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ABSTRACT

This paper deals with the problem of maximum likelihood and Bayesian estimation of stress–strength reliability involving paired observation with ties using bivariate exponentiated half-logistic distribution. This problem is of importance because in some real applications the strength of the component is highly dependent on the stress experienced by it. A bivariate extension of exponentiated half-logistic is discussed and an expression for the stress–strength reliability is obtained. This model is also useful to analyse data having the unusual feature of having a number of pairs with tied scores, even when the scores are continuous. The maximum likelihood estimate and interval estimate of the stress–strength reliability has been developed. The Bayes estimates of the stress–strength reliability under squared error loss function are obtained using importance sampling technique. Simulation studies are conducted to evaluate the performance of maximum likelihood and Bayes estimates. Two real-life data sets are analysed to numerically illustrate the usefulness of the developed method.

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Bivariate exponentiated half-logistic model; stress–strength reliability; maximum likelihood estimates; Bayesian estimation; Markov chain Monte Carlo method; ties

1. Introduction

The stress–strength reliability can be described as an assessment of the reliability of a system defined as the strength, X of the system to overcome the stress, Y experienced by it. If the stress exceeds the strength, the system will fail and thus $R = Pr\{X > Y\}$ can be defined as the reliability in stress–strength relationship. The main idea was introduced by Birnbaum [2] and developed by Birnbaum and McCarty [3]. The stress–strength reliability for several distributions like exponential, normal, gamma, Weibull, Burr, generalized exponential, generalized Weibull, generalized logistic and many more have been developed in the statistical literature by many authors, which shows the importance of such problems. Kotz *et al.* [17] provide an excellent detailed explanation of the development of the stress–strength models up to 2003. The stress–strength reliability,

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