

BIVARIATE EXTENDED POISSON-LINDLEY DISTRIBUTION BASED ON SARMANOV-LEE FAMILY

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Abstract: In this article, we propose a new discrete bivariate distribution, called the Bivariate Extended Poisson-Lindley (BEPL) distribution, suitable for modeling overdispersed and correlated count data. The distribution is constructed within the Sarmanov-Lee family by combining two Extended Poisson-Lindley distributions via a multiplicative factor. We analyze its theoretical properties (moment-generating function, various moments) and estimate its parameters using the maximum likelihood method. The model's performance is evaluated and compared to that of existing discrete bivariate models on two real-world datasets. The proposed distribution exhibits great flexibility in capturing different types of dependencies (positive, zero, or negative correlations), providing an effective tool for modeling correlated count data.

Keywords and Phrases: Bivariate Sarmanov distribution, extended Poisson-Lindley, count data, overdispersion, maximum likelihood estimation, statistical modeling.

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1. Introduction

The Poisson-Lindley distribution, defined in Equation (1.1), is considered one of the main alternatives to the Poisson distribution for modeling overdispersed count