

Inference for Compound Truncated Poisson Lognormal Model with Application to Maximum Precipitation Data

Authors : M. Z. Raqab, Debasis Kundu, M. A. Meraou

Abstract : In this paper, we have analyzed maximum precipitation data during a particular period of time obtained from different stations in the Global Historical Climatological Network of the USA. One important point to mention is that some stations are shut down on certain days for some reason or the other. Hence, the maximum values are recorded by excluding those readings. It is assumed that the number of stations that operate follows zero-truncated Poisson random variables, and the daily precipitation follows a lognormal random variable. We call this model a compound truncated Poisson lognormal model. The proposed model has three unknown parameters, and it can take a variety of shapes. The maximum likelihood estimators can be obtained quite conveniently using Expectation-Maximization (EM) algorithm. Approximate maximum likelihood estimators are also derived. The associated confidence intervals also can be obtained from the observed Fisher information matrix. Simulation results have been performed to check the performance of the EM algorithm, and it is observed that the EM algorithm works quite well in this case. When we analyze the precipitation data set using the proposed model, it is observed that the proposed model provides a better fit than some of the existing models.

Keywords : compound Poisson lognormal distribution, EM algorithm, maximum likelihood estimation, approximate maximum likelihood estimation, Fisher information, skew distribution

Conference Title : ICACCM 2023 : International Conference on Applied Climatology and Climate Modelling

Conference Location : Paris, France

Conference Dates : January 23-24, 2023