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An Advanced Discrete Model with Applications in Medical Science

Bilal Ahmad Para* and Tariq Rashid Jan

Department of Statistics, University of Kashmir, Srinagar
Jammu and Kashmir 190006, India
**parabilal@gmail.com*

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In this paper, we introduce a new discrete model by compounding two parameter discrete Weibull distribution with Beta distribution of first kind. The proposed model can be nested to different compound distributions on specific parameter settings. The model is a good competitive for zero-inflated models. In addition, we present the basic properties of the new distribution and discuss unimodality, failure rate functions and index of dispersion. Finally, the model is examined with real-life count data from medical sciences to investigate the suitability of the proposed model.

Keywords: Compound distribution; medical sciences; simulation; probability models; index of dispersion.

1. Introduction

There has been considerable research conducted over the last decade on the development of compound probability models. The compounding of probability distributions enables us to obtain both discrete as well as continuous distributions. In real life, compound distributions arise when all or some parameters of a distribution known as parent distribution vary according to some probability distribution called the compounding distribution. Negative binomial distribution (NBD) is a compounding version obtained from Poisson distribution (PD) when its parameter λ follows gamma distribution (GD). Many compound probability distributions have been constructed so far as it has been found that compound distributions are very flexible and can be used efficiently to model different types of data sets. Sankaran[1] studied Poisson–Lindley distribution (PLD) by treating the parameter λ in PD as a one parameter Lindley distribution (LD) and showed that resulting distribution gives a better fit for count data analysis when compared with the various classical models already in the literature. Panger and Willmot[13] introduced a compound of NBD with exponential distribution (ED) and the introduced model was applied in modeling count data sets. Ghitany, Al-Mutairi and Nadarajah[2,3] introduced