Background:

The variables taken into consideration in this model are the size of the claim, the size of the premium and the probability of a customer making a claim. The size of the claim ,denoted by X, is drawn from a Pareto Distribution with the density function below;

Calculating the cumulative distribution function of

Since is a continuous random variable, this is obtained by integrating the density function from 0 to

Expectation of

**Conditions for the parameters:**

is a positive random variable, therefore clearly leading to a positive mean size of claims. Also for the same reason, ensuring that the basic integration step can be applied. Clearly, to ensure that the mean size of claim is well defined.

Median of

Let

Solving for *,*

Variance of

By definition,

**Conditions for the parameters:**

Variance is strictly positive . Hence . Clearly , again ensuring that the variance is well defined.

The Inversion method

1. Generate ui (0,1)
2. Set ui=F(xi) and make xi the subject

This can be done since F(x) is continuous and strictly increasing based on the restrictions imposed on the parameters.

Simulation of 1000 values drawn from X

Reasons for use of Pareto Distribution to describe size of claims

* The Pareto Distribution is positively skewed and has a heavy tail on the right.

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For this reason, we use Pareto for insurance applications to model extreme

loss,especially for more risky types of insurance,

* It is a mixture of the exponential distribution with gamma mixing weights.
* In financial applications , the study of heavy tailed distributions provides information about the potential for financial failure(bankruptcy)

As it can be seen from the above simulation, the distribution of assets are negatively skewed which is clearly compatible with the positive skewness of the Pareto distribution. Assets and Total size of claims are negatively related. S, denoted by the total size of claims here is a combination of the Pareto distribution and the Bernoulli distribution.

**Analysing the impact on probability of bankruptcy while changing the variables-premium and probability of a customer making a claim.**

**The effect of premium on probability of bankruptcy**

Throughout this analysis we only change the premium ,whilst controlling for the rest of the variables in the question. We analysed the effects for premium levels ranging from £5500 to £8000 increasing it by £500 each time.

The outcome is as follows:

Clearly, the probability of bankruptcy declines with an increase of premium levels.

However to ensure that the probability of bankruptcy is no more than 2% we need to charge for a premium of at least £7250.

**The effect of probability of a customer making a claim on the probability of bankruptcy**

Here, we change the probability of a customer making a claim ,controlling for premium and other variables in the question.

The analysis has been carried out for probability ranging from 0.05 to 0.15 increasing it by a 0.005 each time.

The outcome is as follows:

We observe a positive trend between the two variables as expected. The higher the chance of a customer making a claim, the higher the claims that the company has to pay for, thus increasing the probability of bankruptcy as premium is fixed.

We also observe an increase in the steepness of the curve