

Exam GIRR

AFTERNOON SESSION

Date: Tuesday, April 28, 2020

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 GIRR.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

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

- 14.** (5 points) You are estimating IBNR using the development method, and are given the following information:

Accident Year	Incremental Paid Claims			
	12	24	36	48
2016	4,056	3,844	1,040	600
2017	4,500	3,300	1,000	
2018	3,150	2,900		
2019	3,900			

Accident Year	Case Estimates			
	12	24	36	48
2016	3,167	2,100	1,800	1,400
2017	4,000	2,000	1,900	
2018	3,650	2,650		
2019	3,400			

- A legislative change became effective January 1, 2018, reducing claim costs 10% for all claims paid on or after this date.
 - The reported claims tail factor for 48 months to ultimate is 1.03.
- (a) (2.5 points) Calculate reported claim development factors using a volume-weighted average.
- (b) (0.5 points) Calculate the accident year 2019 IBNR reserve as of December 31, 2019 using the results from part (a).

The reported tail factor provided above was based on industry experience for a similar coverage.

- (c) (0.5 points) Identify two other approaches that could be used to determine a tail factor for this coverage.
- (d) (1.5 points) Critique each approach identified in part (c).

15. (5 points) You are estimating ultimate claims using the Bornhuetter Ferguson (BF) method.

- (a) (0.5 points) Provide two situations where the BF method is preferred over the development method.

You are given the following information as of December 31, 2018:

Accident Year	Earned Premium	Premium On-Level Factors	Reported Claims
2016	500,000	1.035	300,000
2017	520,000	1.015	240,000
2018	560,000	1.000	166,000

- The expected claim ratio at the 2018 cost level is 60%.
 - Expected claim ratios are based on the 2018 expected claim ratio adjusted to the cost level of each accident year.
 - The annual claim trend is 0%.
 - Unreported claim percentages are 50%, 30%, and 10% for 12, 24, and 36 months, respectively.
 - There is no development beyond 48 months.
- (b) (1 point) Calculate the ultimate claims as of December 31, 2018 for each accident year using the development method.
- (c) (2 points) Calculate the ultimate claims as of December 31, 2018 for each accident year using the BF method.

You are given the following information as of December 31, 2019:

Accident Year	Reported Claims
2016	335,000
2017	308,000
2018	238,000

- (d) (1 point) Calculate the actual versus expected reported claims for calendar year 2019, using the BF method.
- (e) (0.5 points) Critique the appropriateness of the selected assumptions as of December 31, 2018, using the results from part (d).

16. (6 points) You are estimating ultimate claims using the development-based frequency-severity method.

- (a) (1 point) Describe two alternative sources for trend if an insurer's own claim experience is not sufficiently credible.

You are given the following information:

Accident Year	Ultimate Claims Based on Development Method	Ultimate Counts Based on Development Method	Earned Exposures
2015	4,600,000	500	6,500
2016	5,000,000	520	6,700
2017	5,250,000	540	6,900
2018	5,550,000	545	6,900
2019	6,550,000	585	7,300

- The annual frequency trend is 0%.
 - The earned exposures are not inflation sensitive.
 - The claim experience is considered fully credible.
- (b) (2 points) Recommend an annual severity trend to use for the frequency-severity method. Justify your recommendation.
- (c) (3 points) Calculate the accident year 2018 ultimate claims using the development-based frequency-severity method.

17. (5 points)

- (a) (0.5 points) Define premium liabilities.

You are calculating premium liabilities for a captive insurer, Big Lake Captive (BLC). BLC writes a series of identical policies providing windstorm coverage. BLC annually purchases reinsurance on aggregate claims. You are given the following information for 2020:

Inception date for all policies	January 1, 2020
Policy duration	1 year
Total gross written premium	1,600,000
Reinsurance inception date	January 1, 2020
Reinsurance duration	1 year
Reinsurance premium	240,000

Gross and ceded premiums are earned evenly over the policy duration.

- (b) (0.5 points) Calculate the unearned premium reserves as of September 30, 2020, gross and net of reinsurance.

You are provided with the following information:

Expected Distribution of Windstorm Catastrophe Claims				
Gross Claim Amount	Calendar Quarter			
	1	2	3	4
10,000,000	1%	0%	0%	2%
0	99%	100%	100%	98%

- Expected windstorm claims, *excluding* catastrophe claims, are 50,000 per month.
 - BLC's reinsurance is an excess of loss policy covering aggregate claims in excess of 5,000,000 in any quarter.
 - BLC's reinsurance includes ALAE but not ULAE.
 - ALAE is 10% of gross claims.
 - ULAE is 5% of gross claims.
 - Policy administration expenses are 3% of gross earned premium.
- (c) (2 points) Calculate the expected claims including ALAE for valuation of premium liabilities as of September 30, 2020, gross and net of reinsurance.
- (d) (1.5 points) Calculate the premium liabilities as of September 30, 2020, gross and net of reinsurance.

17. Continued

- (e) (0.5 points) Determine the equity (or premium deficiency) in gross and net unearned premium as of September 30, 2020, labeling your answers as equity (or premium deficiency), as applicable.

18. (6 points) You are evaluating data under several independent changing conditions.

- (a) (1.5 points) Describe how a change in third party claim administrator will affect each of the following:
 - (i) Indemnity or ALAE or ULAE, or combination
 - (ii) The triangle row, column, diagonal, or other effect
 - (iii) Paid or reported data, or both
- (b) (1.5 points) Describe how a change from in-house legal staff to external legal consultants will affect each of the following:
 - (i) Indemnity or ALAE or ULAE, or combination
 - (ii) The triangle row, column, diagonal, or other effect
 - (iii) Paid or reported data, or both
- (c) (1.5 points) Describe how a change in the system used for processing claim payments will affect each of the following:
 - (i) Indemnity or ALAE or ULAE, or combination
 - (ii) The triangle row, column, diagonal, or other effect
 - (iii) Paid or reported data, or both
- (d) (1.5 points) Describe how a new tort reform law capping punitive damages for all claims occurring on or after January 1, 2016, will affect each of the following:
 - (i) Indemnity or ALAE or ULAE, or combination
 - (ii) The triangle row, column, diagonal, or other effect
 - (iii) Paid or reported data, or both

19. (4 points) Insurance companies commonly use catastrophe models to manage risk for certain perils.

(a) (1 point) Provide an example of the hazard intensity component of a catastrophe model for the following events:

(i) Hurricane

(ii) Earthquake

You are analyzing a general insurance company's exposure to the following four perils:

I. Fire

II. Flood

III. Hail

IV. Tornado

(b) (2 points) Recommend whether you should use catastrophe modeling for each of the four perils. Justify your recommendations.

(c) (1 point) Explain why the probable maximum loss (PML) for all causes of loss combined is less than the sum of the PMLs from each cause of loss.

- 20.** (4 points) Payart Insurance Company offers a 10% discount to homeowners insurance policyholders that have installed a sewer back-up valve. Payart had a one-time only initiative in 2017 to encourage more policyholders to install the valve.

You are given the following information:

Calendar Year	Percent of Policyholders with 10% Discount
2015	15%
2016	17%
2017	23%
2018	25%
2019	28%

- (a) (2 points) Recommend the annual premium trend to account for changes in the proportion of homeowners policyholders with the 10% discount. Justify your recommendation.

You are conducting a premium trend analysis for ratemaking with the following information:

- New rates will be effective from October 1, 2020 for one year.
 - All policies are six-month policies.
 - You expect the annual premium trend from part (a) to continue into the future rating period.
 - 2015 earned premium at current rate levels is 540,000.
- (b) (2 points) Calculate the 2015 earned premium at current rate level trended for ratemaking.

21. (5 points)

- (a) (1 point) Describe how credibility and homogeneity can present conflicting objectives in the actuarial work supporting risk classification systems.

You are revising your company's homeowners insurance rates to introduce territory as a new risk characteristic. You are given the following information:

Territory	Trended Earned Premium at Current Rate Level	Trended Ultimate Claims	Ultimate Counts
1	12,500,000	7,500,000	3,000
2	4,500,000	3,150,000	810
3	5,000,000	4,000,000	250
Total	22,000,000	14,650,000	4,060

- The full credibility standard is 1,000 ultimate counts.
 - The complement of credibility is equal to 1.
- (b) (2 points) Calculate the indicated class relativities for the territory risk characteristic.

You are given the following additional information:

- The current base rate is 500.
 - The company will introduce the territory rating factor without introducing any change to the overall average rate level.
 - The base territory is territory 1.
- (c) (1 point) Calculate the new base rate.

Suppose that N_i , the number of claims from territory i is distributed as follows:

$$N_i \sim \text{Poisson}(\lambda_i)$$

Where $\lambda_i = e_i \times \exp(\lambda + \alpha_i)$ and e_i is the associated exposure for territory i .

- (d) (0.5 points) Provide an assumption that is required to obtain a unique set of estimates of parameters $\lambda, \alpha_1, \alpha_2$, and α_3 .

You are given the null hypothesis $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = 0$.

- (e) (0.5 points) State the implication of rejecting the null hypothesis.

****END OF EXAMINATION****

Afternoon Session

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