ACSC/STAT 4703, Actuarial Models II

FALL 2022
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Homework Sheet 3

Due: Thursday 13th October: 17:30

Basic Questions

1. A homeowner's house is insured at $270,000. The insurer requires 75% coverage for full insurance. The home sustains $9,600 damage from wind. The policy has a deductible of $4,000, which decreases linearly to zero when the total cost of the loss is $12,000. The insurance company reimburses $6,240. What value are they using for the houses value?

2. An insurance company has two lines of coverage in its Tennant's Insurance packages, 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
Apartment	2019	$6,400,000	0.84	$5,200,000
	2020	$6,800,000	0.85	$4,900,000
	2021	$6,700,000	0.84	$4,600,000
House	2019	$3,500,000	0.77	$2,100,000
	2020	$4,200,000	0.78	$1,800,000
	2021	$5,300,000	0.76	$1,900,000

Calculate the loss reserves at the end of 2021.

3. The following table shows the cumulative paid losses (in thousands) on claims from one line of business of an insurance company over the past 5 years.

Accident year	Earned premiums	Development year				
		0	1	2	3	4
2017	7178	2294	3726	4310	4855	5232
2018	8589	2840	5101	4975	5691	
2019	6788	3268	4221	5198		
2020	8332	3380	4933			
2021	10094	3494				

Assume that all payments on claims arising from accidents in 2016 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 0.74.

4. An actuary is reviewing the following claims data:

No. of closed claims

Acc.	Development Year				Ult.
Year	0	1	2	3	4
2017	4296	8282	9809	10486	10529	10792
2018	6067	9875	11490	12124		12449
2019	5636	9684	11844			12995
2020	7090	11637				14166
2021	9329					17850

Total paid losses on closed claims (000's)

Acc.	Development Year				
Year	0	1	2	3	4
2017	2156	8956	9879	10276	20762
2018	3597	7603	9046	17557	
2019	10125	13866	17338		
2020	10460	7351			
2021	10124				

(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, with average loss development factors 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 has the following aggregate loss development data:

Accident year	Earned premiums	Development year				
		0	1	2	3	4
2017	82864	17592	39598	57167	63803	68242
2018	112460	21110	47601	68628	76510	
2019	132278	25470	57409	82935		
2020	154944	31635	71278			
2021	156018	27332				

From this table, it calculates the following mean loss development factors:

Development year	LDF
0/1	2.253343
1/2	1.443419
2/3	1.115410
3/4	1.069574

After adding a loss payment in development year 3 for loss year 2018, the reserve needed for loss year 2019, development year 3, using the chain-ladder method increases by 13094.77. How much increase in the reserve would the additional loss cause if the company were using the Bornhuetter-Fergusson method with expected loss ratio 0.79 to calculate reserves?