

ACSC/STAT 4703, Actuarial Models II

Fall 2017

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Homework Sheet 6

Due: Friday 24th November: 11:30 PM

Basic Questions

1. An insurance company starts a new line of insurance in 2016, and collects a total of \$1,600,000 in premiums that year, and the estimated incurred losses for accident year 2016 are \$684,000. The premium payments are uniformly distributed over the year. An actuary is using this data to estimate rates for premium year 2018. Claims are subject to 4% inflation per year. By what percentage should premiums increase from 2016 in order to achieve a loss ratio of 0.75.
2. An insurer collects \$340,000 in earned premiums for accident year 2016. The total loss payments are \$284,000. Payments are subject to inflation of 3%, 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 2018?
3. An auto insurer classifies policies into three age groups — young, medium and old. The experience from policy year 2016 is:

Age Class	Current differential	Earned premiums	Loss payments
Young	1.54	3,300	1,100
Medium	1	4,600	3,900
Old	0.89	2,700	1,400

The base premium was \$580. Claim amounts are subject to 4% annual inflation. If the expense ratio is 20%, calculate the new premiums for each age class for policy year 2018.

Standard Questions

4. An insurer has different premiums for male and female customers. Its experience for accident year 2016 is given below. There was a rate change on 1st October 2015, which affects some policies in 2016.

Sex	Differential before rate change	Current differential	Earned premiums	Loss payments
Male	1	1	7,300	6,100
Female	0.81	0.77	5,600	4,300

Before the rate change, the base premium was \$1,250. The current base premium is \$1,320. Assuming that policies are sold uniformly over the year, calculate the new premiums for policy year 2018 assuming 3% annual inflation and a permissible loss ratio of 0.80.

5. An insurer classifies tenant's insurance policyholders into single or family, and into apartment or house. It has the following data from policy year 2016:

	Number of policies		loss payments	
	apartment	house	apartment	house
Single	437	32	\$72,400	\$9,800
Family	128	204	\$42,600	\$69,000

- (a) If the base classes are single and apartment, the base rate is \$210, and the differentials are 1.44 for family and 1.25 for house, 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 family and 0.95 for house.