ACSC/STAT 4703, Actuarial Models II
Fall 2015
Toby Kenney
Homework Sheet 1
Due: Friday 2nd October: 10:30 PM

Basic Questions

1. Loss amounts follow an exponential distribution with $\theta = 12,000$. The distribution of the number of losses is given in the following table:

Number of Losses	Probability
0	0.02
1	0.24
2	0.36
3	0.28

Assume all losses are independent and independent of the number of losses. The insurance company buys excess-of-loss reinsurance on the part of the loss above $150,000. Calculate the expected payment for this excess-of-loss reinsurance.

2. Aggregate payments have a compund distribution. The frequency distribution is negative binomial with $r = 3$ and $\beta = 6$. The severity distribution is a Pareto distribution with $\alpha = 6$ and $\theta = 12000$. Use a Gamma approximation to aggregate payments to estimate the probability that aggregate payments are more than $100,000.

3. An insurance company models loss frequency as negative binomial with $r = 4$, $\beta = 3$, and loss severity as exponential with $\theta = \$4,500$. Calculate the expected aggregate payments if there is a policy limit of $50,000 and a deductible of $1,000 applied to each claim.

4. Claim frequency follows a negative binomial distribution with $r = 8$ and $\beta = 1.7$. Claim severity (in thousands) has the following distribution:

Severity	Probability
1	0.5
2	0.3
3	0.15
4	0.03
5	0.015
6	0.004
7	0.0007

Use the recursive method to calculate the exact probability that aggregate claims are at least 8.

5. Using an arithmetic distribution ($h = 1$) to approximate a Pareto distribution with $\alpha = 4$ and $\theta = 9$, calculate the probability that the value is between 2.5 and 6.5, for the approximation using:

(a) The method of rounding.

(b) The method of local moment matching, matching 1 moment on each interval.

Standard Questions

6. The number of claims an insurance company receives follows a negative binomial distribution with $r = 46$ and $\beta = 8.4$. Claim severity follows a negative binomial distribution with $r = 14$ and $\beta = 0.8$. Calculate the probability that aggregate losses exceed \$4000.

(a) Starting the recurrence 6 standard deviations below the mean.

(b) Using a suitable convolution.