of urinary metabolites. Recently, it is used by Peter et al. (2021) and fitted the Gamma odd Burr III-G family of distributions.

Value

data_airborne gives the effects of variations in airborne exposure on the concentration of urinary metabolites.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Peter, P. O., Oluyede, B., Bindele, H. F., Ndwapi, N., & Mabikwa, O. (2021). The Gamma Odd Burr III-G Family of Distributions: Model, Properties and Applications. Revista Colombiana de Estadistica, 44(2), 331-368.

Kumagai, S., & Matsunaga, I. (1995). Physiologically based pharmacokinetic model for acetone. Occupational and environmental medicine, 52(5), 344-352.

Examples

```
x<-data_airborne
summary(x)
```

`CB12Bio distribution` *Complementary Burr-12 binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Burr-12 binomial (CB12Bio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,, \, m \geq 1,$$

where G(x) represents the CDF of the baseline Burr-12 distribution, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{a}\right)^b\right]^{-k}; \qquad a, b, k > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CB12Bio distribution.

Usage

```
dCB12Bio(x, a, b, k, m, lambda, log = FALSE)
pCB12Bio(x, a, b, k, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCB12Bio(p, a, b, k, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCB12Bio(n, a, b, k, m, lambda)
mCB12Bio(x, a, b, k, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) values.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CB12Bio distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0, 1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`a`	The strictly positive scale parameter of the baseline Burr-12 distribution ($a > 0$).
`b`	The strictly positive shape parameter of the baseline Burr-12 distribution ($b > 0$).
`k`	The strictly positive shape parameter of the baseline Burr-12 distribution ($k > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CB12Bio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CB12Bio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCB12Bio gives the (log) probability function. pCB12Bio gives the (log) distribution function. qCB12Bio gives the quantile function. rCB12Bio generates random values. mCB12Bio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>` and M.H Tahir `<mht@iub.edu.pk>`.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Zimmer, W. J., Keats, J. B., & Wang, F. K. (1998). The Burr XII distribution in reliability analysis. Journal of quality technology, 30(4), 386-394.

See Also

pCB12Geo

Examples

```
x<-data_guineapigs
rCB12Bio(20,2,0.4,1.2,2,0.7)
dCB12Bio(x,2,1,2,2,0.3)
pCB12Bio(x,2,1,2,2,0.3)
qCB12Bio(0.7,2,1,2,2,0.7)
mCB12Bio(x,0.7,0.1,0.2,0.7,0.7, method="B")
```

CB12Geo distribution *Complementary Burr-12 geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Burr-12 geomatric (CB12Geo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\, G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline Burr-12 CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{a}\right)^{b}\right]^{-k}; \qquad a, b, k > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CB12Geo distribution.

Usage

```
dCB12Geo(x, a, b, k, lambda, log = FALSE)
pCB12Geo(x, a, b, k, lambda, log.p = FALSE, lower.tail = TRUE)
qCB12Geo(p, a, b, k, lambda, log.p = FALSE, lower.tail = TRUE)
rCB12Geo(n, a, b, k, lambda)
mCB12Geo(x, a, b, k, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) values.
p	A vector of probablities.
n	The number of random values to be generated under the CB12Geo distribution.
lambda	The strictly positive parameter of the geomatric distribution $\lambda \in (0,1)$.
a	The strictly positive scale parameter of the baseline Burr-12 distribution ($a > 0$).
b	The strictly positive shape parameter of the baseline Burr-12 distribution ($b > 0$).

k	The strictly positive shape parameter of the baseline Burr-12 distribution ($k > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CB12Geo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CB12Geo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCB12Geo gives the (log) probability function. pCB12Geo gives the (log) distribution function. qCB12Geo gives the quantile function. rCB12Geo generates random values. mCB12Geo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Zimmer, W. J., Keats, J. B., & Wang, F. K. (1998). The Burr XII distribution in reliability analysis. Journal of quality technology, 30(4), 386-394.

See Also

pCB12Geo

Examples

```
x<-data_airborne
rCB12Geo(20,2,0.4,1.2,0.2)
dCB12Geo(x,2,1,2,0.3)
pCB12Geo(x,2,1,2,0.3)
qCB12Geo(0.7,2,1,2,0.4)
mCB12Geo(x,1.72,0.2,0.2,0.1, method="B")
```

CB12NB distribution *Complementary Burr-12 negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Burr-12 negative binomial (CB12NB) distribution. The CDF of the complementary G negative binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s} - 1}{(1-\lambda)^{-s} - 1}; \qquad \lambda \in (0,1)\,, s > 0,$$

where G(x) represents the baseline Burr-12 CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{a}\right)^{b}\right]^{-k}; \qquad a, b, k > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CB12NB distribution.

Usage

```
dCB12NB(x, a, b, k, s, lambda, log = FALSE)
pCB12NB(x, a, b, k, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCB12NB(p, a, b, k, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCB12NB(n, a, b, k, s, lambda)
mCB12NB(x, a, b, k, s, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) values.
p	A vector of probablities.
n	The number of random values to be generated under the CB12NB distribution.
lambda	The strictly positive parameter of the negative binomial distribution $\lambda \in (0, 1)$.
s	The positive parameter of the negative binomial distribution $s > 0$.
a	The strictly positive scale parameter of the baseline Burr-12 distribution ($a > 0$).
b	The strictly positive shape parameter of the baseline Burr-12 distribution ($b > 0$).
k	The strictly positive shape parameter of the baseline Burr-12 distribution ($k > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CB12NB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CB12NB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCB12NB gives the (log) probability function. pCB12NB gives the (log) distribution function. qCB12NB gives the quantile function. rCB12NB generates random values. mCB12NB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Zimmer, W. J., Keats, J. B., & Wang, F. K. (1998). The Burr XII distribution in reliability analysis. Journal of quality technology, 30(4), 386-394.

See Also

pCB12Geo

Examples

```
x<-data_actuarialm
rCB12NB(20,2,0.4,1.2,2,0.2)
dCB12NB(x,2,1,2,2,0.3)
pCB12NB(x,2,1,2,2,0.3)
qCB12NB(0.7,2,1,2,2,0.4)
mCB12NB(x, 2,1,0.2,0.2,0.4, method="B")
```

CBXBio distribution *Complementary Burr-X binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Burr-X binomial (CBXBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,,\, m \geq 1,$$

where G(x) represents the baseline Burr-X CDF, it is given by

$$G(x) = \left[1 - \exp\left(-x^2\right)\right]^a; \qquad a > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CBXBio distribution.

Usage

```
dCBXBio(x, a, m, lambda, log = FALSE)
pCBXBio(x, a, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCBXBio(p, a, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCBXBio(n, a, m, lambda)
mCBXBio(x, a, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CBXBio distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0, 1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`a`	The strictly positive shape parameter of the baseline Burr-X distribution ($a > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CBXBio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CBXBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCBXBio gives the (log) probability function. pCBXBio gives the (log) distribution function. qCBXBio gives the quantile function. rCBXBio generates random values. mCBXBio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

dCB12Geo

Examples

```
x<-data_guineapigs
dCBXBio(x,2,2,0.3)
pCBXBio(x,2,2,0.4)
qCBXBio(0.7,2,2,0.7)
mCBXBio(x,0.2,2,0.3, method="B")
```

CBXGeo distribution *Complementary Burr-X geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Burr-X geomatric (CBXGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\, G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline Burr-X CDF, it is given by

$$G(x) = \left[1 - \exp\left(-x^2\right)\right]^a; \qquad a > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CBXGeo distribution.

Usage

```
dCBXGeo(x, a, lambda, log = FALSE)
pCBXGeo(x, a, lambda, log.p = FALSE, lower.tail = TRUE)
qCBXGeo(p, a, lambda, log.p = FALSE, lower.tail = TRUE)
rCBXGeo(n, a, lambda)
mCBXGeo(x, a, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the CBXGeo distribution.
lambda	The strictly positive parameter of the geomatric distribution $\lambda \in (0, 1)$.
a	The strictly positive shape parameter of the baseline Burr-X distribution ($a > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CBXGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CBXGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCBXGeo gives the (log) probability function. pCBXGeo gives the (log) distribution function. qCBXGeo gives the quantile function. rCBXGeo generates random values. mCBXGeo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

dCB12Geo

Examples

```
x<-data_guineapigs
dCBXGeo(x,2,0.3)
pCBXGeo(x,2,0.4)
qCBXGeo(0.7,2,0.7)
mCBXGeo(x,0.2,0.3, method="B")
```

CBXNB distribution *Complementary Burr-X negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Burr-X negative binomial (CBXNB) distribution. The CDF of the complementary G negative binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s}-1}{(1-\lambda)^{-s}-1}; \qquad \lambda \in (0,1)\,, s>0,$$

where G(x) represents the baseline Burr-X CDF, it is given by

$$G(x) = \left[1-\exp\left(-x^2\right)\right]^a; \qquad a>0.$$

By setting G(x) in the above Equation, yields the CDF of the CBXNB distribution.

Usage

```
dCBXNB(x, a, s, lambda, log = FALSE)
pCBXNB(x, a, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCBXNB(p, a, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCBXNB(n, a, s, lambda)
mCBXNB(x, a, s, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CBXNB distribution.
`lambda`	The strictly positive parameter of the negative binomial distribution $\lambda \in (0,1)$.
`s`	The positive parameter of the negative binomial distribution ($s>0$).
`a`	The strictly positive shape parameter of the baseline Burr-X distribution ($a>0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CBXNB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CBXNB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCBXNB gives the (log) probability function. pCBXNB gives the (log) distribution function. qCBXNB gives the quantile function. rCBXNB generates random values. mCBXNB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

dCB12Bio

Examples

```
x<-rCBXNB(500,1.5,1.2,0.8)
dCBXNB(x,2,2,0.3)
pCBXNB(x,2,2,0.4)
qCBXNB(0.7,2,2,0.7)
mCBXNB(x,4,0.2,0.3, method="B")
```

CEEBio distribution *Complementary exponentiated exponential binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponentiated exponential binomial (CEEBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,,\, m \geq 1,$$

where G(x) represents the baseline exponentiated exponential CDF, it is given by

$$G(x) = (1-\exp(-\alpha x))^{\beta}\,; \qquad \alpha, \beta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CEEBio distribution.

Usage

```
dCEEBio(x, alpha, beta, m, lambda, log = FALSE)
pCEEBio(x, alpha, beta, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCEEBio(p, alpha, beta, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCEEBio(n, alpha, beta, m, lambda)
mCEEBio(x, alpha, beta, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CEEBio distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0, 1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`alpha`	The strictly positive scale parameter of the baseline exponentiated exponential distribution ($\alpha > 0$).
`beta`	The strictly positive shape parameter of the baseline exponentiated exponential distribution ($\beta > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CEEBio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CEEBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCEEBio gives the (log) probability function. pCEEBio gives the (log) distribution function. qCEE-Bio gives the quantile function. rCEEBio generates random values. mCEEBio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Bakouch, H. S., Ristic, M. M., Asgharzadeh, A., Esmaily, L., & Al-Zahrani, B. M. (2012). An exponentiated exponential binomial distribution with application. Statistics & Probability Letters, 82(6), 1067-1081.

Nadarajah, S. (2011). The exponentiated exponential distribution: a survey. AStA Advances in Statistical Analysis, 95, 219-251.

See Also

pCEEGeo

Examples

```
x<-data_guineapigs
rCEEBio(20,2,1,2,0.1)
dCEEBio(x,2,1,2,0.2)
pCEEBio(x,2,1,2,0.2)
qCEEBio(0.7,2,1,2,0.2)
mCEEBio(x,0.7,1,2,0.12, method="B")
```

CEEGeo distribution *Complementary exponentiated exponential geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponentiated exponential geomatric (CEEGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\,G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline exponentiated exponential CDF, it is given by

$$G(x) = \left(1-\exp(-\alpha x)\right)^{\beta}; \qquad \alpha,\beta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CEEGeo distribution.

Usage

```
dCEEGeo(x, alpha, beta, lambda, log = FALSE)
pCEEGeo(x, alpha, beta, lambda, log.p = FALSE, lower.tail = TRUE)
qCEEGeo(p, alpha, beta, lambda, log.p = FALSE, lower.tail = TRUE)
rCEEGeo(n, alpha, beta, lambda)
mCEEGeo(x, alpha, beta, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CEEGeo distribution.
`lambda`	The strictly positive parameter of the geomatric distribution $\lambda \in (0, 1)$.
`alpha`	The strictly positive scale parameter of the baseline exponentiated exponential distribution ($\alpha > 0$).
`beta`	The strictly positive shape parameter of the baseline exponentiated exponential distribution ($\beta > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CEEGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CEEGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCEEGeo gives the (log) probability function. pCEEGeo gives the (log) distribution function. qCEEGeo gives the quantile function. rCEEGeo generates random values. mCEEGeo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>` and M.H Tahir `<mht@iub.edu.pk>`.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Louzada, F., Marchi, V., & Carpenter, J. (2013). The complementary exponentiated exponential geometric lifetime distribution. Journal of Probability and Statistics, 2013.

Nadarajah, S. (2011). The exponentiated exponential distribution: a survey. AStA Advances in Statistical Analysis, 95, 219-251.

See Also

pCExpGeo

Examples

```
x<-rCEEGeo(20,2,1,0.1)
dCEEGeo(x,2,1,0.2)
pCEEGeo (x,2,1,0.2)
qCEEGeo (0.7,2,1,0.2)
mCEEGeo(x,0.2,0.1,0.2, method="B")
```

CEENB distribution — *Complementary exponentiated exponential negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponentiated exponential negative binomial (CEENB) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s} - 1}{(1-\lambda)^{-s} - 1}; \qquad \lambda \in (0,1)\,, s > 0,$$

where G(x) represents the baseline exponentiated exponential CDF, it is given by

$$G(x) = (1-\exp(-\alpha x))^{\beta}\,; \qquad \alpha, \beta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CEENB distribution.

Usage

```
dCEENB(x, alpha, beta, s, lambda, log = FALSE)
pCEENB(x, alpha, beta, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCEENB(p, alpha, beta, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCEENB(n, alpha, beta, s, lambda)
mCEENB(x, alpha, beta, s, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CEENB distribution.
`lambda`	The strictly positive parameter of the negative binomial distribution $\lambda \in (0, 1)$.
`s`	The positive parameter of the negative binomial distribution $s > 0$.
`alpha`	The strictly positive scale parameter of the baseline exponentiated exponential distribution ($\alpha > 0$).
`beta`	The strictly positive shape parameter of the baseline exponentiated exponential distribution ($\beta > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CEENB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CEENB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCEENB gives the (log) probability function. pCEENB gives the (log) distribution function. qCEENB gives the quantile function. rCEENB generates random values. mCEENB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Bakouch, H. S., Ristic, M. M., Asgharzadeh, A., Esmaily, L., & Al-Zahrani, B. M. (2012). An exponentiated exponential binomial distribution with application. Statistics & Probability Letters, 82(6), 1067-1081.

Nadarajah, S. (2011). The exponentiated exponential distribution: a survey. AStA Advances in Statistical Analysis, 95, 219-251.

See Also

pCEEBio

Examples

```
x<-data_guineapigs
dCEENB(x,2,1,2,0.2)
pCEENB(x,2,1,2,0.2)
qCEENB(0.7,2,1,2,0.2)
mCEENB(x,2.2,0.4,0.2,0.2, method="B")
```

CEWBio distribution *Complementary exponentiated Weibull binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponentiated Weibull binomial (CEWBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,,\, m \geq 1,$$

where G(x) represents the baseline exponentiated Weibull CDF, it is given by

$$G(x) = \left(1-\exp(-\alpha x^\beta)\right)^\theta; \qquad \alpha, \beta, \theta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CEWBio distribution.

Usage

```
dCEWBio(x, alpha, beta, theta, m, lambda, log = FALSE)
pCEWBio(x, alpha, beta, theta, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCEWBio(p, alpha, beta, theta, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCEWBio(n, alpha, beta, theta, m, lambda)
mCEWBio(x, alpha, beta, theta, m, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the CEWBio distribution.
lambda	The strictly positive parameter of the binomial distribution $\lambda \in (0,1)$.
m	The positive parameter of the binomial distribution $m \geq 1$.
alpha	The strictly positive scale parameter of the baseline exponentiated Weibull distribution ($\alpha > 0$).

beta	The strictly positive shape parameter of the baseline exponentiated Weibull distribution ($\beta > 0$).
theta	The strictly positive shape parameter of the baseline exponentiated Weibull distribution ($\theta > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the Bell Burr-12 distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CEWBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCEWBio gives the (log) probability function. pCEWBio gives the (log) distribution function. qCEWBio gives the quantile function. rCEWBio generates random values. mCEWBio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Nadarajah, S., Cordeiro, G. M., & Ortega, E. M. (2013). The exponentiated Weibull distribution: a survey. Statistical Papers, 54, 839-877.

See Also

pCExpGeo

Examples

```
x<-data_guineapigs
dCEWBio(x,1,1,0.2,2,0.2)
pCEWBio(x,2,1,1.2,2,0.2)
qCEWBio(0.7,2,1,1.2,2,0.2)
mCEWBio(x,2.55,0.62,5.72,8.30,0.42, method="B")
```

CEWGeo distribution *Complementary exponentiated Weibull geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponentiated Weibull geomatric (CEWGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\,G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline exponentiated Weibull CDF, it is given by

$$G(x) = \left(1-\exp(-\alpha x^{\beta})\right)^{\theta}; \qquad \alpha, \beta, \theta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CEWGeo distribution.

Usage

```
dCEWGeo(x, alpha, beta, theta, lambda, log = FALSE)
pCEWGeo(x, alpha, beta, theta, lambda, log.p = FALSE, lower.tail = TRUE)
qCEWGeo(p, alpha, beta, theta, lambda, log.p = FALSE, lower.tail = TRUE)
rCEWGeo(n, alpha, beta, theta, lambda)
mCEWGeo(x, alpha, beta, theta, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the CEWGeo distribution.
lambda	The strictly positive parameter of the geomatric distribution $\lambda \in (0,1)$.
alpha	The strictly positive scale parameter of the baseline exponentiated Weibull distribution ($\alpha > 0$).
beta	The strictly positive shape parameter of the baseline exponentiated Weibull distribution ($\beta > 0$).
theta	The strictly positive shape parameter of the baseline exponentiated Weibull distribution ($\theta > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CEWGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CEWGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCEWGeo gives the (log) probability function. pCEWGeo gives the (log) distribution function. qCEWGeo gives the quantile function. rCEWGeo generates random values.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran `<imranshakoor84@yahoo.com>` and M.H Tahir `<mht@iub.edu.pk>`.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Mahmoudi, E., & Shiran, M. (2012). Exponentiated Weibull-geometric distribution and its applications. arXiv preprint arXiv:1206.4008.

Nadarajah, S., Cordeiro, G. M., & Ortega, E. M. (2013). The exponentiated Weibull distribution: a survey. Statistical Papers, 54, 839-877.

See Also

pCExpGeo

Examples

```
x<-data_guineapigs
dCEWGeo(x,1,1,0.2,0.2)
pCEWGeo(x,2,1,1.2,0.2)
qCEWGeo(0.7,2,1,1.2,0.2)
mCEWGeo(x,2,1,1.2,0.32, method="B")
```

`CEWNB distribution` *Complementary exponentiated Weibull negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponentiated Weibull negative binomial (CEWNB) distribution. The CDF of the complementary G negative binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s} - 1}{(1-\lambda)^{-s} - 1}; \qquad \lambda \in (0,1)\,, s > 0,$$

where G(x) represents the baseline exponentiated Weibull CDF, it is given by

$$G(x) = \left(1 - \exp(-\alpha x^{\beta})\right)^{\theta}; \qquad \alpha, \beta, \theta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CEWNB distribution.

Usage

```
dCEWNB(x, alpha, beta, theta, s, lambda, log = FALSE)
pCEWNB(x, alpha, beta, theta, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCEWNB(p, alpha, beta, theta, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCEWNB(n, alpha, beta, theta, s, lambda)
mCEWNB(x, alpha, beta, theta, s, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CEWNB distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0,1)$.
`s`	The positive parameter of the negative binomial distribution $s > 0$.
`alpha`	The strictly positive scale parameter of the baseline exponentiated Weibull distribution ($\alpha > 0$).
`beta`	The strictly positive shape parameter of the baseline exponentiated Weibull distribution ($\beta > 0$).
`theta`	The strictly positive shape parameter of the baseline exponentiated Weibull distribution ($\theta > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CEWNB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CEWNB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCEWNB gives the (log) probability function. pCEWNB gives the (log) distribution function. qCEWNB gives the quantile function. rCEWNB generates random values. mCEWNB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Nadarajah, S., Cordeiro, G. M., & Ortega, E. M. (2013). The exponentiated Weibull distribution: a survey. Statistical Papers, 54, 839-877.

See Also

pCExpBio

Examples

```
x<-rCEWNB(20,2,1,1.2,2,0.2)
dCEWNB(x,2,1,1.2,2,0.2)
pCEWNB(x,2,1,1.2,2,0.2)
qCEWNB(0.7,2,1,1.2,2,0.2)
mCEWNB(x,2,1,1.2,2,0.2, method="B")
```

CExpBio distribution *Complementary exponential binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponential binomial (CExpBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,,\, m \geq 1,$$

where G(x) represents the baseline exponential CDF, it is given by

$$G(x) = 1 - \exp(-\alpha x); \qquad \alpha > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CExpBio distribution.

Usage

```
dCExpBio(x, alpha, m, lambda, log = FALSE)
pCExpBio(x, alpha, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCExpBio(p, alpha, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCExpBio(n, alpha, m, lambda)
mCExpBio(x, alpha, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) values.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CExpBio distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0, 1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`alpha`	The strictly positive scale parameter of the baseline exponential distribution $(\alpha > 0)$.
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CExpBio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CExpBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCExpBio gives the (log) probability function. pCExpBio gives the (log) distribution function. qCExpBio gives the quantile function. rCExpBio generates random values.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

See Also

pCExpGeo

Examples

```
x<-data_guineapigs
rCExpBio(20,2,2,0.5)
dCExpBio(x,2,2,0.5)
pCExpBio(x,2,3,0.5)
qCExpBio(0.7, 2,3,0.5)
mCExpBio(x,1.402,2.52,0.04, method="B")
```

CExpGeo distribution *Complementary exponential geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponential geomatric (CExpGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\, G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline exponential CDF, it is given by

$$G(x) = 1 - \exp(-\alpha x); \qquad \alpha > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CExpGeo distribution.

Usage

```
dCExpGeo(x, alpha, lambda, log = FALSE)
pCExpGeo(x, alpha, lambda, log.p = FALSE, lower.tail = TRUE)
qCExpGeo(p, alpha, lambda, log.p = FALSE, lower.tail = TRUE)
rCExpGeo(n, alpha, lambda)
mCExpGeo(x, alpha, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) values.
p	A vector of probablities.
n	The number of random values to be generated under the CExpGeo distribution.
lambda	The strictly positive parameter of the geomatric distribution $\lambda \in (0,1)$.
alpha	The strictly positive scale parameter of the baseline exponential distribution ($\alpha > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).

log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CExpGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CExpGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCExpGeo gives the (log) probability function. pCExpGeo gives the (log) distribution function. qCExpGeo gives the quantile function. rCExpGeo generates random values. mCExpGeo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Louzada, F., Roman, M., & Cancho, V. G. (2011). The complementary exponential geometric distribution: Model, properties, and a comparison with its counterpart. Computational Statistics & Data Analysis, 55(8), 2516-2524.

See Also

pCExpGeo

Examples

```
x<-data_guineapigs
rCExpGeo(20,2,0.5)
dCExpGeo(x,2,0.5)
pCExpGeo(x,2,0.5)
qCExpGeo(0.7, 2,0.5)
mCExpGeo(x,2,0.5, method="B")
```

`CExpNB distribution` *Complementary exponential negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary exponential negative binomial (CExpNB) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s}-1}{(1-\lambda)^{-s}-1}; \qquad \lambda \in (0,1)\,, s>0,$$

where G(x) represents the baseline exponential CDF, it is given by

$$G(x) = 1-\exp(-\alpha x); \qquad \alpha > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CExpNB distribution.

Usage

```
dCExpNB(x, alpha, s, lambda, log = FALSE)
pCExpNB(x, alpha, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCExpNB(p, alpha, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCExpNB(n, alpha, s, lambda)
mCExpNB(x, alpha, s, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) values.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CExpBio distribution.
`lambda`	The strictly positive parameter of the negative binomial distribution $\lambda \in (0,1)$.
`s`	The positive parameter of the negative binomial distribution $s > 0$.
`alpha`	The strictly positive scale parameter of the baseline exponential distribution ($\alpha > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CExpNB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CExpNB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCExpNB gives the (log) probability function. pCExpNB gives the (log) distribution function. qCExpNB gives the quantile function. rCExpNB generates random values.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

See Also

pCExpGeo

Examples

```
x<-data_guineapigs
rCExpNB(20,2,2,0.5)
dCExpNB(x,2,2,0.5)
pCExpNB(x,2,3,0.5)
qCExpNB(0.7, 2,3,0.5)
mCExpNB(x,0.02,3.8,0.15, method="B")
```

CFBio distribution   *Complementary Fisk binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Fisk binomial (CFBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,,\, m \geq 1,$$

where G(x) represents the baseline Fisk CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{a}\right)^b\right]^{-1}; \qquad a, b > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CFBio distribution.

Usage

```
dCFBio(x, a, b, m, lambda, log = FALSE)
pCFBio(x, a, b, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCFBio(p, a, b, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCFBio(n, a, b, m, lambda)
mCFBio(x, a, b, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CFBio distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0, 1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`a`	The strictly positive scale parameter of the baseline Fisk distribution ($a > 0$).
`b`	The strictly positive shape parameter of the baseline Fisk distribution ($b > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CFBio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CFBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCFBio gives the (log) probability function. pCFBio gives the (log) distribution function. qCFBio gives the quantile function. rCFBio generates random values. mCFBio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

pCLGeo

Examples

```
x<-data_guineapigs
rCFBio(20,2,1,2,0.2)
dCFBio(x,2,1,1,0.3)
pCFBio(x,2,1,1,0.3)
qCFBio(0.7,2,1,1,0.2)
mCFBio(x,0.07,0.102,0.102,0.203, method="B")
```

CFGeo distribution — *Complementary Fisk geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Fisk geomatric (CFGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\, G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline Fisk CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{a}\right)^{b}\right]^{-1}; \qquad a, b > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CFGeo distribution.

Usage

```
dCFGeo(x, a, b, lambda, log = FALSE)
pCFGeo(x, a, b, lambda, log.p = FALSE, lower.tail = TRUE)
qCFGeo(p, a, b, lambda, log.p = FALSE, lower.tail = TRUE)
rCFGeo(n, a, b, lambda)
mCFGeo(x, a, b, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the CFGeo distribution.
lambda	The strictly positive parameter of the geomatric distribution $\lambda \in (0, 1)$.
a	The strictly positive scale parameter of the baseline Fisk distribution ($a > 0$).
b	The strictly positive shape parameter of the baseline Fisk distribution ($b > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CFGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CFGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCFGeo gives the (log) probability function. pCFGeo gives the (log) distribution function. qCFGeo gives the quantile function. rCFGeo generates random values. mCFGeo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

pCLGeo

Examples

```
x<-rCFGeo(20,2,1,0.7)
x
dCFGeo(x,2,1,0.1)
pCFGeo(x,2,1,0.1)
qCFGeo(0.7,2,1,0.1)
mCFGeo(x,0.2,0.1,0.1, method="B")
```

CFNB distribution *Complementary Fisk negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Fisk negative binomial (CFNB) distribution. The CDF of the complementary G negative binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s} - 1}{(1-\lambda)^{-s} - 1}; \qquad \lambda \in (0,1)\,, s > 0,$$

where G(x) represents the baseline Fisk CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{a}\right)^{b}\right]^{-1}; \qquad a, b > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CFNB distribution.

Usage

```
dCFNB(x, a, b, s, lambda, log = FALSE)
pCFNB(x, a, b, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCFNB(p, a, b, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCFNB(n, a, b, s, lambda)
mCFNB(x, a, b, s, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the CFNB distribution.
lambda	The strictly positive parameter of the negative binomial distribution $\lambda \in (0, 1)$.
s	The positive parameter of the negative binomial distribution $s > 0$.
a	The strictly positive scale parameter of the baseline Fisk distribution ($a > 0$).
b	The strictly positive shape parameter of the baseline Fisk distribution ($b > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).

log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CFNB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CFNB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCFNB gives the (log) probability function. pCFNB gives the (log) distribution function. qCFNB gives the quantile function. rCFNB generates random values. mCFNB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

pCLBio

Examples

```
x<-data_guineapigs
rCFNB(20,2,1,2,0.2)
dCFNB(x,2,1,1,0.3)
pCFNB(x,2,1,1,0.3)
qCFNB(0.7,2,1,1,0.2)
mCFNB(x,0.72,0.7,0.5,0.7, method="B")
```

CLBio distribution *Complementary Lomax binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Lomax binomial (CLBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,,\, m \geq 1,$$

where G(x) represents the baseline Lomax CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{b}\right)\right]^{-q}; \qquad b, q > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CLBio distribution.

Usage

```
dCLBio(x, b, q, m, lambda, log = FALSE)
pCLBio(x, b, q, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCLBio(p, b, q, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCLBio(n, b, q, m, lambda)
mCLBio(x, b, q, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CLBio distribution.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0,1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`b`	The strictly positive parameter of the baseline Lomax distribution ($b > 0$).
`q`	The strictly positive shapes parameter of the baseline Lomax distribution ($q > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CLBio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CLBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCLBio gives the (log) probability function. pCLBio gives the (log) distribution function. qCLBio gives the quantile function. rCLBio generates random values. mCLBio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

pCFGeo

Examples

```
x<-rCLBio(20,2,1,2,0.7)
dCLBio(x,2,1,2,0.5)
pCLBio(x,2,1,2,0.3)
qCLBio(0.7,2,1,2,0.2)
mCLBio(x,0.2,0.1,0.2,0.5, method="B")
```

CLGeo distribution *Complementary Lomax geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Lomax geomatric (CLGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\,G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline Lomax CDF, it is given by

$$G\left(x\right) = 1 - \left[1 + \left(\frac{x}{b}\right)\right]^{-q}; \qquad b, q > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CLGeo distribution.

Usage

```
dCLGeo(x, b, q, lambda, log = FALSE)
pCLGeo(x, b, q, lambda, log.p = FALSE, lower.tail = TRUE)
qCLGeo(p, b, q, lambda, log.p = FALSE, lower.tail = TRUE)
rCLGeo(n, b, q, lambda)
mCLGeo(x, b, q, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CLGeo distribution.
`lambda`	The strictly positive parameter of the geomatric distribution $\lambda \in (0,1)$.
`b`	The strictly positive parameter of the baseline Lomax distribution ($b > 0$).
`q`	The strictly positive shapes parameter of the baseline Lomax distribution ($q > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CLGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CLGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCLGeo gives the (log) probability function. pCLGeo gives the (log) distribution function. qCLGeo gives the quantile function. rCLGeo generates random values. mCLGeo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Hassan, A. S., & Abdelghafar, M. A. (2017). Exponentiated Lomax geometric distribution: properties and applications. Pakistan Journal of Statistics and Operation Research, 545-566.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

pCFGeo

Examples

```
x<-rCLGeo(20,2,1,0.7)
dCLGeo(x,2,1,0.5)
pCLGeo(x,2,1,0.3)
qCLGeo(0.7,2,1,0.2)
mCLGeo(x,0.2,0.1,0.5, method="B")
```

CLNB distribution   *Complementary Lomax negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Lomax negative binomial (CLNB) distribution. The CDF of the complementary G negative binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s}-1}{(1-\lambda)^{-s}-1}; \qquad \lambda \in (0,1)\,, s>0,$$

where G(x) represents the baseline Lomax CDF, it is given by

$$G\left(x\right) = 1 - \left[1+\left(\frac{x}{b}\right)\right]^{-q}; \qquad b,q>0.$$

By setting G(x) in the above Equation, yields the CDF of the CLNB distribution.

Usage

```
dCLNB(x, b, q, s, lambda, log = FALSE)
pCLNB(x, b, q, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCLNB(p, b, q, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCLNB(n, b, q, s, lambda)
mCLNB(x, b, q, s, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CLNB distribution.
`lambda`	The strictly positive parameter of the negative binomial distribution $\lambda \in (0, 1)$.
`s`	The positive parameter of the negative binomial distribution $s > 0$.
`b`	The strictly positive parameter of the baseline Lomax distribution ($b > 0$).
`q`	The strictly positive shapes parameter of the baseline Lomax distribution ($q > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CLNB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CLNB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCLNB gives the (log) probability function. pCLNB gives the (log) distribution function. qCLNB gives the quantile function. rCLNB generates random values. mCLNB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Kleiber, C., & Kotz, S. (2003). Statistical size distributions in economics and actuarial sciences. John Wiley & Sons.

See Also

pCFBio

Examples

```
x<-rCLNB(20,2,1,2,0.7)
dCLNB(x,2,1,2,0.5)
pCLNB(x,2,1,2,0.3)
qCLNB(0.7,2,1,2,0.2)
mCLNB(x,0.2,0.1,0.2,0.5, method="B")
```

CWBio distribution — *Complementary Weibull binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Weibull binomial (CWBio) distribution. The CDF of the complementary G binomial distribution is as follows:

$$F(x) = \frac{[1-\lambda(1-G(x))]^m - (1-\lambda)^m}{1-(1-\lambda)^m}; \qquad \lambda \in (0,1)\,, \, m \geq 1,$$

where G(x) represents the baseline Weibull CDF, it is given by

$$G(x) = 1 - \exp(-\alpha x^{\beta}); \qquad \alpha, \beta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CWBio distribution.

Usage

```
dCWBio(x, alpha, beta, m, lambda, log = FALSE)
pCWBio(x, alpha, beta, m, lambda, log.p = FALSE, lower.tail = TRUE)
qCWBio(p, alpha, beta, m, lambda, log.p = FALSE, lower.tail = TRUE)
rCWBio(n, alpha, beta, m, lambda)
mCWBio(x, alpha, beta, m, lambda, method="B")
```

Arguments

`x`	A vector of (non-negative integer) quantiles.
`p`	A vector of probablities.
`n`	The number of random values to be generated under the CWBio.
`lambda`	The strictly positive parameter of the binomial distribution $\lambda \in (0, 1)$.
`m`	The positive parameter of the binomial distribution $m \geq 1$.
`alpha`	The strictly positive scale parameter of the baseline Weibull distribution ($\alpha > 0$).
`beta`	The strictly positive shape parameter of the baseline Weibull distribution ($\beta > 0$).
`lower.tail`	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
`log`	if TRUE, probabilities p are given as log(p).
`log.p`	if TRUE, probabilities p are given for exp(p).
`method`	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CWBio distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CWBio distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCWBio gives the (log) probability function. pCWBio gives the (log) distribution function. qCWBio gives the quantile function. rCWBio generates random values. mCWBio gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Hallinan Jr, A. J. (1993). A review of the Weibull distribution. Journal of Quality Technology, 25(2), 85-93.

Rinne, H. (2008). The Weibull distribution: a handbook. CRC press.

See Also

pCExpGeo

Examples

```
x<-rCWBio(20,2,1,2,0.2)
dCWBio(x,2,1,2,0.2)
pCWBio(x,2,1,2,0.2)
qCWBio(0.7,2,1,2,0.2)
mCWBio(x,2,1,2,0.2, method="B")
```

CWGeo distribution *Complementary Weibull geomatric distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Weibull geomatric (CWGeo) distribution. The CDF of the complementary G geomatric distribution is as follows:

$$F(x) = \frac{(1-\lambda)\,G(x)}{(1-\lambda G(x))}; \qquad \lambda \in (0,1),$$

where G(x) represents the baseline Weibull CDF, it is given by

$$G(x) = 1 - \exp(-\alpha x^{\beta}); \qquad \alpha, \beta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CWGeo distribution.

Usage

```
dCWGeo(x, alpha, beta, lambda, log = FALSE)
pCWGeo(x, alpha, beta, lambda, log.p = FALSE, lower.tail = TRUE)
qCWGeo(p, alpha, beta, lambda, log.p = FALSE, lower.tail = TRUE)
rCWGeo(n, alpha, beta, lambda)
mCWGeo(x, alpha, beta, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the complementary Weibull geomatric.
lambda	The strictly positive parameter of the geomatric distribution $\lambda \in (0,1)$.
alpha	The strictly positive scale parameter of the baseline Weibull distribution ($\alpha > 0$).
beta	The strictly positive shape parameter of the baseline Weibull distribution ($\beta > 0$).

lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CWGeo distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CWGeo distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCWGeo gives the (log) probability function. pCWGeo gives the (log) distribution function. qCWGeo gives the quantile function. rCWGeo generates random values. mCWGeo gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Tojeiro, C., Louzada, F., Roman, M., & Borges, P. (2014). The complementary Weibull geometric distribution. Journal of Statistical Computation and Simulation, 84(6), 1345-1362.

Hallinan Jr, A. J. (1993). A review of the Weibull distribution. Journal of Quality Technology, 25(2), 85-93.

Rinne, H. (2008). The Weibull distribution: a handbook. CRC press.

See Also

pCExpGeo

Examples

```
x<-data_actuarialm
rCWGeo(20,2,1,0.2)
dCWGeo(x,2,1,0.2)
pCWGeo(x,2,1,0.2)
qCWGeo(0.7,2,1,0.2)
mCWGeo(x,0.2,0.5,0.2, method="B")
```

CWNB distribution *Complementary Weibull negative binomial distribution*

Description

Evaluates the PDF, CDF, QF, random numbers and MLEs based on the complementary Weibull negative binomial (CWNB) distribution. The CDF of the complementary G negative binomial distribution is as follows:

$$F(x) = \frac{(1-\lambda G(x))^{-s} - 1}{(1-\lambda)^{-s} - 1}; \qquad \lambda \in (0,1)\,, s > 0,$$

where G(x) represents the baseline Weibull CDF, it is given by

$$G(x) = 1 - \exp(-\alpha x^{\beta}); \qquad \alpha, \beta > 0.$$

By setting G(x) in the above Equation, yields the CDF of the CWNB distribution.

Usage

```
dCWNB(x, alpha, beta, s, lambda, log = FALSE)
pCWNB(x, alpha, beta, s, lambda, log.p = FALSE, lower.tail = TRUE)
qCWNB(p, alpha, beta, s, lambda, log.p = FALSE, lower.tail = TRUE)
rCWNB(n, alpha, beta, s, lambda)
mCWNB(x, alpha, beta, s, lambda, method="B")
```

Arguments

x	A vector of (non-negative integer) quantiles.
p	A vector of probablities.
n	The number of random values to be generated under the CWBio.
lambda	The strictly positive parameter of the negative binomial distribution $\lambda \in (0,1)$.
s	The positive parameter of the negative binomial distribution $s > 0$.
alpha	The strictly positive scale parameter of the baseline Weibull distribution ($\alpha > 0$).
beta	The strictly positive shape parameter of the baseline Weibull distribution ($\beta > 0$).
lower.tail	if FALSE then 1-F(x) are returned and quantiles are computed 1-p.
log	if TRUE, probabilities p are given as log(p).
log.p	if TRUE, probabilities p are given for exp(p).
method	the procedure for optimizing the log-likelihood function after setting the intial values of the parameters and data values for which the CWNB distribution is fitted. It could be "Nelder-Mead", "BFGS", "CG", "L-BFGS-B", or "SANN". "BFGS" is set as the default.

Details

These functions allow for the evaluation of the PDF, CDF, QF, random numbers and MLEs of the unknown parameters with the standard error (SE) of the estimates of the CWNB distribution. Additionally, it offers goodness-of-fit statistics such as the AIC, BIC, -2L, A test, W test, Kolmogorov-Smirnov test, P-value, and convergence status.

Value

dCWNB gives the (log) probability function. pCWNB gives the (log) distribution function. qCWNB gives the quantile function. rCWNB generates random values. mCWNB gives the estimated parameters along with SE and goodness-of-fit measures.

Author(s)

Muhammad Imran and M.H Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and M.H Tahir <mht@iub.edu.pk>.

References

Tahir, M. H., & Cordeiro, G. M. (2016). Compounding of distributions: a survey and new generalized classes. Journal of Statistical Distributions and Applications, 3, 1-35.

Hallinan Jr, A. J. (1993). A review of the Weibull distribution. Journal of Quality Technology, 25(2), 85-93.

Rinne, H. (2008). The Weibull distribution: a handbook. CRC press.

See Also

pCExpGeo

Examples

```
x<-data_actuarialm
rCWNB(20,2,1,2,0.2)
dCWNB(x,2,1,2,0.2)
pCWNB(x,2,1,2,0.2)
qCWNB(0.7,2,1,2,0.2)
mCWNB(x,0.2,0.1,0.2,0.1, method="B")
```

Guinea Pigs *The survival times of guinea pigs infected*

Description

The function allows to provide survival times (in days) of 72 guinea pigs infected with virulent tubercle bacilli.

Usage

```
data_guineapigs
```

Arguments

`data_guineapigs`
A vector of (non-negative integer) values.

Details

The data set represents the survival times (in days) of 72 guinea pigs infected with virulent tubercle bacilli. Recently, the data set is used by Alyami et al.(2022) and fitted the Topp-Leone modified Weibull model.

Value

data_guineapigs gives the survival times (in days) of 72 guinea pigs infected with virulent tubercle bacilli.

Author(s)

Muhammad Imran and H.M Tahir.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com> and H.M Tahir <mht@iub.edu.pk>.

References

Bjerkedal, T. (1960). Acquisition of Resistance in Guinea Pies infected with Different Doses of Virulent Tubercle Bacilli. American Journal of Hygiene, 72(1), 130-48.

Chesneau, C., & El Achi, T. (2020). Modified odd Weibull family of distributions: Properties and applications. Journal of the Indian Society for Probability and Statistics, 21, 259-286.

Khosa, S. K., Afify, A. Z., Ahmad, Z., Zichuan, M., Hussain, S., & Iftikhar, A. (2020). A new extended-f family: properties and applications to lifetime data. Journal of Mathematics, 2020, 1-9.

Alyami, S. A., Elbatal, I., Alotaibi, N., Almetwally, E. M., Okasha, H. M., & Elgarhy, M. (2022). Topp-Leone Modified Weibull Model: Theory and Applications to Medical and Engineering Data. Applied Sciences, 12(20), 10431.

Kemaloglu, S. A., & Yilmaz, M. (2017). Transmuted two-parameter Lindley distribution. Communications in Statistics-Theory and Methods, 46(23), 11866-11879.

Examples

```
x<-data_guineapigs
summary(x)
```

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