

ACSC/STAT 4703, Actuarial Models II

Fall 2018

Toby Kenney

Homework Sheet 3

Due: Friday 12th October: 10:30 PM

Basic Questions

1. A homeowner's house is valued at \$520,000, but is insured at \$270,000. The insurer requires 70% coverage for full insurance. The home sustains \$8,400 from flooding. The policy has a deductible of \$5,000, which decreases linearly to zero when the total cost of the loss is \$10,000. How much does the insurance company reimburse?
2. An insurance company has three types of coverages for businesses with different expected loss ratios, and has the following data on recent claims:

Policy Type	Policy Year	Earned Premiums	Expected Loss Ratio	Losses paid to date
Workers' compensation insurance	2015	\$4,000,000	0.76	\$1,900,000
	2016	\$4,500,000	0.75	\$1,100,000
	2017	\$5,200,000	0.77	\$700,000
Fire insurance	2015	\$800,000	0.74	\$580,000
	2016	\$920,000	0.74	\$675,000
	2017	\$880,000	0.75	\$630,000
Liability insurance	2015	\$2,000,000	0.68	\$540,000
	2016	\$2,400,000	0.67	\$520,000
	2017	\$2,600,000	0.66	\$190,000

Calculate the loss reserves at the end of 2017.

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
2012	4,118	800	790	680	511	151	164
2013	4,346	931	799	636	619	197	
2014	4,538	904	921	682	571		
2015	4,417	906	833	706			
2016	4,656	938	930				
2017	4,845	981					

Assume that all payments on claims arising from accidents in 2012 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 0.81.

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	
2013	396	644	804	824	877	1014	2013	5,014	8,472	10,946	12,188	13,660
2014	461	806	1003	1071		1163	2014	5,605	11,374	15,878	17,628	
2015	625	1022	1167			1486	2015	8,834	13,459	20,213		
2016	589	1007				1592	2016	8,938	14,971			
2017	703					1758	2017	9,250				

(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. The number of claims on an insurance policy follows a Poisson distribution with mean 40. For each claim, there is the following distribution of years to settlement and final claim amount:

Years to settlement	Probability	Final Claim amount	
		Mean	Standard Deviation
0	0.2	800	300
1	0.3	800	300
2	0.2	1,000	350
3	0.15	1,300	500
4	0.1	1,700	1,100
5	0.05	2,800	2,300

(a) Calculate the expected loss development ratio.

(b) For policies sold 4 years ago, what is the probability that the losses paid out in development year 5 are more than twice the expected loss using the loss development ratio? You may use a normal approximation for the aggregate losses in a given year.