A Bivariate Modified Odd Generalized Exponential Linear Failure Rate Distribution

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ABSTRACT

In this paper we introduce a bivariate modified odd generalized exponential linear failure rate (BMOGELFR) distribution. The cumulative distribution function of this bivariate model has absolutely continuous and singular parts. Representations for the cumulative and density functions are presented and properties such as marginal, conditional distributions and some reliability measures, the joint reliability function, joint hazard rate, and joint reversed (hazard) function. The estimation of the parameters by maximum likelihood is discussed and the Fisher information matrix is determined. An applications to real data is carried out to illustrate that the new distribution is more flexible and effective than other popular distributions in modeling lifetime data. Finally, some simulations are presented to verify the performance of the direct maximum-likelihood estimation.

Keywords: Joint probability; density function; Conditional probability density function Maximum likelihood; estimators Fisher information matrix.

1 Introduction

Recently, El-Damcese et al. [14] introduced a new class of univariate distribution called Odd Generalized Exponential-Linear Failure Rate ($OGE-LFR$) distribution with parameters a, b, α and β written as $OGE-LFR(\upsilon)$, where the vector υ is defined in the form $\upsilon = (a, b, \alpha, \beta\ )$. A random variable X is said to have $OGE-LFR$ with parameters a, b, α and β. Our aim in this paper is to proposed a new bivariate modified odd generalized exponential linear failure rate distribution, whose marginal are modified odd generalized exponential linear failure rate distributions. It is a Marshall-Olkin type. Many authors used this method to introduce a new bivariate distributions, see for example, Downton [3] introduced three types of bivariate exponential distribution based on a simple failure model, Hawkes[6] introduced a more general distribution, Barreto-Souza and Lemonte [2] Introduced a bivariate Kumaraswamy (BVK) distribution whose marginals are Kumaraswamy distributions, Sarhan and Balakrishnan [11] introduced the definition of the joint moment generating function of (x, y),

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Ashour et al. [12] introduced Moment generating function of the bivariate generalized exponential distribution, Al-Khendhairi and El- Gohary [4] persented a bivariate Gompertz distribution based on Gompertz and exponential distribution, Mellor et al. [10]. Measurement of tensile strength by diametral compression of discs and annuli Engineering Geology, Gupta and kundu [5] introduced the generalized exponential (GE) distribution, Hawkes [6] introduced a more general distribution than the distribution introduced by Downton [3] which may have some advantages in practic, El-Morshedy et al. [16] Introduced Bivariate exponentiated discrete Weibull distribution: statistical properties, estimation, simulation and applications, Meintanis [13] analyzed one data set using Marshall -Olkin bivariate exponential distribution provided a very good fit, kundu and Gupta [9] Introduced bivariate proportional reversed hazard models using a method similar to the same method that used to obtain the Marshal-Olkin Bivariate Exponential model, Jafariand Roozegar [7] Introduced a new class of bivariate distributions by compounding the bivariate generalized exponential and power-series distributions, and Kundu and Gupta [8] presented the new bivariate model with a special emphasis on the Weibull distribution.

2 Conclusions

In this paper, we have proposed $BMOGELFR$ distribution, whose marginals are $MOGELFR$ distributions. Some of its statistical and reliability properties have been studied. Found that the MLE_S is a suitable method to estimate the model parameters. Moreover, a real data set has been analyzed to show the usefulness of the proposed distribution. It is observed that the proposed model provides a better than bivarite generalized liner failure rate ($BGLFR$)distribution, bivarite odd generalized exponential modified weibull ($BOGEMW$) distribution and bivariate exiponentain modified weibull ($BEMW$) distribution. Also, the bias and MSE of the parmeters is calculated using simulation studies.

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