QUADRATIC RANK TRANSMUTED HALF LOGISTIC RAYLEIGH DISTRIBUTION (QRTHLRD).

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Abstract: We introduce new continuous non normal distribution called the Quadratic Rank Transmuted Half Logistic Rayleigh Distribution (QRTHLRD). We derive some Mathematical properties including explicit expressions such as the Survival and Hazard Rate Function.

Keywords: Quadratic rank Transmuted Half Logistic Rayleigh Distribution (QRTHLRD), Probability density function, Cumulative distribution function, Hazard function and Survival function.

1. Introduction:

Probability models are frequentely used for the prediction of lifetime products in various field of applied models is also used to explain the failure rate and survival rate of the certain product. Therefore, many generalised family of distributions formed from last few decades. Nadarajah et al. (2013) introduced a family of lifetime models by adding a parameter to the Marshall-Olkin family of distributions, Transmuted Kumaraswamy-G Family of Distributions for Modelling Reliability Data. In literature, there are several generalizations of the Lomax distribution. Abdul-Moniem (2012) developed the Exponentiated Lomax distribution, Al-Awadhi and Ghitany (2001) introduced the discrete Poisson–Lomax distribution by using the Lomax distribution as a mixing distribution for the Poisson Parameter and Cordeiro et al. (2015) investigated the Gamma-Lomax distribution and studied its Properties.

The Generalized Transmuted-G (GT-G) distribution introduced by Nofal et a. (2015). This generalization is adapted to the half logistic distribution and the resulting model is considered in this study. A half logistic model obtained as the distribution of an Absolute Standard Logistic variate is a probability model of recent origin (Balakrishnan, 1985). Generalized-G (TExG-G) by Yousof et al. (2015), used in the application of Biological and Engineering sciences there are situations of non-monotone failure rates available to model such data; A comprehensive narration of the models is given in Rajarshi &Rajarshi (1988). Mudholkar, et al. (1995) presented an extension of the Weibull family that contains Unimodel distributions with bathtub failure rates and also allows for a broader class of monotone Hazard rates; they named their extended version the Exponentiated Weibull family.

In this paper, we define a new distribution using generalised Half Logistic Rayleigh Distribution and named it as Quadratic Rank Transmuted Half Logistic Rayleigh Distribution (QRTHLRD) from a new family of distributions proposed by Tahir et al. (2015). The paper is organized as follows. The new distribution is developed in Section 2 and also we define the CDF, density function, Survival and Hazard functions of the Quadratic rank Transmuted Half Logistic Rayleigh Distribution.

2. The Probability density and Distribution functions of the QRTHLRD:

2.1. QRTHLRD Specifications: In this section we define new tree parameters distribution called Quadratic Rank Transmuted Half Logistic Rayleigh Distribution with parameters θ, μ and λ. The Probability density function (PDF),

$$f(x)=\frac{4\mu(x-\theta)e^{-\mu(x-\theta)2}}{\left(1+e^{-\mu(x-\theta)^2}\right)^2}\left[1+\lambda\left(\frac{3e^{-\mu(x-\theta)2}-1}{1+e^{-\mu(x-\theta)^2}}\right)\right]$$

$x>\theta$, μ, $\lambda>0$

θ is location parameter, μ is scale parameter

λ is Transmuted parameter $|\lambda|\leq 1$

2.2. Cumulative distribution function (CDF)

$$F(x)=\frac{1-\left(e^{-\mu(x-\theta)^2}\right)^2+2\lambda e^{-\mu(x-\theta)2}\left[1-e^{-\mu(x-\theta)^2}\right]}{\left[1+e^{-\mu(x-\theta)^2}\right]^2}$$

2.3. Survival function S(x) and Hazard function h(x) of the new model QRTHLRD are respectively defined as follows:

$$s(x)=\frac{2\mathrm{e}^{-\mu(x-\theta)^2}\left[e^{-\mu(x-\theta)^2}(1+\lambda)(1-\lambda)\right]}{\left[1+e^{-\mu(x-\theta)^2}\right]^2}$$

$$h(x)=\frac{\dfrac{4\mu(x-\theta)e^{-\mu(x-\theta)2}}{\left(1+e^{-\mu(x-\theta)^2}\right)^2}\left[1+\lambda\left(\dfrac{3e^{-\mu(x-\theta)2}-1}{1+e^{-\mu(x-\theta)^2}}\right)\right]}{\dfrac{2\mathrm{e}^{-\mu(x-\theta)^2}\left[e^{-\mu(x-\theta)^2}(1+\lambda)(1-\lambda)\right]}{\left[1+e^{-\mu(x-\theta)^2}\right]^2}}$$

Conclusion:

In this paper we study and introduce Quadratic Rank Transmuted Half Logistic Rayleigh Distribution (QRTHLRD), Probability density function, Cumulative distribution function, Hazard function and Survival function

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