
SOCIETY OF ACTUARIES
Introduction to Ratemaking & Reserving

Exam GIIRR

AFTERNOON SESSION

Date: Wednesday, April 30, 2014

Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 9 questions numbered 14 through 22 for a total of 40 points. The points for each question are indicated at the beginning of the question.
2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.
3. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.
2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.
3. The answer should be confined to the question as set.
4. When you are asked to calculate, show all your work including any applicable formulas.
5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets because they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate morning or afternoon session for Exam GIIRR.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.

****BEGINNING OF EXAMINATION****

**Afternoon Session
Beginning with Question 14**

- 14.** (4 points) The following development triangles have been constructed based on your company's data:

Accident Year	Cumulative Paid Claims			
	12	24	36	48
2010	2,150	4,510	6,480	7,650
2011	2,460	5,190	7,450	
2012	2,370	4,890		
2013	3,260			

Accident Year	Cumulative Reported Claims			
	12	24	36	48
2010	7,010	8,510	9,560	9,890
2011	8,320	10,340	11,150	
2012	9,610	11,620		
2013	9,620			

Accident Year	Cumulative Closed Counts			
	12	24	36	48
2010	22	39	54	64
2011	20	44	62	
2012	25	47		
2013	29			

Accident Year	Cumulative Reported Counts			
	12	24	36	48
2010	76	79	82	83
2011	82	93	94	
2012	98	108		
2013	90			

The following subsequent claim transactions were provided after the above triangles were constructed:

Transaction Date	Transaction Description	Claim ID	Case Estimate	Claim Payment
Mar 7, 2010	Open new claim file	1	150	
Jun 16, 2010	Payment on reported claim file	1		50
May 30, 2011	Open and close new claim file	2		90
Sep 22, 2011	Payment and change in case	1	-90	100
Jan 30, 2012	Open new claim file	3	250	
May 21, 2012	Close reported claim file	1	-60	60
Aug 18, 2012	Payment and change in case	3	-100	140

Claim ID	Occurrence Date
1	Jan 20, 2010
2	Mar 1, 2010
3	Oct 16, 2011

Restate the four data triangles to include the transactions from the subsequently provided claim transaction data.

15. (4 points) The following historical information on a liability line of business is provided:

Experience Period	Percent Earned Exposures by Policy Limits		
	500,000	1,000,000	2,000,000
2011	24%	52%	24%
2012	22%	52%	26%
2013	20%	52%	28%
Current Increased Limits Factors:	0.90	1.00	1.15

- (a) (1 point) Explain the purpose of premium trend adjustments.
- (b) (1.5 points) Calculate *and* select an annual trend due to the shift in policy limits.

You are conducting a ratemaking analysis for this liability line of business for rates to be effective September 1, 2014. The new rates are to be in effect for one year, with 67% of the policies written for an annual term and 33% written for a six-month term.

- (c) (1.5 points) Calculate the trend factor to be used for 2012 earned premium using the annual trend selected in part (b).

- 16.** (6 points) You are an actuary at United Personal Property Insurance (UPPI). You are analyzing the risk classification factors for territory. The information in the following table was provided:

Territory	Trended Ultimate Pure Premium	Ultimate Counts	Written Exposures	Existing Relativity
A	450	1,200	15,200	1.00
B	475	729	12,400	0.95
C	507	635	10,700	1.10

- The full credibility standard is 900 ultimate counts.
 - The square root rule is used for partial credibility.
 - The complement of credibility is assigned to the existing relativity.
- (a) (3 points) Calculate the indicated rating relativities using the pure premium one-way analysis procedure. The indicated relativities should be shown so that the base territory A has no change.

You are also provided with the following information:

Trended Ultimate Pure Premiums				Written Exposures			
	Age of Home				Age of Home		
Territory	0-15 years	16+ years	Total	Territory	0-15 years	16+ years	Total
A	390	510	450	A	7,600	7,600	15,200
B	400	525	475	B	4,960	7,440	12,400
C	461	576	507	C	6,420	4,280	10,700
Total	417	530	474	Total	18,980	19,320	38,300

- (b) (2 points) Calculate the first set of age-of-home factors using the minimum bias procedure. Use the existing territory relativities as inputs to the calculation.
- (c) (1 point) Explain why you expect the rating factors for territory calculated using the one-way procedure to be the same or different than the rating factors for territory calculated using the minimum bias procedure. In your response, give two reasons.

17. (4 points) You are performing investigative testing of development triangles using the following table of ratios:

Accident Half- Year	Ratios of Paid Claims to Reported Claims							
	6	12	18	24	30	36	42	48
2010-1	0.75	0.85	0.90	0.97	0.97	0.98	0.99	1.00
2010-2	0.67	0.83	0.90	0.97	0.98	0.98	0.99	
2011-1	0.74	0.84	0.89	0.97	0.98	0.98		
2011-2	0.67	0.85	0.89	0.97	0.97			
2012-1	0.74	0.83	0.90	0.94				
2012-2	0.67	0.84	0.82					
2013-1	0.70	0.79						
2013-2	0.61							

- (a) (1 point) State two observations about the pattern of the ratios of paid claims to reported claims in the above table.
- (b) (1 point) Explain a possible cause of each observation from part (a).
- (c) (1 point) State two other diagnostics you would review to confirm your observations from part (a), and describe the patterns you expect to see for each diagnostic.
- (d) (1 point) State two examples of actions that could result in shifts in the average reported claims.

- 18.** (5 points) You are provided with the following information as of December 31, 2013 for a company established January 1, 2011:

Accident Year	Earned Premium	Selected Ultimate Claims	General Expenses
2011	45,100	32,470	6,540
2012	47,500	34,680	6,790
2013	49,300	35,000	7,100

Total paid claims as of December 31, 2013	72,400
Total reported claims as of December 31, 2013	88,300
Selected ULAE ratio as a percent of claims	8%
ULAE multiplier	50%
Proportion of general expenses applicable to unearned premium	25%
Unearned premium as of December 31, 2013	32,600

- The selected ultimate claims include ALAE.
 - The provision for unpaid ULAE is determined using the classical paid-to-paid method.
- (a) (2 points) Calculate total unpaid claims as of December 31, 2013, including unpaid ULAE.
- (b) (1 point) State two points the actuary should consider when selecting claim ratios to be used for calculating premium liabilities.
- (c) (1.5 points) Calculate the premium liabilities as of December 31, 2013.
- (d) (0.5 point) Determine either the premium deficiency reserve or the equity in the unearned premium.

- 19.** (4 points) The city of Faultline is in an earthquake zone. CommCo insurance company covers over one-half of the commercial properties in Faultline, but does not offer homeowners insurance. HomeCo insurance company covers over one-half of the single-family homes in Faultline, but does not offer commercial property insurance. Both companies' policies provide comprehensive coverage of all perils.

Three of the components of a catastrophe model are:

- Hazard module
 - Inventory module
 - Vulnerability module
- (a) (1.5 points) Describe each of the components.
- (b) (1.5 points) Indicate similarities (if any) and differences (if any) between the CommCo and HomeCo implementations of an earthquake model for each component. Justify each of your answers.
- (c) (1 point) Compare the analyses required to establish the claims loading for hurricane and non-hurricane weather claims for HomeCo.

20. (4 points)

- (a) (1 point) Define the following forms of general insurance rating:
- (i) Manual
 - (ii) Schedule
 - (iii) Prospective experience
 - (iv) Retrospective experience
- (b) (1 point) Explain why retrospective experience rating is typically not appropriate for insureds with small premium size or poor claims experience.

Small Liability self-insurance pool has two members, Centre and Exurb. Both participants and the administrator have decided to change the formula for allocating retained claims and expenses:

- The experience component is currently historical ultimate claims excluding ALAE but prospectively will be historical ultimate claims including ALAE.
- The exposure component is the population estimate and will remain so.
- The pool determines credibility based on the square root rule with a full credibility population standard of 1,000,000.

- (c) (1.5 points) Determine allocation percentages for Centre and Exurb based on the agreed allocation procedure after the change in claims definition described above, given the additional information below:

Pool Participant	Population Estimate	Ultimate Claims (Including ALAE)
Centre	435,600	550,000
Exurb	250,000	700,000
Total	685,600	1,250,000

- (d) (0.5 point) Explain the importance of understanding the distribution of ALAE in the allocation of retained claims and expenses to participants in self-insurance pools.

21. (4 points) The following information was determined from your colleague's initial ratemaking analysis of one of your company's lines of business:

Direct Earned Premium at current rate level	125,000,000
Exposure counts	250,000
Weighted average trended pure premium	350
ULAE as a ratio to claims	9%
Initial total fixed expense per exposure	100
Variable expenses as a ratio to premiums:	
Initial general & other acquisition expenses (variable)	6%
Commissions, premium taxes & licenses	16%
Profit and contingencies as a ratio to premiums	5%

Your review of your colleague's analysis has found that the rate indication was calculated assuming 2/3 of general and other acquisition expenses are fixed and 1/3 are variable, but the split should have been 1/3 fixed and 2/3 variable.

- (a) (1 point) Explain the importance of recognizing the appropriate split between fixed and variable expenses in ratemaking.
- (b) (1 point) Calculate the indicated rate under the initial assumption for the split of general and other acquisition expenses.
- (c) (1 point) Calculate the revised fixed and variable general and other acquisition expenses.
- (d) (1 point) Calculate the revised rate indication using the revised fixed and variable general and other acquisition expenses in part (c).

22. (5 points) You are analyzing the claim trend for a line of business that you are pricing.

- (a) (1 point) Explain how portfolio changes in policy deductibles can affect both frequency and severity.
- (b) (1 point) Describe two options to consider when experience is not fully credible for trending.

You are given the following information:

- All policies are six-month policies.
 - New rates are to be effective June 1, 2014.
 - The new rates are expected to be unchanged for all six-month policies written between June 1, 2014 and May 31, 2015.
 - The selected annual frequency trend is -1.2% and the selected annual severity trend is $+5.8\%$.
 - The experience period is accident years 2012 and 2013.
- (c) (2 points) Calculate the pure premium trend factors for each year in the experience period.
 - (d) (1 point) Explain how the trend factors calculated in part (c) would be calculated if you are pricing a single large policy that renews on June 1, 2014 for a two-year term.

****END OF EXAMINATION****
Afternoon Session

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