THE SABUR DISTRIBUTION: PROPERTIES AND APPLICATION RELATED TO ENGINEERING DATA

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Abstract

This paper introduces a novel probability distribution called the Sabur distribution (SD), characterized by two parameters. It offers a comprehensive analysis of this distribution, encompassing various properties such as moments, moment-generating functions, deviations from the mean and median, mode and median, Bonferroni and Lorenz curves, Renyi entropy, order statistics, hazard rate functions, and mean residual functions. Furthermore, the paper delves into the graphical representation of the probability density function, cumulative distribution function and hazard rate function to provide a visual understanding of their behavior. The distribution's parameters are estimated using the well-known method of maximum likelihood estimation. The paper also showcases the practical applicability of the Sabur distribution through real-world examples, underscoring its performance and relevance in various scenarios.

Keywords: Moments, moment generating function, reliability measures, mean deviations, maximum likelihood function.

Subject classification: 60E05, 62E15.

1. Introduction

Statistical distributions hold great importance in fields such as biomedicine, engineering, economics, and various scientific domains. Two widely recognized distributions, namely the exponential distribution and the gamma distribution, are often used as lifetime distributions for analyzing statistical data. Among these, the exponential distribution stands out due to its singular parameter and several intriguing statistical properties, notably its memory less property and constant hazard rate characteristic. In the realm of statistics, numerous extensions of these distributions have been developed to enhance their flexibility and applicability. One notable contribution to this literature is attributed to Lindley in [10]. He introduced a one-parameter lifetime distribution characterized by the following probability density function:

$$f(y,\beta)=\frac{\beta^2}{(1+\beta)}(1+y)e^{-\beta y}\quad ;y>0\,,\beta>0$$

In recent years, researchers have made significant advancements in the study of the Lindley distribution and have proposed various one- and two-parameter distributions to model complex datasets effectively. A notable contribution was made by Ghitney et al. [8], who conducted an extensive study on the Lindley distribution. They demonstrated that the Lindley distribution