SOCIETY OF ACTUARIES

Introduction to Ratemaking & Reserving

Exam GIIRR

AFTERNOON SESSION

Date: Wednesday, October 31, 2018
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 8 questions numbered 14 through 21 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 since 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.

Recognized by the Canadian Institute of Actuaries.

Tournez le cahier d'examen pour la version française.

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Exam GIIRR-Front Cover

****BEGINNING OF EXAMINATION****
Afternoon Session

14. (*4 points*) You are the consulting actuary for ABC Insurer and are given the following summary of historical rate changes:

Calendar Year	Rate Change % In Year	Effective Date of Rate Change
2013	6%	October 1, 2013
2014	3%	July 1, 2014
2015	–5%	October 1, 2015
2016	0%	October 1, 2016
2017	4%	October 1, 2017

- All policies are written for 6-month terms.
- Premiums are written evenly throughout the year.
- Premiums are earned evenly throughout the policy term.
- Each rate change applies to all policies written on or after the effective date of the rate change.

(a) (*2 points*) Calculate the premium on-level factor for calendar year 2014 used to project expected claim ratios for reserving purposes as of December 31, 2017.

(b) (*0.5 points*) Calculate the premium on-level factor for calendar year 2014 used to project expected claim ratios for ratemaking analysis.

ABC Insurer has now informed you that on April 1, 2014, a 10% discount was introduced that was applicable to 20% of all new and in-force policyholders.

(c) (*1.5 points*) Calculate the weighted average rate level for calendar year 2014 taking into account this new information.

15. (*6 points*) You are given the following information as of December 31, 2017 as part of a reserving analysis:

Report Year	Paid Claims excluding ALAE	Reported Claims excluding ALAE	Estimated Ultimate Claims excluding ALAE	Paid ALAE
2012	4,200	4,410	4,410	617
2013	4,000	4,620	4,620	570
2014	3,700	5,025	5,130	472
2015	2,250	4,167	4,680	213
2016	1,270	3,021	4,750	76
2017	590	1,795	5,080	18
Total	**16,010**	**23,038**	**28,670**	**1,966**

Report Year	Reported ALAE to Reported Claim Ratios				
	12	24	36	48	60
2012	0.053	0.101	0.125	0.151	0.150
2013	0.054	0.103	0.127	0.151	0.150
2014	0.055	0.105	0.128	0.151	
2015	0.052	0.095	0.117		
2016	0.049	0.090			
2017	0.050				

Report Year	Age-to-Age Development Factors for Reported ALAE to Reported Claim Ratios				
	12-24	24-36	36-48	48-60	60-Ultimate
2012	1.906	1.238	1.208	0.993	1.000
2013	1.907	1.233	1.189	0.993	
2014	1.909	1.219	1.180		
2015	1.827	1.228			
2016	1.837				

- ALAE limits were changed from unlimited to one million limit effective January 1, 2015.
- The a priori ratio of ultimate ALAE to ultimate claims is 0.12 for a limit of one million.
- Claim development has been relatively stable.
- There is no reported development beyond 60 months for claims and ALAE.

15. Continued

(a) (*3 points*) Estimate ultimate ALAE for report year 2017 using the following methods:

(i) Development method

(ii) Bornhuetter Ferguson method

(iii) Benktander method, one iteration

(b) (*0.5 points*) Describe a limitation that all three methods have in common in this situation.

(c) (*1 point*) Recommend an estimate of unpaid ALAE for report year 2017. Justify your recommendation.

You are given the following additional information as of December 31, 2017:

Calendar Year	Paid Claims excluding ALAE	Reported Claims excluding ALAE	Paid ULAE
2015	4,000	4,200	450
2016	4,100	4,400	510
2017	4,200	4,600	470
Total	**12,300**	**13,200**	**1,430**

- The company paid an unusual one-time fee of 30 in 2016 related to the claim system.
- The company paid an unusual one-time fee of 20 in 2016 related to the marketing system.
- Approximately 25% of claim department expenses relate to opening a claim file and 75% relate to maintaining and closing a claim file.

(d) (*1.5 points*) Estimate unpaid ULAE as of December 31, 2017 using a paid-to-paid method.

16. (*5 points*) You are estimating premium liabilities as of December 31, 2017 and are given the following information:

	2015	2016	2017
Gross of Reinsurance			
Earned Premiums (000)	2,300	2,500	2,400
Accident Year Ultimate Claims (000)	1,100	3,250	1,270
Net of Reinsurance			
Earned Premiums (000)	1,520	1,680	1,510
Accident Year Ultimate Claims (000)	830	1,440	950

Unearned Premium as of December 31, 2017	
Gross (000)	1,180
Net (000)	880

- The claims data includes ALAE, but not ULAE.
- ULAE is 10% of claims (including ALAE), which is not covered by reinsurance.
- Accident year 2016 claims include amounts of 2,000,000 gross and 500,000 net of reinsurance relating to an unusual large claim that is not expected to recur.
- There have been no changes in the reinsurance program for 2018.
- The excess of loss reinsurance policy for accident year 2018 will cost 12% of premium. This cost has not been reflected in the net unearned premiums.
- Maintenance expenses are 5% of gross unearned premiums.
- Deferred acquisition expenses are 15% of gross unearned premium.

(a) (*1.5 points*) Recommend expected claim ratios, both for gross and net of reinsurance, that will be used in the determination of premium liabilities. Justify your recommendation.

(b) (*2 points*) Calculate the premium liabilities, both gross and net of reinsurance.

(c) (*0.5 points*) Explain the purpose of a premium deficiency reserve.

(d) (*0.5 points*) Calculate the equity in gross and net unearned premiums.

(e) (*0.5 points*) Calculate the maximum reported deferred policy acquisition expense (DPAE) as of December 31, 2017.

17. (*5 points*)

(a) (*1.5 points*) Define the following terms in the context of individual risk rating:

(i) Modified premiums

(ii) Expense modification plan

(iii) Schedule rating

(b) (*0.5 points*) Explain why prospective experience rating is frequently used in workers compensation.

(c) (*1 point*) Critique the use of a prospective experience rating plan for personal automobile coverage.

An insurer is considering a new prospective experience rating plan with the following characteristics:

- all of an insured's claims experience since policy inception is included, and
- there is no limit on claims included in the experience rating formula.

(d) (*1 point*) Critique each characteristic in the new plan.

A general liability self-insurance pool consists of ten contiguous municipalities of varying sizes.

(e) (*0.5 points*) Recommend an appropriate exposure base for this pool. Justify your recommendation.

(f) (*0.5 points*) Recommend whether claim counts or claim amounts should determine the experience of a given municipality. Justify your recommendation.

18. (*6 points*) You are estimating ultimate claims and are given the following information:

Accident Year	Average Case Estimate (000)			
	12	**24**	**36**	**48**
2014	17.8	20.6	21.0	17.6
2015	19.1	24.2	29.7	
2016	22.0	25.0		
2017	25.1			

Accident Year	Open Counts			
	12	**24**	**36**	**48**
2014	210	131	54	17
2015	215	135	55	
2016	223	140		
2017	231			

There was one large claim in accident year 2015 with no payments to date but with the following case estimates:

Accident Year	Case Estimates for Large Claim (000)		
	12	**24**	**36**
2015	0	360	320

The annual severity trend is 5%.

(a) (*1.5 points*) Demonstrate that there has been case reserve strengthening.

(b) (*0.5 points*) Identify two operational changes in an insurance company that could result in case reserve strengthening.

(c) (*1 point*) Calculate the triangle of average case estimates with an adjustment for case reserve strengthening.

(d) (*0.5 points*) Explain whether projected ultimate claims are higher with or without an adjustment for case reserve strengthening.

18. Continued

You are provided with the following additional information:

Accident Year	Cumulative Paid Claims (000)			
	12	24	36	48
2014	1,100	2,870	4,700	5,700
2015	1,260	3,100	5,080	
2016	1,400	3,400		
2017	1,390			

(e) (*2.5 points*) Calculate the ultimate claims for accident year 2015 using adjusted reported claims and assuming no reported development after 48 months.

19. (*4 points*) You are given the following information about the monthly claims reporting pattern for a line of business:

Evaluation Month (accident month basis)	Cumulative Reported Claims (000)
1	2
2	4
3	6
4	8
5	10
6	12
7	14
8	16
9	18
10	20
11	22
12	24
13	26

- Each accident month in an accident year has an identical reporting pattern.
- There is no development beyond 13 months.

(a) (*2 points*) Calculate the reported age-to-ultimate factor for the following cases:

(i) Accident month at 3 months

(ii) Accident quarter at 4 months

(iii) Accident half year at 9 months

(iv) Accident year at 12 months

(b) (*1 point*) Explain the relationship of the results in part (a)(iii) and part (a)(iv) by considering the average accident date.

Actual claim development data will likely be different than the situation described above.

(c) (*1 point*) Identify two potential differences.

20. (*5 points*) You are the reserving actuary for a general liability line of business. You are given the following information for accident years 2005-2017:

	Available Information
A	Triangle of paid claims at annual evaluations
B	Triangle of reported claims at annual evaluations
C	Triangle of reported claim counts at annual evaluations
D	Earned premium by calendar year
E	A priori estimates of accident year ultimate claim ratios provided by the pricing department

- Claim development has been stable except for an unusual large claim in accident year 2013 with no payments to date.
- No reported development is expected beyond 10 years.

(a) (*3 points*) Evaluate the appropriateness of each of the following methods for estimating ultimate claims for accident year 2013:

(i) Cape Cod method applied to paid claims

(ii) Bornhuetter Ferguson method applied to reported claims

(iii) Frequency-Severity method applied to reported claims

(b) (*0.5 points*) Recommend the most appropriate method from part (a) for estimating ultimate claims for accident year 2013. Justify your recommendation.

(c) (*1.5 points*) Outline the steps for estimating ultimate claims for accident year 2013 using your selection from part (b).

21. (*5 points*) You are estimating ultimate claims using the development method.

(a) (*0.5 points*) List the two primary assumptions of the development method.

(b) (*1 point*) State four considerations in selecting age-to-age development factors.

(c) (*0.5 points*) Identify one situation where you would recommend a volume-weighted average rather than a simple average for selecting age-to-age development factors.

You are given the following triangle for a professional liability coverage. The triangle intentionally excludes report years 2016 and 2017.

Report Year	Reported Claims					
	12	**24**	**36**	**48**	**60**	**72**
2012	226	349	351	353	353	353
2013	249	353	422	443	443	
2014	269	393	475	475		
2015	233	378	387			

(d) (*1 point*) Provide two situations where it might be appropriate to use a triangle that excludes the most recent years in determining age-to-age development factors.

(e) (*0.5 points*) Calculate the 12-to-24 months age-to-age development factor using a volume-weighted average.

You are considering various approaches for estimating tail factors.

(f) (*1.5 points*) Provide one advantage and one disadvantage for each of the following approaches:

(i) Bondy method,

(ii) Algebraic method, and

(iii) Use of benchmark data.

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

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