ACSC/STAT 4703, Actuarial Models II
Fall 2018
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Homework Sheet 6
Due: Friday 23rd November: 11:30 PM

Basic Questions

1. An insurance company starts a new line of insurance in 2017, and collects a total of $1,400,000 in premiums that year, and the estimated incurred losses for accident year 2017 are $982,000. The premium payments are uniformly distributed over the year. An actuary is using this data to estimate rates for premium year 2020. Claims are subject to 3% inflation per year. By what percentage should premiums increase from 2017 in order to achieve a loss ratio of 0.7.

2. An insurer collects $1,200,000 in earned premiums for accident year 2017. The total loss payments are $1,052,000. Payments are subject to inflation of 4%, and policies are sold uniformly throughout the year. If the insurer's permissible loss ratio is 75%, by how much should the premium be changed for policy year 2019?

3. A workers' compensation insurer classifies companies into three sectors — manufacture, retail and services. The experience from policy year 2017 is:

Sector	Current differential	Earned premiums	Loss payments
Manufacture	2.36	5,230	2,100
Retail	0.91	4,280	3,900
Services	1	7,100	5,400

The base premium was $370. Claim amounts are subject to 5% annual inflation. If the expense ratio is 30%, calculate the new premiums for each sector for policy year 2020.

Standard Questions

4. An insurer has different premiums for male and female customers. Its experience for accident year 2017 is given below. There was a rate change on 7th April 2017, which affects some of the policies.

Sex	Differential before rate change	Current differential	Earned premiums	Loss payments
Male	1	1	11,200	9,100
Female	1.11	1.07	8,500	6,300

Before the rate change, the base premium was $840. The current base premium is $960. Assuming that policies are sold uniformly over the year, calculate the new premimums for policy year 2019 assuming 5% annual inflation and a permissible loss ratio of 0.75.

5. An insurer classifies automobile insurance policyholders into male or female, and into car or motorcycle. It has the following data from policy year 2016:

Number of policies				loss payments		
	car	motorcycle			car	motorcycle
Male	530	132		Male	$50,400	$25,800
Female	252	44		Female	$11,300	$2,000

(a) If the base classes are Male and car, the base rate is $120, and the differentials are 0.7 for female and 1.63 for motorcycle, calculate the new premiums which give an expense ratio of 0.2 using the loss-ratio method.

(b) Repeat part (a) based on differentials of 0.85 for female and 0.95 for motorcycle.