

AN EFFICIENT COUNT DATA MODEL: PROPERTIES, ACTUARIAL MEASURES, BAYESIAN ESTIMATION, REGRESSION MODEL, AND APPLICATIONS TO HEALTH CARE DATA

Mohammad Kafeel Wani^{1*} and Peer Bilal Ahmad²

Received January 20, 2025 / Accepted April 20, 2025

ABSTRACT. Based on the compounding mechanism, a unique discrete probability distribution is investigated in this paper. The Poisson distribution is mixed with a lifetime model called as the Fav-Jerry model. The important statistical properties are investigated and inferred. Further, the Actuarial measures have also been studied. The Bayesian estimation approach and the maximum likelihood method are used for the estimation process. Using a Monte-Carlo simulation technique, the behavior of the maximum likelihood estimate is examined. Additionally, when data is reproduced from different competing models, the model compatibility is being examined. The study further introduces a novel count data regression model for over-dispersed data by assuming that the response variable follows the Poisson mixture of Fav-Jerry model. Various performance criteria are considered and real-world data sets are used to investigate the model's applicability in real life. The outcomes are juxtaposed with few potentially intriguing models. The real world application of the regression model is also investigated.

Keywords: Poisson mixture, bayesian estimation, count regression.

1 INTRODUCTION

Since its inception, distribution theory has evolved considerably, with recent developments placing greater emphasis on addressing practical challenges faced by practitioners and applied researchers, while also introducing a range of techniques for effective data analysis and interpretation. To put it another way, there is a critical need to create useful models for better investigation of real occurrences. Utilizing count data analysis to comprehend the recurrence of occurrences in the actual world is a good illustration of this. The applications of distribution theory extend far beyond the field of Statistics and can be found in a wide range of fields. In the discipline

*Corresponding author

¹Department of Mathematical Sciences, Islamic University of Science and Technology, Kashmir 192122 – E-mail: wanmk5@gmail.com – <http://orcid.org/0000-0001-7180-9323>

²Department of Mathematical Sciences, Islamic University of Science and Technology, Kashmir 192122 – E-mail: bilalahmadpz@gmail.com – <http://orcid.org/0000-0002-1009-9898>