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Compound of Discrete Pareto and Kumaraswamy Distributions: An Advanced Discrete Model with Properties and Applications

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Abstract: In this article, we study a new discrete model which is obtained by compounding discrete Pareto distribution with Kumaraswamy distribution. We shall first study some basic distributional and moment properties of the new distribution. Structural properties of the distribution such as its unimodality, hazard rate behavior and index of dispersion are also discussed. Finally, real data sets are analyzed to investigate the suitability of the proposed distribution in modeling count.

Keywords: Weibull Discrete Pareto Distribution, Zero Inflated, Kumaraswamy Distribution, Compound Distribution.

1 Introduction

Statistical distributions play a prominent role in various fields like social sciences, medical sciences etc. Researchers obtainplethora of distribution for the sake of analyzing complex data from various fields. Lot of well known techniques are getting employed to serve the purpose of constructing new probability distributions. Some well known techniques like discretization [2,3,16], transmutation [5] and Compounding methodologies received utmost attention from researchers from past decade. Compound distribution arises when all or some parameters of a distribution known as parent distribution vary according to some probability distribution called the compounding distribution, for instance negative binomial distribution can be obtained from Poisson distribution when its parameter λ follows gamma distribution. If the parent distribution is discrete then resultant compound distribution will also be discrete and if the parent distribution is continuous then resultant compound distribution will also be continuous i,e. the support of the original (parent) distribution determines the support of compound distributions. In several research papers it has been found that compound distributions are very flexible and can be used efficiently to model different types of data sets. With this in mind many compound probability distributions have been constructed. Sankaran [1] introduced a compound of Poisson distribution with that of Lindley distribution for modeling count data. Zamani and Ismail [4] also constructed a new compound distribution by compounding negative binomial with one parameter Lindley distribution that provides good fit for count data where the probability at zero has a large value. Adil and Jan [15] constructed a new compound distribution as compound of size biased Geeta distribution with generalized beta distribution. Recently, Para and Jan [6] constructed compound of discrete inverse Weibull distribution with Minimax distribution as a new discrete model with applications in medical sciences.

In this paper we propose a new count data model by compounding two parameter discrete Pareto distribution with Kumaraswamy distribution, as there is a need to find more plausible discrete probability models or survival models in medical science and other fields, to fit to various discrete data sets. It is well known in general that a compound model is more flexible than the ordinary model and it is preferred by many data analysts in analyzing statistical data. Moreover, it presents beautiful mathematical exercises and broadened the scope of the concerned model being compounded.

2 Material and Methods

A discrete analogue of the continuous Pareto distribution

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