

MATH 341 Prof.Miller

HW 11 - Selected Problems

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Review

In Brazauskas et al (2009), the authors develop statistical inferential methods to quantify the inflation rates, associated with insurance payments that involve a deductible, and illustrate them using simulated data.

A number of challenges arise when an insurance policy covers only loss amounts that exceed a threshold known as the deductible. When (re)insurance coverages involve a deductible, the impact of inflation on loss amounts is distorted, and the changes in claims paid by the (re)insurer cannot be assumed to reflect the rate of inflation. Nevertheless, this paper tries estimating the inflation rate from the simulated observations, recognizing that the distribution of the number of observed losses changes from year to year depending on the inflation rate.

For this end, this paper adopts the Pareto distribution to model insurance losses, which is widely used in actuarial practice. The authors observe that, when losses follow a Pareto distribution, the observed loss amounts (those that exceed the deductible) are identically distributed from year to year even in the presence of inflation. Then the authors proceed to simulate losses corresponding to 10 successive years, in which the number of losses each year is assumed to be independent Poisson random variables with mean 1000, and all loss amounts are independent (these are common assumptions in insurance loss modelling). The losses occurring during the j th year follow a Pareto distribution with scale parameter $\theta = 1.05^{j-1}$ and shape parameter $\alpha = 2$. These parameter choices are arbitrary but reflect the phenomenon that has been observed. Further, this paper assumes that the insurer will pay only the amount of losses that exceed 5 and therefore will be unaware of any losses that are less than 5.

From the simulated loss data, the authors find that, while the average loss amount increases with inflation, the average observed loss amount does

not appear to increase. In addition, the number of observed losses tends to increase over time, and this is how this paper captures the information about inflation. The sum of observed losses also increases over time. However, such increases reflect the leveraging effect (see note 1) of the fixed deductible and do not properly represent the increases due to inflation. If the deductible is kept unchanged, then total observed losses will not increase by the inflation rate because losses that were previously below the deductible may, with inflation, exceed the deductible.

Notes:

1. Leveraging effect, deductible: If insurance claims increase while the deductible remains the same between one policy year and the next, an economic adjustment is made in the premium structure to reflect the increase in the amount of benefits paid in comparison to increases in the total cost of services. Fixed deductibles result in greater inflation in group premiums. The larger the deductible, the greater the impact on premium inflation the following policy year.

References:

1. Vytaras Brazauskas, Bruce L. Jones, and Ricardas Zitikis. "When Inflation Causes No Increase in Claim Amounts". *Journal of Probability and Statistics*, Volume 2009 (2009), Article ID 943926, 10 pages, doi:10.1155/2009/943926.