Estimation of Threshold-Boundary Poisson Regression Models

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Abstract

This study employs the Threshold Boundary Poisson Regression (TBPR) model to analyze count data. The TBPR model constructs a Poisson regression and a threshold boundary function through explanatory variables, allowing the threshold boundary function to be formed as a linear or nonlinear classifier from multiple explanatory variables. We anticipate that the flexible classification of count data can be achieved through the threshold function, enabling more effective analysis using two Poisson regression models. To estimate the TBPR model, we propose an ordered iterative algorithm that combines Weighted Support Vector Machine (WSVM) and Maximum Likelihood estimation. We refer to this method as the TBPR-WSVM algorithm. Additionally, we integrate Monte Carlo Markov Chain (MCMC) with TBPR-WSVM estimation results to further enhance algorithm prediction performance. In this study, we conduct a simulation study specifically for the TBPR-WSVM algorithm. Numerical analysis results indicate that the TBPR-WSVM algorithm exhibits favorable estimation and predictive performance for both linear and nonlinear threshold boundary Poisson models with a limited sample size.

Keywords: Poisson regression, threshold, weighted support vector machine

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