ACSC/STAT 4703, Actuarial Models II
Fall 2016

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Homework Sheet 2

Due: Friday 7th October: 10:30 PM

Basic Questions

1. An insurance company has the following portfolio of home insurance policies:

Type of home	Number	Probability of claim	mean claim	standard deviation
Small home	1300	0.10	\$35,000	\$29,000
Medium home	1200	0.09	\$51,000	\$39,000
Large home	400	0.07	\$200,000	\$88,000

   Calculate the cost of reinsuring losses above \$10,000,000, if the loading on the reinsurance premium is one standard deviation above the expected claim payment on the reinsurance policy using a gamma approximation for the aggregate losses on this portfolio.

2. For the following dataset

```
0.9 1.3 2.6 0.6 1.5 3.8 2.1 0.6 1.6 0.2 1.5 0.7 2.2
2.1 1.1 2.2 0.1 1.9 1.4 1.2 1.8 1.3 2.6
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   Use the Emprirical distribution to calculate cumulative hazard rate $H(2.5)$.

3. For the sample from Question 2, calculate a Nelson-Åalen estimate for the probability that a random sample is more than 1.85.

4. Draw a histogram of the following distribution:

Claim Amount	Number of Claims
Less than \$5,000	14
\$5,000–\$10,000	95
\$10,000–\$20,000	157
\$20,000–\$30,000	34

Standard Questions

5. An insurance company insures 3 types of drivers with the following characteristics

Type of driver	Number of claim	Probability claim	mean deviation	standard
Good driver	200	0.01	\$3,500	\$1,300
Average driver	1,500	0.02	\$3,800	\$1,700
Bad driver	550	0.11	\$4,700	\$2,800

An insurance company sets the premium for each policy at 0.5 standard deviations above the mean annual claim (assume no more than one claim per year). The company models aggregate losses using a Pareto distribution with the first two moments matching the true distribution. The insurance company uses excess of loss insurance to ensure it cannot make a loss on this portfolio (ignoring administrative costs). The reinsurance company charges a premium at the mean plus one standard deviation of the payment on the excess loss. At what level should they purchase excess-of-loss reinsurance. [Remember to include this premium in the insurance company's loss, when setting the level for the excess-of-loss reinsurance.]

(i) \$1,133,206

(ii) \$1,243,078

(iii) \$1,301,579

(iv) \$1,389,425

6. An insurance company collects the following data on insurance claims:

Claim Amount	Number of Policies
Less than \$10,000	41
\$10,000–\$20,000	477
\$20,000–\$50,000	2006
\$50,000–\$100,000	470
More than \$100,000	6
Total	3000

Using the ogive as an estimate for the empirical distribution function:

(a) estimate the VaR of the severity distribution at the 95% level.

(b) estimate the TVaR at the 95% level assuming the policy has a policy limit of \$100,000.