

Model Risk in the Cramér–Lundberg Model: The Impact of Clustered and Dependent Claims

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Abstract

Two insurance models can have the same expected aggregate loss but still describe very different levels of risk. This thesis studies this issue by extending the classical Cramér–Lundberg model to allow claim arrivals to generate several related subclaims. The aim is to understand how clustering and dependence between the number of subclaims and their sizes affect total losses.

We compare the extended model with two alternative models. The first keeps the clustered claim count but removes the dependence in subclaim sizes. The second replaces the clustered count with a Poisson count with the same mean. This makes it possible to separate the effect of clustering from the effect of dependence.

For all three models, formulas for the expected value and variances are derived and compared with Monte Carlo simulations. The results show that the expected loss is the same in all three models, but their coefficients of variability differs. The extended model gives the largest variance, while the adjusted classical model gives the smallest. The difference becomes larger as the group size increases, showing that dependence can affect risk even when the expected loss is unchanged. The results are also consistent with earlier research showing that dependence and clustering can affect insurance risk.

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