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A new generalized version of Log-logistic distribution with applications in medical sciences and other applied fields

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In this paper, we studied a two-parameter transmuted model of Log-logistic distribution (LLD) using the quadratic rank transmutation map technique studied by Shaw and Buckley[1] as a new survival model in medical sciences and other applied fields. Statistical properties of Transmuted LLD (TLLD) are discussed comprehensively. Robust measures of skewness and kurtosis of the proposed model have also been discussed along with graphical overview. The estimation of the model parameters is performed by Maximum Likelihood (ML) method followed by a Monte Carlo (MC) simulation procedure to investigate the performance of the ML estimators and the asymptotic confidence intervals of the parameters. Applications of the proposed model to real-life data are also presented.

Keywords: Transmuted Log-logistic distribution (TLLD); survival analysis; lifetime; medical sciences; Monte Carlo simulation.

1. Introduction

According to the Quadratic Rank Transmutation Map (QRTM), approach given by Shaw and Buckley,[1] the cumulative distribution function (CDF) satisfies the relationship

$$F_\tau(x) = (1 + \lambda)F_b(x) - \lambda[F_b(x)]^2, \tag{1.1}$$

which on differentiation yields

$$f_\tau(x) = f_b(x)[1 + \lambda - 2\lambda F_b(x)], \tag{1.2}$$

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