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Title Computation of Actuarial Measures Using Bell G Family

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Imports stats

Description It computes two frequently applied actuarial measures, the expected shortfall and the value at risk. Seven well-known classical distributions in connection to the Bell generalized family are used as follows: Bell-exponential distribution, Bell-extended exponential distribution, Bell-Weibull distribution, Bell-extended Weibull distribution, Bell-Lomax distribution, Bell-Burr-12 distribution, and Bell-Burr-X distribution. Related works include: a) Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). ``A new useful exponential model with applications to quality control and actuarial data''. Computational Intelligence and Neuroscience, 2022. <doi:10.1155/2022/2489998>. b) Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). ``Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data''. Open Physics, 21(1), 20220242. <doi:10.1515/phys-2022-0242>.

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Contents

`ActuarialM-package` *Computation of Actuarial Measures Using Bell G Family*

Description

Evaluates the value at risk (VaR) and expected shortfall (ES) of seven well-known probability distributions in connection with the Bell G family of distributions.

Details

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Maintainers

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Author(s)

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References

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022. <doi:10.1155/2022/2489998>.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242. <doi:10.1155/2022/2489998>.

BellB12 distribution *Bell Burr-12 distribution*

Description

Computes the value at risk and expected shortfall based on the Bell Burr-12 (BellB12) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1 - \exp\left[-e^{\lambda}\left(1 - e^{-\lambda K(x)}\right)\right]}{1 - \exp\Bigl(1 - e^{\lambda}\Bigr)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellB12 distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = a\left(\left[\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1 - p\left[1 - \exp\Bigl(1 - e^{\lambda}\Bigr)\right]\right)\right] + e^{\lambda}\right)\right]\right)\right]^{-1/k} - 1\right)^{1/b},$$

where $p \in (0, 1)$. The ES can be computed from the following expression:

$$ES_p(X) = \frac{a}{p}\int_0^p \left(\left[\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1 - z\left[1 - \exp\Bigl(1 - e^{\lambda}\Bigr)\right]\right)\right] + e^{\lambda}\right)\right]\right)\right]^{-1/k} - 1\right)^{1/b} dz.$$

Usage

```
vBellB12(p, a, b, k, lambda, log.p = FALSE, lower.tail = TRUE)
eBellB12(p, a, b, k, lambda)
```

Arguments

p	A vector of probablities $p \in (0, 1)$.
lambda	The strictly positive parameter of the Bell G family ($\lambda > 0$).
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-H(x) are returned and quantiles are computed for 1-p.
log.p	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellB12 distribution.

Value

vBellB12 gives the value at risk. eBellB12 gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

eBellBX, eBellL

Examples

```
p=runif(10,min=0,max=1)
vBellB12(p,1,1,2,1.2)
eBellB12(p,1,1,2,1.2)
```

`BellBX distribution` *Bell Burr-X distribution*

Description

Computes the value at risk and expected shortfall based on the Bell Burr-X (BellBX) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1-\exp\left[-e^{\lambda}\left(1-e^{-\lambda K(x)}\right)\right]}{1-\exp\Big(1-e^{\lambda}\Big)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellBX distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = \left(-\ln\left[1 - \left\{1 - \left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1 - p\left[1 - \exp\left(1 - e^{\lambda}\right)\right]\right)\right] + e^{\lambda}\right)\right]\right)\right\}^{1/a}\right]\right)^{0.5},$$

where $p \in (0,1)$. The ES can be computed from the following expression:

$$ES_p(X) = \frac{1}{p}\int_0^p \left(-\ln\left[1 - \left\{1 - \left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1 - z\left[1 - \exp\left(1 - e^{\lambda}\right)\right]\right)\right] + e^{\lambda}\right)\right]\right)\right\}^{1/a}\right]\right)^{0.5} dz.$$

Usage

```
vBellBX(p, a, lambda, log.p = FALSE, lower.tail = TRUE)
eBellBX(p, a, lambda)
```

Arguments

`p`	A vector of probablities $p \in (0,1)$.
`lambda`	The strictly positive parameter of the Bell G family ($\lambda > 0$).
`a`	The strictly positive scale parameter of the baseline Burr-X distribution ($a > 0$).
`lower.tail`	if FALSE then 1-H(x) are returned and quantiles are computed for 1-p.
`log.p`	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellBX distribution.

Value

vBellBX gives the value at risk. eBellBX gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

See Also

eBellB12, eBellL

Examples

```
p=runif(10,min=0,max=1)
vBellBX(p,1.2,2)
eBellBX(p,1.2,2)
```

BellE distribution *Bell exponential distribution*

Description

Computes the value at risk and expected shortfall based on the Bell exponential (BellE) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1 - \exp\left[-e^{\lambda}\left(1 - e^{-\lambda K(x)}\right)\right]}{1 - \exp\Big(1 - e^{\lambda}\Big)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellE distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = \frac{-1}{\alpha} \ln\left(\frac{1}{\lambda}\left\{\ln\left[\ln\left(1 - p\left\{1 - \exp(1 - e^{\lambda})\right\}\right) + e^{\lambda}\right]\right\}\right); \qquad p \in (0, 1).$$

The ES can be computed from the following expression:

$$ES_p(X) = \frac{1}{p}\int\limits_0^p \left[\frac{-1}{\alpha}\ln\left(\frac{1}{\lambda}\left\{\ln\left[\ln\left(1 - z\left\{1 - \exp(1 - e^{\lambda})\right\}\right) + e^{\lambda}\right]\right\}\right)\right] dz.$$

Usage

```
vBellE(p, alpha, lambda, log.p = FALSE, lower.tail = TRUE)
eBellE(p, alpha, lambda)
```

Arguments

p	A vector of probablities $p \in (0, 1)$.
lambda	The strictly positive parameter of the Bell G family of distributions $\lambda > 0$.
alpha	The strictly positive scale parameter of the baseline exponential distribution ($\alpha > 0$).
lower.tail	if FALSE then 1-H(x) are returned and quantiles are computed for 1-p.
log.p	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellE distribution.

Value

vBellE gives the values at risk. eBellE gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

See Also

eBellW, eBellEE

Examples

```
p=runif(10,min=0,max=1)
vBellE(p,1,1.2)
eBellE(p,1,1.2)
```

BellEE distribution *Bell exponentiated exponential distribution*

Description

Computes the value at risk and expected shortfall based on the Bell exponentiated exponential (BellEE) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1-\exp\left[-e^{\lambda}\left(1-e^{-\lambda K(x)}\right)\right]}{1-\exp\Big(1-e^{\lambda}\Big)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellEE distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = \frac{-1}{\alpha}\ln\left[1-\left(1-\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1-p\left[1-\exp\Big(1-e^{\lambda}\Big)\right]\right)\right]+e^{\lambda}\right)\right]\right)\right)^{1/\beta}\right],$$

where $p \in (0,1)$. The ES can be computed from the following expression:

$$ES_p(X) = \frac{1}{p}\int_0^p \left[\frac{-1}{\alpha}\ln\left[1-\left(1-\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1-z\left[1-\exp\Big(1-e^{\lambda}\Big)\right]\right)\right]+e^{\lambda}\right)\right]\right)\right)^{1/\beta}\right]\right] dz.$$

Usage

```
vBellEE(p, alpha, beta, lambda, log.p = FALSE, lower.tail = TRUE)
eBellEE(p, alpha, beta, lambda)
```

Arguments

p	A vector of probablities $p \in (0,1)$.
lambda	The strictly positive parameter of the Bell G family of distributions $\lambda > 0$.
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-H(x) are returned and quantiles are computed for 1-p.
log.p	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellEE distribution.

Value

vBellEE gives the value at risk. eBellEE gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

See Also

`eBellEW`, `eBellE`

Examples

```
p=runif(10,min=0,max=1)
vBellEE(p,1,1.2,2)
eBellEE(p,1,1.2,2)
```

`BellEW distribution` *Bell exponentiated Weibull distribution*

Description

Computes the value at risk and expected shortfall based on the Bell exponentiated Weibull (BellEW) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1 - \exp\left[-e^{\lambda}\left(1 - e^{-\lambda K(x)}\right)\right]}{1 - \exp\left(1 - e^{\lambda}\right)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellEW distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = \left[\frac{-1}{\alpha}\ln\left(1-\left[1-\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1-p\left[1-\exp\left(1-e^{\lambda}\right)\right]\right)\right]+e^{\lambda}\right)\right]\right)\right]^{1/\theta}\right)\right]^{1/\beta},$$

where $p \in (0,1)$. The ES can be computed from the following expression:

$$ES_p(X) = \frac{1}{p}\int_0^p \left[\frac{-1}{\alpha}\ln\left(1-\left[1-\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1-z\left[1-\exp\left(1-e^{\lambda}\right)\right]\right)\right]+e^{\lambda}\right)\right]\right)\right]^{1/\theta}\right)\right]^{1/\beta} dz.$$

Usage

```
vBellEW(p, alpha, beta, theta,lambda, log.p = FALSE, lower.tail = TRUE)
eBellEW(p, alpha, beta, theta,lambda)
```

Arguments

`p`	A vector of probablities $p \in (0,1)$.
`lambda`	The strictly positive parameter of the Bell G family of distributions $\lambda > 0$.
`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-H(x) are returned and quantiles are computed for 1-p.
`log.p`	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellEW distribution.

Value

vBellEW gives the value at risk. eBellEW gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

See Also

`eBellW`, `eBellEE`

Examples

```
p=runif(10,min=0,max=1)
vBellEW(p,1,1,2,1)
eBellEW(p,1,1,2,1)
```

`BellL distribution` *Bell Lomax distribution*

Description

Computes the value at risk and expected shortfall based on the Bell Lomax (BellL) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1 - \exp\left[-e^{\lambda}\left(1 - e^{-\lambda K(x)}\right)\right]}{1 - \exp\Big(1 - e^{\lambda}\Big)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellL distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = b\left[\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1 - p\left[1 - \exp\Big(1 - e^{\lambda}\Big)\right]\right)\right] + e^{\lambda}\right)\right]\right)^{-1/q} - 1\right],$$

where $p \in (0, 1)$. The ES can be computed from the following expression:

$$ES_p(X) = \frac{b}{p}\int_0^p \left[\left(\frac{1}{\lambda}\left[\ln\left(\left[\ln\left(1 - z\left[1 - \exp\Big(1 - e^{\lambda}\Big)\right]\right)\right] + e^{\lambda}\right)\right]\right)^{-1/q} - 1\right] dz.$$

Usage

```
vBellL(p, b, q, lambda, log.p = FALSE, lower.tail = TRUE)
eBellL(p, b, q, lambda)
```

Arguments

p	A vector of probablities $p \in (0, 1)$.
lambda	The strictly positive parameter of the Bell G family ($\lambda > 0$).
b	The strictly positive scale parameter of the baseline Lomax distribution ($b > 0$).
q	The strictly positive shape parameter of the baseline Lomax distribution ($q > 0$).
lower.tail	if FALSE then 1-H(x) are returned and quantiles are computed for 1-p.
log.p	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellL distribution.

Value

vBellL gives the values at risk. eBellL gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

See Also

eBellBX, eBellB12

Examples

```
p=runif(10,min=0,max=1)
vBellL(p,1,1,2)
eBellL(p,1,1,2)
```

BellW distribution *Bell Weibull distribution*

Description

Computes the value at risk and expected shortfall based on the Bell Weibull (BellW) distribution. The CDF of the Bell G family is as follows:

$$H(x) = \frac{1 - \exp\left[-e^{\lambda}\left(1 - e^{-\lambda K(x)}\right)\right]}{1 - \exp\Big(1 - e^{\lambda}\Big)}; \qquad \lambda > 0,$$

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

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

By setting K(x) in the above Equation, yields the CDF of the BellW distribution. The following expression can be used to calculate the VaR:

$$VaR_p(X) = \left[\frac{-1}{\alpha} \ln\left(\frac{1}{\lambda}\left\{\ln\left[\ln\left(1 - p\left\{1 - \exp(1 - e^{\lambda})\right\}\right) + e^{\lambda}\right]\right\}\right)\right]^{1/\beta}; \qquad p \in (0,1).$$

The ES can be computed from the following expression:

$$ES_p(X) = \frac{1}{p}\int_0^p \left[\frac{-1}{\alpha} \ln\left(\frac{1}{\lambda}\left\{\ln\left[\ln\left(1 - z\left\{1 - \exp(1 - e^{\lambda})\right\}\right) + e^{\lambda}\right]\right\}\right)\right]^{1/\beta} dz.$$

Usage

```
vBellW(p, alpha, beta, lambda, log.p = FALSE, lower.tail = TRUE)
eBellW(p, alpha, beta, lambda)
```

Arguments

`p`	A vector of probablities $p \in (0,1)$.
`lambda`	The strictly positive parameter of the Bell G family of distributions $\lambda > 0$.
`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-H(x) are returned and quantiles are computed for 1-p.
`log.p`	if TRUE then log(H(x)) are returned and quantiles are computed for exp(p).

Details

The functions allow to compute the value at risk and the expected shortfall of the BellW distribution.

Value

vBellW gives the values at risk. eBellW gives the expected shortfall.

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

Fayomi, A., Tahir, M. H., Algarni, A., Imran, M., & Jamal, F. (2022). A new useful exponential model with applications to quality control and actuarial data. Computational Intelligence and Neuroscience, 2022.

Alsadat, N., Imran, M., Tahir, M. H., Jamal, F., Ahmad, H., & Elgarhy, M. (2023). Compounded Bell-G class of statistical models with applications to COVID-19 and actuarial data. Open Physics, 21(1), 20220242.

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

eBellEW, eBellE

Examples

```
p=runif(10,min=0,max=1)
vBellW(p,1,2,1)
eBellW(p,1,2,1)
```

Index