Obligatory assignment for STK3505/4505, Autumn 2016

You are to write a report, stating clearly what assumptions you have made, and interpreting the results you get. The report must be handed in **on paper** within **October 31** in the mail-shelf of Ingrid Hobæk Haff on the 7th floor of the Math building.

The assignment consists in two parts. To pass, you must answer both. Also remember that if you are taking STK4505, the report must be written in LaTeX.

Part I

Suppose a non-life insurance company has responsibility for a portfolio of $J = 1,000$ policies. Assume further that the number of claims $\mathcal{N}$ is Poisson distributed with intensity $\mu = 0.01$, and that the claim sizes Z_i are Gamma distributed with $\mathrm{E}(Z_i) = 1.7$ and $\mathrm{sd}(Z_i) = 1,\ 2,\ 3.5$.

a) Find the parameters ξ and α of the Gamma distribution for each of the three values of $\mathrm{sd}(Z_i)$ and plot the probability density function of each of the three distributions.

b) Compute the 95% and 99% reserve for this portfolio for each of the three sets of parameters.

c) Assume now that the actual compensations have a deductible $a = 0.6$ and a maximum insured sum $b = 4$ per claim, and repeat b). Compare with the results from b).

Part II

Assume that the net assets of the above company are given by the recursion

$$\mathcal{Y}_k = (1 + \mathcal{R}_k)\mathcal{Y}_{k-1} + \Pi_k - \mathcal{O}_k - \mathcal{X}_k,\ k = 1, 2, \ldots$$

with $\mathcal{Y}_0 = \nu_0$. Further, assume that $\mathrm{sd}(Z_i) = 3.5$ and $\Pi_k - \mathcal{O}_k = 18$, for all k.

a) First, assume that there is no financial income ($\mathcal{R}_k = 0$, for all k). Use Monte Carlo methods to find the start capital ν_ϵ keeping the ruin probability at $\epsilon = 5\%,\ 1\%$ at the horizon $K = 20$ years.

b) Repeat a) for $K = 10$ and $K = 5$ and compare the results.

c) Now, assume that $\mathcal{R}_k = e^{\xi_R + \sigma_R \varepsilon} - 1$, with $\varepsilon \sim N(0,1)$, $\xi_R = 0.07$ and $\sigma_R = 0.2$. Repeat a) and b) and compare the results.