Are California Public Entities At Risk?

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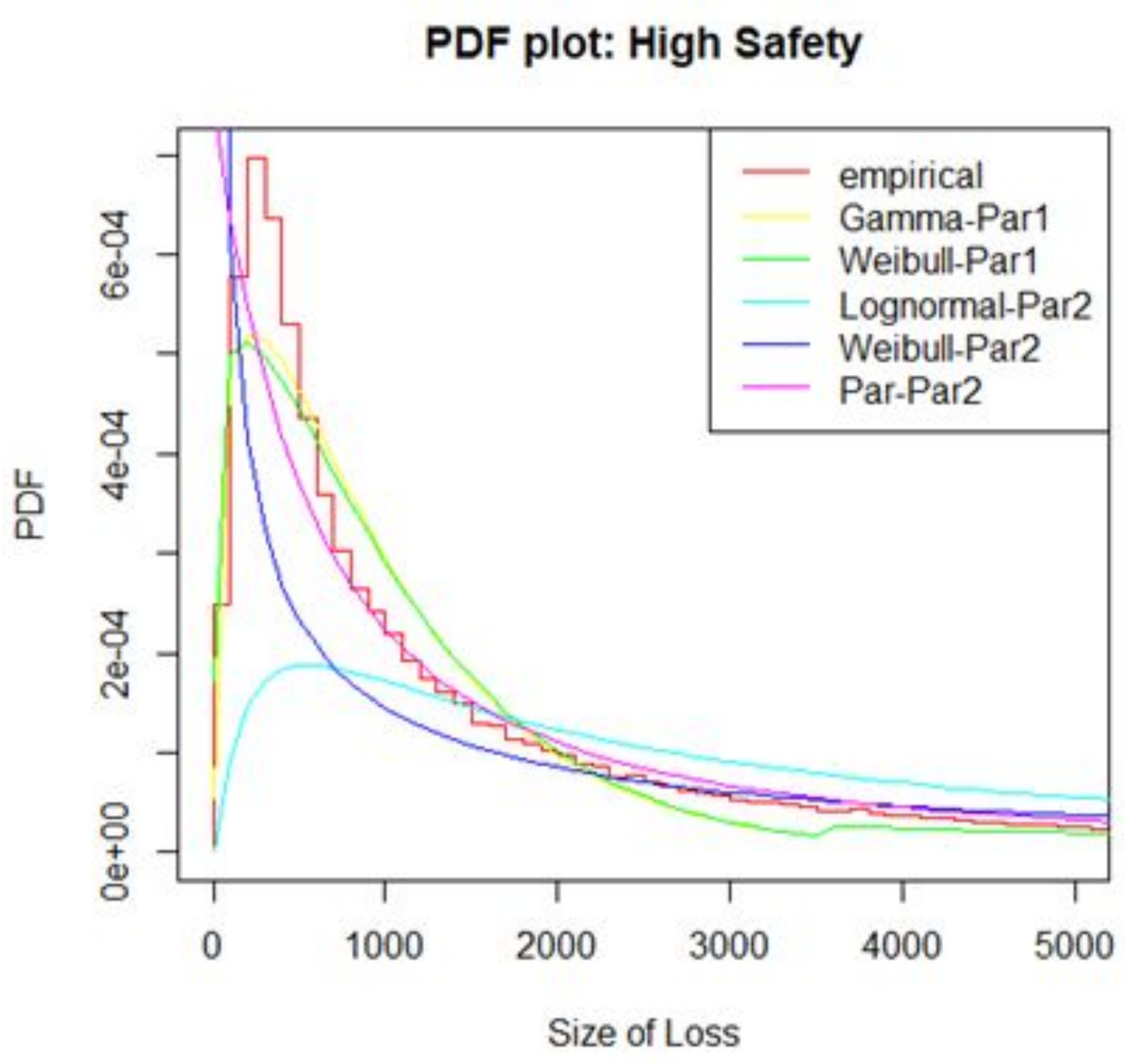
Abstract

The goal of our study is to model the distribution of Workers Compensation (WC) claim amounts for public entities across four rating groups. WC losses tend to be very heavy-tailed, so we will analyze the body and tail of the data separately. We test multiple distributions and determine best fit models based on statistical goodness of fit measures. We find that in all cases, either the Gamma-Pareto or Pareto-Pareto combination is most accurate, depending on the rating group. From our results, we conclude all four rating groups follow a similar distribution and there exists no significant statistical difference between them.

Introduction

Workers Compensation covers all costs that result from any injury that occurs while an employee is at work. Our sponsor, CSAC-EIA, provides excess WC insurance to California public entities for losses surpassing a given attachment point. Creating a loss distribution for each of the four rating groups will enable a better understanding of the risk attributed to insuring public entities under each category. This will help with both rate-making and risk management purposes.



Discussion

Given our results, we concluded that there is no statistically significant difference in the distributions of the four rating groups.
Possible next steps may include attempting to build a more accurate model with the use of mixed Erlang distributions to incorporate more parameters.

Methods

Due to the heavy tailed nature of our data, we decided to employ a splicing model and fit a separate distribution to the body and tail portion of our data. For each of the four rating groups, we chose the optimal model as follows:
Step 1. We used the hill estimator to choose a splicing point. This also fits the tail of the data to a Pareto Distribution and estimates the shape parameter α. We used two different methods of estimation: eyeballing method and asymptotic mean squared error.
Step 2. Fit the body of the data to a multitude of distributions using Method of Moments and Maximum Likelihood Estimation for parameters.
Step 3. Use goodness of fit measures (Kolmogorov-Smirnoff and log-likelihood) and indicators (Akaike Indicator Criterion) to compare models and choose the best overall fit.

Results

Using the resulting log likelihood for each model, we found the best fit for each rating group as follows:

- High Safety: Gamma-Pareto w/ Eyeballing Method
- Low Safety: Gamma-Pareto w/ Eyeballing Method
- Counties: Pareto-Pareto w/ Eyeballing Method
- Schools: Gamma-Pareto w/ Eyeballing Method

Method	Body Distribution	KS Statistic	Log-Likelihood	Accept/Reject
Eyeballing	Gamma (MME)	.03	-1,820,130	Reject
	Weibull (MLE)	.03	-1,820,511	Reject
AMSE	Weibull (MLE)	.28	-1,871,319	Reject
	Log Normal (MME)	.11	-1,846,818	Reject
	Pareto (MLE)	.05	-1,819,884	Reject

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