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Reliability estimation in Lindley distribution with progressively type II right censored sample

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Abstract

In this paper we discuss one parameter Lindley distribution. It is suggested that it may serve as a useful reliability model. The model properties and reliability measures are derived and studied in detail. For the estimation purposes of the parameter and other reliability characteristics maximum likelihood and Bayes approaches are used. Interval estimation and coverage probability for the parameter are obtained based on maximum likelihood estimation. Monte Carlo simulation study is conducted to compare the performance of the various estimates developed. In view of cost and time constraints, progressively Type II censored sample data are used in estimation. A real data example is given for illustration.
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Keywords: Lindley distribution; Reliability and failure rate functions; Progressive type II censoring; Maximum likelihood estimation; Bayes estimates

1. Introduction

In the lifetime theory, we study the lifetime of a system or an item. The word system (or item or component) is defined as an arbitrary device performing its intended task. A system can be electrical, electronic, mechanical, or chemical device. Apart from man made systems there are many natural or God made systems such as human beings, plants, animals, etc. that are included in the lifetime analysis.

Applications of lifetime distribution methodology range from investigations into the endurance of manufactured items to research involving human diseases. Some methods of dealing with lifetime data are quite old, but many important developments are relatively recent and have to be searched out not only in statistics journals, but also in the literature of various other disciplines. Lifetime distribution methodology is most frequently used in the fields of engineering and biomedical sciences.

Numerous other parametric models have also been suggested and used in the analysis of lifetime data. Most of them are positively skewed statistical distributions with range restricted to positive part of the real line. Among others, exponential, gamma, Weibull and lognormal are most frequently used lifetime models. Pareto, Burr and half normal have also been used to model lifetime data. For more detail of these distributions, see Lawless [10], Mann et al. [13], and Sinha [17].

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