STAT 490
Quiz 2
Fall 2022

September 20, 2022

1. Jake (not from State Farm) is one of the actuaries at Andrew Auto. He has the following Paid Claims triangle for collision coverage:

	Cumulative Loss Payments by Development Year					
Accident Year	Development Year					
	0	1	2	3	4	5
2014	1,000,000	1,500,000	1,700,000	1,800,000	1,850,000	1,875,000
2015	1,100,000	1,750,000	1,775,000	1,825,000	1,870,000	
2016	1,200,000	1,900,000	2,200,000	2,350,000		
2017	1,500,000	2,200,000	2,500,000			
2018	2,000,000	2,900,000				
2019	2,500,000					

There is no further development after year 5.

Calculate the loss reserve on December 31, 2019 using the chain ladder method with arithmetic average loss development factors.

Solution:

$$f(1/0)=\left(\frac{1}{5}\right)\left[\frac{1.5}{1.0}+\frac{1.75}{1.1}+\frac{1.9}{1.2}+\frac{2.2}{1.5}+\frac{2.9}{2.0}\right]=1.518182$$

$$f(2/1)=\left(\frac{1}{4}\right)\left[\frac{1.7}{1.5}+\frac{1.775}{1.75}+\frac{2.2}{1.9}+\frac{2.5}{2.2}\right]=1.110469$$

$$f(3/2)=\left(\frac{1}{3}\right)\left[\frac{1.8}{1.7}+\frac{1.825}{1.775}+\frac{2.35}{2.2}\right]=1.0528634$$

$$f(4/3)=\left(\frac{1}{2}\right)\left[\frac{1.85}{1.8}+\frac{1.87}{1.825}\right]=1.026218$$

$$f(5/4)=\left[\frac{1.875}{1.85}\right]=1.013514$$

$$f(6/5)=1$$

AY Reserve = (Claims Paid To Date)(f_{Ult}) − Claims Paid To Date

2014 AY Reserve $= (1,875,000)(1)-1,875,000=0$

2015 AY Reserve $= (1,870,000)(1)(1.013514)-1,870,000=25,270$

2016 AY Reserve $= (2,350,000)(1)(1.013514)(1.026218)-2,350,000=94,201$

2017 AY Reserve

$= (2,500,000)(1)(1.013514)(1.026218)(1.0528634)-2,500,000=234,709$

2018 AY Reserve

$= (2,900,000)(1)(1.013514)(1.026218)(1.0528634)(1.110469)-2,900,000=622,700$

2019 AY Reserve

$= (2,500,000)(1)(1.013514)(1.026218)(1.0528634)(1.110469)(1.518182)-2,500,000$

$= 2,110,431$

Reserve $= 25,270+94,201+234,709+622,700+2,110,431=3,087,311$