

ACSC/STAT 4703, Actuarial Models II

Fall 2017

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Homework Sheet 3

Due: Friday 13th October: 10:30 PM

Basic Questions

1. A homeowner's house is valued at \$420,000, but is insured at \$270,000. The insurer requires 75% coverage for full insurance. The home sustains \$3,100 from a fire. The policy has a deductible of \$2,000, which decreases linearly to zero when the total cost of the loss is \$6,000. How much does the insurance company reimburse?
2. A homeowners insurance company has three types of coverages with different expected loss ratios, has the following data on recent claims:

Policy Type	Policy Year	Earned Premiums	Expected Loss Ratio	Losses paid to date
Homeowner's insurance	2014	\$400,000	0.72	\$270,000
	2015	\$480,000	0.72	\$130,000
	2016	\$590,000	0.74	\$70,000
Tennant's insurance	2014	\$70,000	0.83	\$58,600
	2015	\$72,000	0.83	\$44,300
	2016	\$75,000	0.83	\$29,400
Fire insurance	2014	\$300,000	0.65	\$126,000
	2015	\$350,000	0.65	\$85,000
	2016	\$380,000	0.67	\$17,000

Calculate the loss reserves at the end of 2016.

3. The following table shows the paid losses on claims from one line of business of an insurance company over the past 6 years.

Accident year	Earned premiums	Development year						
		0	1	2	3	4	5	
2011	3,156	870	95	253	727	-425	851	
2012	3,930	844	184	709	409	300		
2013	3,248	1,394	258	184	-3			
2014	4,955	1,291	54	856				
2015	4,142	1,422	579					
2016	4,806	1,754						

Assume that all payments on claims arising from accidents in 2011 have now been settled. Estimate the future payments arising each year from open claims arising from accidents in each calendar year using

- (a) The loss development triangle method

(b) The Bornhuetter-Ferguson method with expected loss ratio 0.76.

4. An actuary is reviewing the following claims data:

No. of closed claims						Total paid losses on closed claims (000's)						
Acc. Year	Development Year				Ult.	Acc. Year	Development Year					
	0	1	2	3	4		0	1	2	3	4	
2012	250	335	370	395	400	400	2012	723	2,087	2,263	2,822	4,783
2013	280	385	400	450		460	2013	1,509	2,641	2,948	5,256	
2014	330	395	470			500	2014	1,745	3,214	3,754		
2015	320	460				540	2015	3,094	3,244			
2016	360					580	2016	2,824				

(a) Calculate tables of percentage of claims closed and cumulative average losses.

(b) Adjust the total loss table to use the current disposal rate.

(c) Use the chain ladder method to estimate claim development based on the adjusted numbers. Compare this to the chain ladder method on aggregate payments on closed claims.

Standard Questions

5. An insurance company insures 10,000 homes. Each home makes a claim with probability 0.02. If a home makes a claim, the loss distribution of the claim is a mixture distribution: with probability 0.95, the loss amount follows an exponential distribution with mean \$5,000. With probability 0.05, the loss amount follows an exponential distribution with mean \$300,000. The insurance company sets its premium at 110% of expected claims. What policy limit should it set to ensure that the probability that aggregate claims exceed aggregate premiums is less than 0.001? [Note that changes to the policy limit will change the premium.]