ACSC/STAT 4703, Actuarial Models II
Fall 2016

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Homework Sheet 7

Due: Friday 25th November: 10:30 PM

Basic Questions

1. An insurance company sets the book pure premium for its home insurance premium at \$1,132. The expected process variance is 261,244 and the variance of hypothetical means is 89,402. If an individual has no claims over the last 8 years, calculate the credibility premium for this individual's next year's insurance using the Bühlmann model.

2. An insurance company has the following data on an insurance policy for a company that rents out apartments.

Year	1	2	3	4
Exposure	835	884	952	944
Aggregate claims	\$122,000	\$106,000	\$153,000	\$149,000

   The book premium is \$500 per unit of exposure. The variance of hypothetical means per unit of exposure is 880. The expected process variance per unit of exposure is 6,300. Using a Bühlmann-Straub model, calculate the credibility premium for Year 5 if the company has 1,063 units of exposure.

3. An insurance company has the following previous data on aggregate claims:

Policyholder	Year 1	Year 2	Year 3	Year 4	Year 5	Mean	Variance
1	0.00	158.74	1674.34	0.00	0.00	366.616	539144.09148
2	135.41	0.00	0.00	29.10	152.90	63.482	5602.81662
3	0.00	0.00	0.00	0.00	588.49	117.698	69264.09602
4	0.00	0.00	88.22	233.61	1424.39	349.244	370346.60373

   Calculate the Bühlmann credibility premium for each policyholder in Year 6.

4. Over a three-year period, an insurance company observes the following numbers of claims:

No. of claims	Frequency
0	1,856
1	2,901
2	2,465
3	1,387
4	760
5	386
6	159
7	51
8	19
9	13
10	3

Assuming the number of claims made by an individual in a year follows a Poisson distribution, calculate the credibility estimate for the expected claim frequency in the following year, of an individual who has made a total of 7 claims in the past 3 years.

Standard Questions

5. Aggregate claims for a given individual policy are modelled as following a Pareto distribution with $\alpha = 4$. The first 4 years of experience on this policy are:

Policyholder	Year 1	Year 2	Year 3	Year 4
1	2061	1928	449	1663
2	785	690	7002	711
3	984	958	3206	1260
4	3040	415	294	1714

(a) Estimate the EPV and VHM based on the method of moment estimates for each θ. [That is for each policyholder estimate a value of θ that makes the mean observations for that policyholder equal to the observed mean.]

(b) Calculate the credibility premium for policyholder 2 in the next year.

6. Claim frequency in a year for an individual follows a Poisson with parameter Λt where Λ is the individual's risk factor and t is the individual's exposure in that year. An insurance company collects the following data:

	Year 1		Year 2		Year 3	
Policyholder	Exp	claims	Exp	claims	Exp	claims
1	130	1	403	2	231	0
2	241	7	373	11	379	15
3	86	0	371	0	407	1
4	64	3	275	7	255	3

In Year 5, policyholder 2 has 264 units of exposure. Calculate the credibility estimate for claim frequency for policyholder 2.