REVERSED INSURANCE

1. ASSIGNMENT

You are given the data on reported insurance claims from 2012 to 2020 for a specific insurance product. In the data, there are claims with their accident dates. As you will see the claims do not have a Normal distribution, instead there are some, but not numerous claims with high paid-out amount. Therefore we have to use a heavy-tailed distribution. Your task is to:

a) Find the distribution that fits the data best (you can use different programs as R, Matlab, Python or Excel). You can use any method you can think of, your goal is to find the best fit for the data.
b) Quantitatively check your fitted distribution with a statistic test (at least with Kolmogorov-Smirnov test), to see whether you have managed to fit your distribution well to the given data.

Explain why you choose the method you opted for, and you can also give ther distributions you tried fitting the data with along with the test of fit. Any visual representation of your results will be a benefit as well.

2. ASSIGNMENT

Find the most probable number of policies in the portfolio for each month from 1.1. 2013 onwards, assuming that the monthly loss ratio follows Normal distribution with the parameters $N(0.9; 1 - \log(\log(N_{t-1}^2)))$ where

N_t = estimated number of insured persons at the end of the month

Assumptions:

- First policies begin on 1.1.2012 and that is also when premiums and claims begin.
- The only cash flows arising from the insurance contract are premiums, claims, reinsurance premiums and reinsurance claims.
- Estimated number of insured persons as at 31.12.2012 = 893.
- All premiums are paid monthly
- Min loss ratio value is 0

- Min number of insured is 0

3. ASSIGNMENT

Based on the results found in 2nd Assignment and the distribution of claims in 1st Assignment, find the most profitable reinsurance cover from 1.1.2013 on, which will assure the survival of the insurance company in 99,5% of cases. The only available reinsurance cover is per risk XL reinsurance.

Boundaries:

- The equity avalible to cover losses in current year equals 30% of profit arising from this portfolio calculated on last day of previous year from begining + reinsurance premium for same period (year ending at 31.12.)
- Reinsurance cover could be changed 3 years after last change

Additional explanation:

Per risk XL reinsurance cover is a type on non-proportional reinsurance, meaning that a claims payment under an insurance cover is conditional upon an insured loss event having taken place. Specifically per risk Excess of loss (XL) means that the insurer is liable only for risks up to a predetermined maximum amount per claim (which is recognised as the company's loss retention), which enables an insurer to underwrite risks that it could not otherwise manage. The reinsurance over is designed on a »per risk« basis, which means that each loss is regarded separately per risk.

Technical instructions: The data can be found on a cloud:

Quickconnect.to

ID: aclogatec

User: MChallenge

Password: Portoroz.2021

Folder: Math Challenge/Challenge 3

The data is available in the folder Math Challenge/Challenge 3 in Challenge3_data.xls. For the numerical part, the competitors must complete the files NumericalSolution1.xls, NumericalSolution2.xls and NumericalSolution3.xls. The competitors must also provide a description of the solutions of all the three assignments.