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To cite this article: Nileshkumar H. Jadhav (2021): A new linearized ridge Poisson estimator in the presence of multicollinearity, Journal of Applied Statistics, DOI: [10.1080/02664763.2021.1887103](https://doi.org/10.1080/02664763.2021.1887103)

To link to this article: <https://doi.org/10.1080/02664763.2021.1887103>



Published online: 16 Feb 2021.



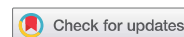
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A new linearized ridge Poisson estimator in the presence of multicollinearity

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ABSTRACT

Poisson regression is a very commonly used technique for modeling the count data in applied sciences, in which the model parameters are usually estimated by the maximum likelihood method. However, the presence of multicollinearity inflates the variance of maximum likelihood (ML) estimator and the estimated parameters give unstable results. In this article, a new linearized ridge Poisson estimator is introduced to deal with the problem of multicollinearity. Based on the asymptotic properties of ML estimator, the bias, covariance and mean squared error of the proposed estimator are obtained and the optimal choice of shrinkage parameter is derived. The performance of the existing estimators and proposed estimator is evaluated through Monte Carlo simulations and two real data applications. The results clearly reveal that the proposed estimator outperforms the existing estimators in the mean squared error sense.

ARTICLE HISTORY

Received 5 June 2020
Accepted 3 February 2021

KEYWORDS

Poisson regression;
multicollinearity; ridge
Poisson estimator; linearized
ridge regression estimator;
mean squared error

MATHEMATICS SUBJECT CLASSIFICATIONS

62J07; 62F10

1. Introduction

Poisson regression is a common method in applied research for modeling count data to explain the effect of explanatory variables. While modeling the Poisson regression, usually the maximum likelihood (ML) estimator is used to estimate the unknown regression coefficients. When some of the independent variables are highly related, then the problem of multicollinearity arises in the data. Due to the presence of multicollinearity, the covariance of the ML estimator increases and it may provide misleading signs of the estimates which leads to unstable or falls effects of the independent variables. Thus, making statistical inference based on the ML estimator in the presence of multicollinearity becomes difficult.

Various researchers have considered the problem of multicollinearity in Poisson regression and proposed new biased estimation methods alternative to ML estimator. Though, the alternative estimation methods are biased, the performance of these estimators is good as compared to the ML estimator in the mean squared error sense. Some notable references are Algarni and Alanaz [1], Alkhateeb & Algarni [2], Asar and Genc [3], Kibria *et al.* [12], Mansson *et al.* [14], Mansson and Shukur [15], Qasim *et al.* [19], Rashad and Algarni [20], Türkan and Özel [22].

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