Obligatory assignment for STK3505/4505, Autumn 2017

You are to write a report where you clearly state what assumptions you have made in addition to the ones stated in the text and describe and interpret the results you get. The report must be handed in **electronically** within **October 17** in the Devilry system (see here).

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 follow a log-normal distribution with $\mathrm{E}(Z_i) = 1.9$ and $\mathrm{sd}(Z_i) = 1,\ 2,\ 3.5$.

a) Find the parameters ξ and σ of the log-normal 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 parts of the responsibility is ceded to a reinsurer. The reinsurance contract, which is a layer $a \times b$ contact, applies to the individual losses Z_i. Compute the 95% and 99% reserve for the cedent when $a = 0.7$ and $b = 3.8$ and compare to the results from b). Also compute the reinsurance premium and comment on the results.

Part II

a) Consider the put option with $r_g = 0.05$ when the underlying return R follows the log-normal model with volatility $\sigma\sqrt{T}$. Compute the value of this option when the risk-free return is $r = 0.03$, $T = 1$ and σ varies between $0.2, 0.25, 0.3$, both analytically and using Monte Carlo. Explain how you proceed and comment on the results.

b) Now consider a cliquet option with the same conditions as in a), and with $r_c = 0.06, 0.1, 0.15, 0.3, 0.4$. Compute the value of this option for the

different values of σ and r_c. Explain how you proceed and compare the results to the ones from a).