Discrete Inverse Weibull Minimax Distribution: Properties and Applications

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Abstract: There are not many known distributions for modeling discrete data. In this paper, we shall introduce a new count data model, which is obtained by compounding two parameter discrete Inverse Weibull distribution with Minimax distribution. The proposed model has several properties such as it can be nested to different compound distributions on specific parameter settings. We shall first study some basic distributional and moment properties of the new distribution. Then, certain structural properties of the distribution such as its unimodality, hazard rate behavior and index of dispersion are discussed. Finally, real data set is analyzed to investigate the suitability of the proposed distribution in modeling count data from medical genetics.

Keywords: Discrete Inverse Weibull Distribution, Minimax distribution, Compound distribution, Medical science, Count data.

1 Introduction

In the last few decades some papers dealing with probability distributions, the compounding of probability distribution has received maximum attention which is an innovative and sound technique to obtain new probability distributions. Lot of new discrete models [17,18] have been introduced by researchers to handle complex data. 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. In the early 1970s, Dubey [13] derived a compound gamma, beta and F distribution by compounding a gamma distribution with another gamma distribution and reduced it to the beta Ist and 2nd kind and to the F distribution by suitable transformations.

Sankaran [1] introduced a compound of Poisson distribution with that of Lindley distribution for modeling count data. Gerstenkorn [14,15] proposed several compound distributions, he obtained compound of gamma distribution with exponential distribution by treating the parameter of gamma distribution as an exponential variate and also obtained compound of polya with beta distribution. Ghitany, Al-Mutairi and Nadarajah [2,3] introduced zero-truncated Poisson-Lindley distribution, who used the distribution for modeling count data in the case where the distribution has to be adjusted for the count of missing zeros. Zamani and Ismail [4] 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. Rashid and Jan [5] explored a mixture of generalized negative binomial distribution with that of generalized exponential distribution which contains several compound distributions as its sub cases and proved that this particular model is better in comparison to others when it comes to fit observed count data set. Most recently Adil, Ahmad and Jan [6] constructed a new count data model (Compound of Negative binomial distribution with Kumaraswamy distribution) with application in genetics and ecology.

In this paper we propose a new count data model by compounding two parameter discrete Inverse Weibull distribution with Minimax 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.

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