Subgroup Analysis of Zero-Inflated Poisson Model with Application to Insurance Data

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Abstract: Customized personal rate offering is of growing importance in the insurance industry. To achieve this, an important step is to identify subgroups of insureds from the corresponding heterogeneous claim frequency data. In this paper, a penalized Poisson regression approach for subgroup analysis in claim frequency data is proposed. Subjects are assumed to follow a zero-inflated Poisson regression model with group-specific intercepts, which capture group characteristics of claim frequency. A penalized likelihood function is derived and optimized to identify the group-specific intercepts and effects of individual covariates. To handle the challenges arising from the optimization of the penalized likelihood function, an alternating direction method of multipliers algorithm is developed and its convergence is established. Simulations studies and real applications are provided for illustrations.