SOCIETY OF ACTUARIES
Introduction to Ratemaking & Reserving

Exam GIIRR

AFTERNOON SESSION

Date: Wednesday, April 26, 2017
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 7 questions numbered 13 through 19 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.

Tournez le cahier d'examen pour la version française.

475 N. Martingale Road
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Printed in the U.S.A.
Exam GIIRR-Front Cover

****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 13

13. (*4 points*) You are conducting a claim severity trend analysis for a small regional line of business that started on January 1, 2015, and are given the following information for the only five claims that have occurred:

Claim ID	Accident Year	Ground Up Claims Evaluated as of December 31, 2016
1	2015	560
2	2015	1,300
3	2015	800
4	2016	950
5	2016	1,500

(a) (*0.5 points*) Calculate the annual change in average severity from 2015 to 2016.

You are given the following information effective January 1, 2017:

- The company will introduce a deductible of 100.
- A tort reform will cap all new claims at 1,000 after applying the deductible.

(b) (*1 point*) Calculate the annual change in average severity following the January 1, 2017 changes.

The latest industry study for this line of business includes accident years 2011 through 2016 and recommends an annual claim severity trend of 2%.

(c) (*1.5 points*) Identify three considerations to use when recommending an annual claim severity trend for this company's business.

(d) (*1 point*) Explain the difference between development and trend.

14. (*7 points*) You are calculating insurance liabilities as of December 31, 2016, and are given the following information:

Accident Year	Written Premiums	Earned Premiums	Paid Claims	Reported Claims	Selected Ultimate Claims
2014	52,800	51,900	37,800	37,800	37,800
2015	62,000	57,400	30,800	39,000	41,100
2016	64,200	63,100	22,400	35,800	44,800
Total	**179,000**	**172,400**	**91,000**	**112,600**	**123,700**

Selected ULAE ratio as a percent of claims	6%
ULAE multiplier	50%
Selected general expenses ratio as a percentage of premium	12%
Proportion of general expenses applicable to unearned premium	25%

- Claims include ALAE.
- Unpaid ULAE is determined using the classical paid-to-paid method.
- All policies are annual, and are written evenly throughout the year.
- There was a 25% rate increase effective January 1, 2015.

(a) (*1.5 points*) Calculate total unpaid claims as of December 31, 2016, including unpaid ULAE.

(b) (*2 points*) Calculate the on-level claim ratio excluding ULAE for each accident year.

(c) (*1 point*) Recommend a claim ratio excluding ULAE to use for estimating expected claims for the unearned policy period as of December 31, 2016. Justify your recommendation.

(d) (*1.5 points*) Calculate premium liabilities as of December 31, 2016.

14. Continued

The following new information was not considered in the estimation of the 2016 insurance liabilities:

- New legislation will increase all claims reported after February 1, 2017 by 20%.

(e) (*1 point*) Explain how this new information is likely to affect the calculations as of December 31, 2016 for:

(i) Claim liabilities

(ii) Premium liabilities

15. (*7 points*) You are estimating ultimate property claims for ratemaking purposes for State X. The claims experience of State X is not fully credible for calculating trend.

(a) (*1 point*) Describe two considerations in selecting a credibility factor.

You are given the following information:

Accident Year	Selected Ultimate Claims at 1,000,000 Limit (000)	Selected Ultimate Claims at Total Limit (000)
2014	3,900	4,000
2015	4,800	4,850
2016	5,100	5,150

Selections	1,000,000 Limit	Total Limit
State X Severity Trend	5.4%	6.1%
State X Credibility	60%	50%
Countrywide Severity Trend	4.9%	5.7%

- Rates will be effective July 1, 2017 for one year.
- All policies are written for 12-month policy terms.

You are given the following loadings for large claims for the 100,000 to 1 million limit:

Accident Year	100,000 to 1 Million Limit
2014	1.371
2015	1.522
2016	1.514

(b) (*3 points*) Calculate the loadings for 100,000 to total limits for each accident year.

(c) (*1 point*) Recommend a loading for 100,000 to total limits for ratemaking purposes. Justify your recommendation.

(d) (*1 point*) Explain the effect of using a pure premium trend rather than a severity trend in your part (b) calculation.

(e) (*1 point*) Describe an alternative approach that accounts for the effect of large claims in a ratemaking analysis.

16. (*5 points*) You are conducting an exposure and premium trend analysis for SuperFun Captive. SuperFun Captive writes a single policy that provides liability coverage for a hotel company.

(a) (*1 point*) List four changes that premium trend would capture.

(b) (*1 point*) Evaluate each of the following for use as an exposure base for SuperFun:

(i) Number of hotels
(ii) Revenue

You are given the following information:

Policy Period	Earned Exposures
Apr. 1, 2013 – Dec. 31, 2013	6,450
Jan. 1, 2014 – Dec. 31, 2014	9,000
Jan. 1, 2015 – Dec. 31, 2015	9,500
Jan. 1, 2016 – Dec. 31, 2016	10,010

(c) (*1.5 points*) Calculate program year 2013 earned exposures trended to the policy period that begins January 1, 2017.

SuperFun Captive will begin writing a new additional policy that provides auto coverage to all hotels starting January 1, 2017. SuperFun will use the following historical data for ratemaking. There have been no rate changes in the historical data.

Calendar Year	Written Vehicles	Written Premium
2012	2,410	480,000
2013	2,580	542,000
2014	2,630	563,000
2015	2,740	598,000
2016	2,790	612,000

(d) (*1.5 points*) Recommend an annual premium trend for the new automobile policy, and justify your recommendation.

17. (*7 points*) You are given the following information:

Accident Year	Cumulative Reported Claims			
	12	**24**	**36**	**48**
2013	17,800	25,000	31,700	32,800
2014	19,400	28,000	34,700	
2015	22,000	31,500		
2016	24,300			

(a) (*3 points*) Calculate the estimated ultimate claims for all accident years, using the reported development method with the original Bondy method for the tail factor.

The 2014 paid claims evaluated at December 31, 2016 are 27,000.

(b) (*1 point*) Calculate the accident year 2014 case estimate, IBNR, and total claim liability.

(c) (*1 point*) State two assumptions underlying the algebraic method of estimating a paid tail factor.

The following age-to-age development factors based on paid claims have been selected:

Development Interval	Paid Claims Age-to-Age Development Factors
12-24	3.40
24-36	1.60
36-48	1.30

(d) (*1 point*) Calculate the indicated paid claims tail factor for accident year 2014 using Boor's algebraic method with the results from part (a).

The accident year 2016 reported claims contain a single large claim of 6,000.

(e) (*0.5 points*) Calculate the ultimate claims for this accident year using a large claim adjustment.

(f) (*0.5 points*) State an assumption underlying the approach in part (e).

18. (*5 points*) Cardinale Insurance Company (CIC) has two product lines. One is private passenger automobile insurance that is sold in all jurisdictions in the United States. The other is homeowners hurricane coverage in a hurricane prone area.

(a) (*2 points*) Explain why the hurricane coverage product line has higher risk than the automobile product line with respect to each of the following risk characteristics:

(i) Availability of data

(ii) Uncertainty of loss

(iii) Correlation between claims

(iv) Insurer capacity

(b) (*1 point*) Explain the relationship between insurer capacity and customer demand with respect to catastrophe coverages.

Grossi and Kunreuther describe a survival constraint with respect to insurability of catastrophe coverage.

(c) (*0.5 points*) Define survival constraint.

(d) (*0.5 points*) Explain how an exceedance probability curve can be used as a tool in assessing an insurer's survival constraint.

(e) (*0.5 points*) Identify one regulatory constraint that could threaten an insurer's survival constraint.

(f) (*0.5 points*) State two actions CIC may be able to take to meet the survival constraint when offering hurricane coverage.

19. (*5 points*)

(a) (*1.5 points*) Provide three reasons an actuary might use a triangle of ratios of paid claims to reported claims for investigative testing.

You are given the following information for an auto insurer's third party liability for bodily injury:

Accident Year	Ratio of Paid Claims to Reported Claims – Total Limits					
	12	**24**	**36**	**48**	**60**	**72**
2009	0.13	0.33	0.42	0.53	0.70	0.82
2010	0.12	0.32	0.42	0.53	0.70	0.82
2011	0.11	0.30	0.41	0.64	0.70	0.82
2012	0.12	0.32	0.42	0.54	0.70	
2013	0.16	0.40	0.54	0.62		
2014	0.20	0.48	0.56			
2015	0.24	0.48				
2016	0.24					

(b) (*0.5 points*) Identify two possible anomalies apparent in this triangle that may need further investigation.

(c) (*1 point*) Provide a possible explanation for each anomaly identified in part (b).

(d) (*1 point*) Explain a limitation when using a triangle of ratios of paid claims to reported claims.

(e) (*1 point*) Describe two additional triangles that could be used for investigative testing.

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

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