

# ACSC/STAT 4703, Actuarial Models II

FALL 2021

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Homework Sheet 3

Due: Thursday 14th October: 11:30 AM

## Basic Questions

1. A homeowner's house is valued at \$840,000, but is insured at \$360,000. The insurer requires 70% coverage for full insurance. The home sustains \$12,600 from fire. The policy has a deductible of \$5,000, which decreases linearly to zero when the total cost of the loss is \$15,000. How much does the insurance company reimburse?
2. An inland marine insurance company has two lines of coverage 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
Train	2018	\$4,200,000	0.78	\$3,200,000
	2019	\$4,600,000	0.77	\$2,900,000
	2020	\$6,500,000	0.78	\$4,800,000
Truck	2018	\$6,600,000	0.74	\$3,200,000
	2019	\$7,700,000	0.75	\$2,250,000
	2020	\$9,300,000	0.74	\$2,150,000

Calculate the loss reserves at the end of 2020.

3. The following table shows the paid losses 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
2016	6990	3347	1052	327	532	285
2017	5473	2863	2096	188	525	
2018	11117	4331	2671	869		
2019	11931	3797	2101			
2020	15229	4542				

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 0.81.

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
2016	1075	2723	3298	3619	3666	3721	2016	2424	10146	10048	12217	15284
2017	2392	4337	5035	5418		5535	2017	5653	12384	19361	18659	
2018	4570	7042	8513			9311	2018	10942	22642	25571		
2019	4197	8827				11945	2019	11111	24353			
2020	3107					6769	2020	5983				

- (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 mean 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
2016	80929	12628	23111	39897	54644	58812
2017	80863	14270	26105	45201	61893	
2018	80874	14693	26991	46577		
2019	66143	13435	24570			
2020	91734	17247				

- (a) Use this data to estimate the loss development factors using the average method, and use both the chain ladder method and the Bornhuetter-Fergusson method with expected loss ratio 0.83 to estimate reserves for 2021.
- (b) How much would the loss reserves be changed if the losses for accident year 2017, development year 3 were increased by \$20,000?