

Compound of Discrete Pareto and Beta distributions as a new Count Data Model

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Abstract

In this article, we attempt to introduce a new count data model which is obtained by compounding discrete Pareto distribution with Beta distribution of first kind. 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 and hazard rate behavior are discussed. Finally, real data set is analyzed to investigate the suitability of the proposed distribution in modeling count.

Keywords: Discrete Pareto Distribution, Zero Inflated, Beta distribution, compound distribution, count data.

Mathematics Subject Classification: 60-XX, 5288

1. Introduction

Statistical distributions are very useful in describing and predicting real world phenomena and have various applications. There are always rooms for developing distributions which are either more flexible or for fitting specific real world scenarios. Some well-known methods in the early days for generating univariate continuous distributions include compounding, discretization, transmutation etc. but compounding of probability distribution has received maximum attention which is an innovative and sound technique to obtain new probability distributions. The compounding of probability distributions enables us to obtain both discrete as well as continuous distribution.

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. In the early 1970s, Dubey (1970) derived a compound gamma, beta and F distribution by