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Alpha Power Transformed Inverse Lindley Distribution: A Distribution With An Upside-Down Bathtub-Shaped Hazard Function

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Abstract

The inverse Lindley distribution has been generalized by many authors in recent years. Here, we introduce a new generalization called alpha power transformed inverse Lindley (APTIL) distribution that provides better fits than the inverse Lindley distribution and some of its known generalizations. The new model includes the inverse Lindley distribution as a special case. Various properties of the proposed distribution, including explicit expressions for the mode, moments, conditional moments, mean residual lifetime, Bonferroni and Lorenz curves, entropies, stochastic ordering, stress-strength reliability and order statistics are derived. The new distribution can have an upside-down bathtub failure rate function depending on its parameters. The model parameters are obtained by the method of maximum likelihood estimation. The approximate confidence intervals of the model parameters are also obtained. A simulation study is carried out to examine the performance of the maximum likelihood estimators of the parameters. Finally, two data sets have been analyzed to show how the proposed model works in practice.

Keywords: Alpha-power transformed inverse Lindley distribution, moments, quantile function, stress-strength reliability, maximum likelihood estimation.

2000 MS Classification: 60E05, 62F10

1 Introduction

Most of the standard distributions are incapable of modeling a variety of complex real data sets; particularly, lifetime ones. This is a matter of grave concern among distribution users and

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