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# Non-Linear Regression Modeling for Composite Distributions

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**Abstract :** Modeling loss data is an important part of actuarial science. Actuaries use models to predict future losses and manage financial risk, which can be beneficial for marketing purposes. In the insurance industry, small claims happen frequently while large claims are rare. Traditional distributions such as Normal, Exponential, and inverse-Gaussian are not suitable for describing insurance data, which often show skewness and fat tails. Several authors have studied classical and Bayesian inference for parameters of composite distributions, such as Exponential-Pareto, Weibull-Pareto, and Inverse Gamma-Pareto. These models separate small to moderate losses from large losses using a threshold parameter. This research introduces a computational approach using a nonlinear regression model for loss data that relies on multiple predictors. Simulation studies were conducted to assess the accuracy of the proposed estimation method. The simulations confirmed that the proposed method provides precise estimates for regression parameters. It's important to note that this approach can be applied to datasets if goodness-of-fit tests confirm that the composite distribution under study fits the data well. To demonstrate the computations, a real data set from the insurance industry is analyzed. A Mathematica code uses the Fisher information algorithm as an iteration method to obtain the maximum likelihood estimation (MLE) of regression parameters.

**Keywords :** maximum likelihood estimation, fisher scoring method, non-linear regression models, composite distributions
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