

Exam 5



Virginia R. Prevosto
Vice President-Admissions

Steven D. Armstrong
Chairperson
Examination Committee

William Wilder
Assistant Chairperson
Examination Committee

October 28, 2014

Examination Committee

General Officers

Aadil Ahmad

Derek Jones

Sharon Mott

James Sandor

Thomas Struppeck

Christopher Styrsky

Rhonda Walker

Exam 5

Basic Techniques for Ratemaking and Estimating Claim Liabilities

4 HOURS

INSTRUCTIONS TO CANDIDATES

1. This 58.25 point examination consists of 24 problem and essay questions.
2. For the problem and essay questions, the number of points for each full question and part of a question is indicated at the beginning of the question or part. Answer these questions on the lined sheets provided in your Examination Envelope. Use dark pencil or ink. Do not use multiple colors or correction fluid/tape.
 - Write your Candidate ID number and the examination number, 5, at the top of each answer sheet. Your name, or any other identifying mark, must not appear.
 - Do not answer more than one question on a single sheet of paper. Write only on the front lined side of the paper – DO NOT WRITE ON THE BACK OF THE PAPER. Be careful to give the number of the question you are answering on each sheet. If your response cannot be confined to one page, please use additional sheets of paper as necessary. Clearly mark the question number on each page of the response in addition to using a label such as “Page 1 of 2” on the first sheet of paper and then “Page 2 of 2” on the second sheet of paper.
 - The answer should be concise and confined to the question as posed. When a specified number of items are requested, do not offer more items than requested. For example, if you are requested to provide three items, only the first three responses will be graded.
 - In order to receive full credit or to maximize partial credit on mathematical and computational questions, you must clearly outline your approach in either verbal or mathematical form, showing calculations where necessary. Also, you must clearly specify any additional assumptions you have made to answer the question.
3. Do all problems until you reach the last page of the examination where "END OF EXAMINATION" is marked.

CONTINUE TO NEXT PAGE OF INSTRUCTIONS

©2014 Casualty Actuarial Society

4. Prior to the start of the exam you will have a **fifteen-minute reading period** in which you can silently read the questions and check the exam booklet for missing or defective pages. A chart indicating the point value for each question is attached to the back of the examination. Writing will NOT be permitted during this time and you will not be permitted to hold pens or pencils. You will also not be allowed to use calculators. The supervisor has additional exams for those candidates who have defective exam booklets.
 - Verify that you have received the reference materials:

Insurance Services Office, Inc., Personal Automobile Manual (Effective 6-98),
General Rules 1-6.
5. Your Examination Envelope is pre-labeled with your Candidate ID number, name, exam number and test center. Do not remove this label. Keep a record of your Candidate ID number for future inquiries regarding this exam.
6. Candidates must remain in the examination center until two hours after the start of the examination. The examination starts after the reading period is complete. You may leave the examination room to use the restroom with permission from the supervisor. To avoid excessive noise during the end of the examination, candidates may not leave the exam room during the last fifteen minutes of the examination.
7. At the end of the examination, place all answer sheets in the Examination Envelope. Please insert your answer sheets in your envelope in question number order. Insert a numbered page for each question, even if you have not attempted to answer that question. Nothing written in the examination booklet will be graded. Only the answer sheets will be graded. Also place any included reference materials in the Examination Envelope. **BEFORE YOU TURN THE EXAMINATION ENVELOPE IN TO THE SUPERVISOR, BE SURE TO SIGN IT IN THE SPACE PROVIDED ABOVE THE CUT-OUT WINDOW.**
8. If you have brought a self-addressed, stamped envelope, you may put the examination booklet and scrap paper inside and submit it separately to the supervisor. It will be mailed to you. Do not put the self-addressed stamped envelope inside the Examination Envelope.

If you do not have a self-addressed, stamped envelope, please place the examination booklet in the Examination Envelope and seal the envelope. You may not take it with you. Do not put scrap paper in the Examination Envelope. The supervisor will collect your scrap paper.

Candidates may obtain a copy of the examination from the CAS Web Site.

All extra answer sheets, scrap paper, etc. must be returned to the supervisor for disposal.
9. Candidates must not give or receive assistance of any kind during the examination. Any cheating, any attempt to cheat, assisting others to cheat, or participating therein, or other improper conduct will result in the Casualty Actuarial Society and the Canadian Institute of Actuaries disqualifying the candidate's paper, and such other disciplinary action as may be deemed appropriate within the guidelines of the CAS Policy on Examination Discipline.
10. The exam survey is available on the CAS Web Site in the "Admissions/Exams" section. Please submit your survey by November 17, 2014.

END OF INSTRUCTIONS

EXAM 5, FALL 2014

1. (2 points)

In an attempt to improve poor workers compensation underwriting results, an insurance company is considering changing its exposure base from number of employees to number of hours worked.

a. (0.5 point)

Identify two criteria of a good exposure base.

b. (0.5 point)

Briefly discuss whether this change in exposure base is appropriate for each of the criteria from part a. above.

c. (0.25 point)

Briefly describe the impact the exposure base change could have on frequency.

d. (0.25 point)

Briefly describe the impact the exposure base change could have on severity.

e. (0.5 point)

Discuss an impact the exposure base change could have on the company's loss ratio.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

2. (1.5 points)

Given the following policy data:

Policy	Effective Date	Expiration Date	Initial Policy Premium
1	June 1, 2012	May 31, 2013	480
2	July 1, 2012	December 31, 2012	125
3	March 1, 2013	February 28, 2014	225
4	August 1, 2013	March 31, 2014	300

- Six months after the policy expires, the initial policy premium on every policy increases by 8% due to the final audit.

a. (0.5 point)

Calculate calendar year 2013 earned premium as of December 31, 2013.

b. (0.5 point)

Calculate calendar year 2013 written premium as of December 31, 2013.

c. (0.25 point)

Calculate policy year 2013 earned premium as of December 31, 2013.

d. (0.25 point)

Calculate policy year 2013 written premium as of December 31, 2014.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

3. (2 points)

A personal auto insurer has a highly-refined classification rating plan. In the calculation of a rate level indication for this insurer, fully assess the use of the following methods to adjust premium to current rate level:

- i. Parallelogram method
- ii. Extension of Exposures method

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

4. (1.5 points)

Given the following workers compensation information for an employer:

Ratio of Wage to the State Average Weekly Wage (SAWW)	Percentage of Workers
0.50	6%
0.85	18%
1.00	31%
1.45	26%
1.90	17%
2.20	2%

- Minimum benefit = 45% of State Average Weekly Wage (SAWW).
- Current Compensation Rate = 80% of Worker's Pre-Injury Wage.
- Proposed Compensation Rate = 85% of Worker's Pre-Injury Wage.
- Current Maximum Benefit = 130% of SAWW.
- Proposed Maximum Benefit = 115% of SAWW.

a. (1 point)

Assuming no changes to claim frequency, calculate the combined percent impact of both the compensation rate and maximum benefit changes to the average weekly expected claim benefit.

b. (0.5 point)

Briefly describe a potential indirect effect of the maximum benefit changes on:

- i. Frequency
- ii. Duration

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

5. (3.25 points)

The following information is available for a homeowners insurance company as of December 31, 2013:

Period (months)	Reported Loss and ALAE Age-to-Age Development Factors
12-24	1.10
24-36	1.05
36-48	1.01

Calendar/Accident Year	Earned Exposures (000)	Amount of Insurance Years (AIY) (\$000)	Reported Non-Catastrophe Loss and ALAE (\$000)
2011	45	13,500	23,000
2012	50	15,300	25,000
2013	40	12,500	20,000

- Annual loss and ALAE trend = 4%.
- Historical non-catastrophe ULAE to loss and ALAE ratio = 1.05.
- Historical catastrophe ULAE to loss and ALAE ratio = 1.09.
- Long-term non-modeled catastrophe loss and ALAE-to-AIY ratio = 0.25.
- Modeled catastrophe loss and ALAE-to-AIY ratio = 0.07.
- Rates will take effect on January 1, 2015, and will be in effect for one year.
- All policies are annual.
- Assume no development after 48 months.

Using three years of historical data, determine the provision for loss and LAE to be used in the pure premium indication.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

6. (2.25 points)

Given the following information:

- Projected ultimate pure premium, including LAE = \$450.
- Underwriting profit provision = 5%.
- Projected average premium per exposure = \$750.

Expense Category	Selected Expense Ratio	% Fixed
General Expenses	6.0%	75%
Other Acquisition	9.5%	75%
Taxes, Licenses and Fees	2.8%	25%
Commission and Brokerage	12.0%	0%

a. (0.5 point)

Calculate the indicated average rate using the all variable expense method for determining expense provisions.

b. (1 point)

Calculate the indicated average rate using the premium-based projection method for determining expense provisions.

c. (0.75 point)

Assume the historical average premium per exposure on which the selected expense provisions are based is \$675. Discuss whether the result calculated in part b. above is excessive or inadequate.

EXAM 5, FALL 2014

7. (2.5 points)

An insurance company began writing personal automobile policies in 2011. Given the following information for the insurance company:

Calendar/ Accident Year	Written Policies	Ultimate Loss & LAE (\$000)
2011	44,000	14,250
2012	48,400	19,500
2013	53,240	22,000

Variable expense ratio	20%
Profit and contingency provision	5%
Fixed expense per exposure	\$50

- Expense and profit provisions are not expected to change.
- Policies have six-month terms, are written uniformly throughout the year, and include one automobile per policy.
- The company is currently charging an average premium per policy of \$500.
- The annual loss trend factor = 3%.
- The data is fully credible.
- When calculating the indication, consider data from all three years.
- Rates are assumed to be effective July 1, 2014, and in effect for six months.

Calculate the overall indicated rate change, including justification for the selection of projected ultimate pure premium.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

8. (4.25 points)

A company is reviewing the rate level adequacy in State X. Given the following information for a book of business:

- All policies are annual.
- Rate change history:
 - -5% effective April 1, 2012, mandated by law to apply to all policies in force with no impact on losses.
 - 10% effective January 1, 2013.
- New rates will be in effect for 12 months beginning on April 1, 2015.
- Selected annual underlying loss trend = 2%.
- Selected annual premium trend = 0%.
- Loss adjustment expense provision = 4% of loss.
- Projected expense ratios:
 - Fixed = 5%.
 - Variable = 27%.
- Underwriting profit and contingencies provision = 8%.
- Ultimate losses are estimated using the reported development technique.
- Credibility of the indicated rate change = 0.6.
- State X's earned premium is 5% of the total earned premium countrywide.
- State X is part of Region A, and accounts for 50% of the total earned premium for that region.
- Potential complements of credibility include:
 - Countrywide rate indication = 10%.
 - Total Region A rate indication = 8%.
 - Major competitor rate indication for State X = 4%.
 - Annual inflation trend for State X = 3%.

Calendar Year Ending	Earned Premium (\$000)
December 31, 2012	9,500
December 31, 2013	9,800

Accident Year as of December 31, 2013	Reported Losses (\$000)
2012	4,800
2013	4,100

Accident Year	Age-to-Age Reported Loss Development Factors				
	12-24 months	24-36 months	36-48 months	48-60 months	60-72 months
2008	1.37	1.15	1.06	1.02	1.00
2009	1.35	1.15	1.05	1.02	
2010	1.32	1.12	1.07		
2011	1.28	1.09			
2012	1.25				

a. (1 point)

Recommend a complement of credibility from the list above. Briefly explain the recommendation, including a brief discussion of each potential complement not selected.

b. (3.25 points)

Calculate the indicated rate change using the complement of credibility recommended in part a. above. Briefly justify selection of age-to-age reported loss development factors.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

9. (2.75 points)

An insurance market with a fixed number of insureds consists of two insurers – Company A and Company B. Company A has identified a new potential rating variable to segment its risks, consisting of High Risk and Low Risk.

Variable	True Expected Cost	Insured Risks	
		Company A	Company B
High Risk	\$200	10,000	90,000
Low Risk	\$100	10,000	90,000

- All policies are annual.
- True expected cost is known only to Company A
- The probability each risk will switch insurers at renewal if they are offered a lower price by the new insurer is given by the following equation: $\text{Probability} = 0.9 \times (\text{Difference in Offered Rates}) / \text{True Expected Cost}$
- The probability each risk will switch insurers at renewal if they are offered a higher or equal price by the new insurer is 0.

Company A intends to charge the true cost for High Risk insureds, and is evaluating two different prices for Low Risk insureds: \$130 or \$140. Company B charges \$150 for all risks.

a. (1.75 points)

Determine which of the two rates Company A should charge the Low Risk insureds to maximize profits, assuming Company B does not adjust its price.

b. (0.5 point)

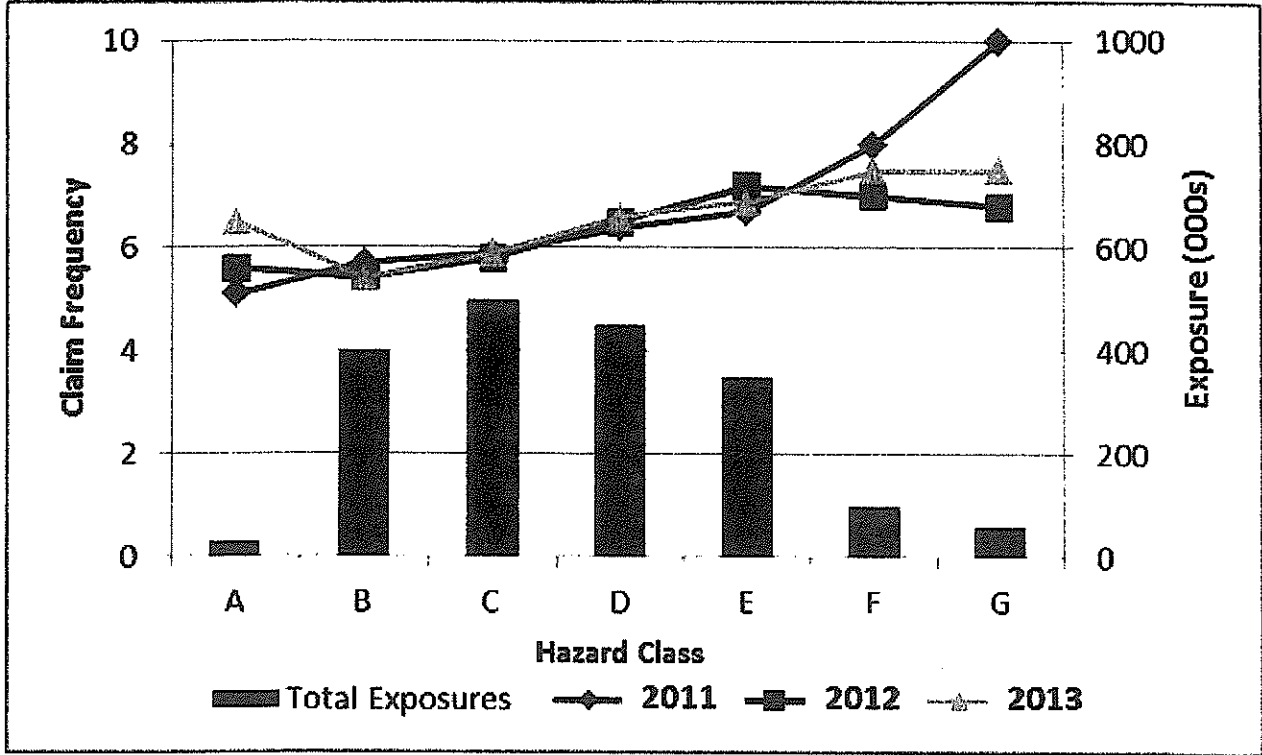
Describe the ultimate impact on the distribution of risks and each company's profitability if Company B does not adjust its strategy.

c. (0.5 point)

Briefly describe two possible strategies Company B could utilize in response to Company A's new rate plan.

10. (1.75 points)

An actuary performed an analysis of a products liability class plan using a Generalized Linear Model (GLM) for the first time on this book of business. The insureds are categorized by hazard classes A through G. The following graph shows claim frequency and exposure data by hazard class.



a. (0.75 point)

Fully evaluate the predictive value of hazard class based on the information provided above.

b. (1 point)

Briefly describe two data mining techniques and how each might be used to enhance a GLM multivariate classification analysis.

EXAM 5, FALL 2014

11. (3 points)

Given the following information for a homeowners book of business:

Territory	Earned Exposures	Earned Premium (\$000)	Ultimate Losses Excluding Catastrophes (\$000)	Current Relativity
1	2,500	3,375	3,200	1.150
2	7,000	11,200	6,200	1.000
3	500	700	1,000	0.900

- Ratio of ALAE to loss = 4%.
- Full credibility standard for exposures = 5,000.
- Use square root rule for credibility calculations.
- Territory 2 is the base class.
- The rating algorithm is Base Rate x Territory Factor x Amount of Insurance Factor.

a. (2 points)

Calculate the credibility-weighted indicated non-catastrophe relativity to the base for each territory using the pure premium method.

b. (0.5 point)

Territory 1 has a high percentage of low-value homes relative to territories 2 and 3. Describe a possible distortion to the indicated territory 1 relativity resulting from the distribution of home values.

c. (0.5 point)

Assume that \$1,000,000 of the loss in territory 2 came from a single loss. Discuss an appropriate adjustment to the analysis.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

12. (2.5 points)

Given the following information:

Policy Year	Premium	Present Value of Losses	Variable Expenses		Fixed Expenses		Income
			New	Renewal	New	Renewal	
1	\$800	\$656	\$242	-	\$142	-	\$(240)
2	\$872	\$701	-	\$54	-	\$32	\$86
3	\$950	\$748	-	\$59	-	\$33	\$110
4	\$1,036	\$799	-	\$64	-	\$34	\$139
5	\$1,129	\$853	-	\$70	-	\$36	\$170

Policy Year	Persistence	Cumulative Persistence	Profit	Discount Factor	Present Value of Profits	Present Value of Premiums
1	100%	100%	\$(240)	1.00	\$(240)	\$800
2	85%	85%	\$73	1.12	\$65	\$662
3	86%	73%	\$81	1.25	\$64	\$554
4	87%	64%	\$88	1.40	\$63	\$469
5	88%	56%	\$95	1.57	\$61	\$402
Total					\$13	\$2,886

- Premium-to-surplus ratio is 2 to 1.
- Surplus equals GAAP equity.
- The company seeks growth in this market.
- Management requires the present value of profit of policy years 1 to 5 to be positive in total.

a. (0.5 point)

Briefly describe two differences between asset share pricing and pure premium ratemaking when they are used to price property and casualty products.

b. (1 point)

After preparing the asset share model shown above, the actuary evaluates an alternative set of persistency assumptions in which persistency in the third and fourth policy years are changed to 81% and 82%, respectively. Calculate the revised present value of premiums.

c. (1 point)

Briefly discuss the results of the asset share model under each set of persistency assumptions with regard to Management's profitability requirement. Provide a recommendation to management on whether to make a change to the current rating structure.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

13. (1.5 points)

The importance of accurately estimating unpaid claims can be examined from three points of view: internal management, investors, and regulators.

a. (0.75 point)

Briefly describe how a redundant unpaid claim estimate can impact decisions for each of these three groups.

b. (0.75 point)

Briefly describe how an inadequate unpaid claim estimate can impact decisions for each of these three groups.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

14. (3 points)

Given the following information:

Claim ID	Accident Date	Report Date	2011 Transactions		2012 Transactions		2013 Transactions	
			Cal. Yr. Paid	Ending Case O/S	Cal. Yr. Paid	Ending Case O/S	Cal. Yr. Paid	Ending Case O/S
1	March 3, 2011	July 1, 2011	260	0	0	0	0	0
2	September 18, 2011	October 2, 2011	200	500	0	500	230	270
3	December 1, 2011	February 15, 2012			620	0	0	0
4	March 1, 2012	April 1, 2012			200	200	400	0
5	June 15, 2012	September 9, 2012			460	0	0	0
6	September 30, 2012	October 20, 2012			0	400	700	400
7	December 12, 2012	March 11, 2013					300	230
8	April 12, 2013	June 18, 2013					400	200
9	May 28, 2013	July 23, 2013					600	300
10	November 12, 2013	December 5, 2013						100
11	October 30, 2013	January 31, 2014						

- Reported claims are closed when case outstanding equals 0.

a. (2 points)

Create the following cumulative annual triangles organized by accident year:

- paid claims
- reported claims
- reported claim count
- closed claim count

b. (1 point)

Use the triangles produced in part a. above to generate one additional triangle to show that an operational change took place during the experience period. Identify and briefly describe an operational change consistent with the data.

EXAM 5, FALL 2014

15. (2 points)

Given the following data as of December 31, 2013:

Accident Year	Reported Claims (\$000)	Reported Development Factor to Ultimate	On-Level Earned Premium (\$000)
2011	20,900	1.600	38,000
2012	21,000	2.100	50,000
2013	11,500	3.700	67,000

- Annual loss trend = 7%.
- There has been a law change effective July 1, 2012, applicable to all claims occurring after the effective date.
- Estimated reduction to ultimate claims based on law change = 20%.

Estimate IBNR for accident year 2013 using the expected claims technique.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

16. (1.75 points)

The following information is available for an insurer:

Accident	<u>Reported Claim Counts as of (months)</u>				
<u>Half - Year</u>	<u>6</u>	<u>12</u>	<u>18</u>	<u>24</u>	<u>30</u>
2011-1	28	35	39	39	39
2011-2	40	80	140	168	168
2012-1	20	25	28	28	
2012-2	32	64	112		
2013-1	36	45			
2013-2	35				

- There is no development after 30 months.
- The actuary's estimate of ultimate claim counts for accident year 2013 is 152.

Assess the reasonability of the actuary's estimate of ultimate claim counts.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

17. (3.5 points)

A monoline insurance company writes business in one state. The state has experienced significant increases in insurance costs. In an effort to reduce costs, the state's government passes legislative reforms effective January 1, 2013, which impacts all outstanding and future reported insurance claims.

The legislative reforms were expected to have the following impacts:

- Reduce the amount of time claims remained open.
- Reduce the average annual inflation by half of what it was prior to the reforms.

The following information is available for the insurance company as of December 31, 2013:

Accident Year	Cumulative Paid Claims as of (months)			
	12	24	36	48
2010	\$1,000,000	\$1,750,000	\$2,350,000	\$2,850,000
2011	\$1,210,000	\$2,117,500	\$3,059,100	
2012	\$1,089,000	\$2,042,370		
2013	\$1,709,000			

Accident Year	Cumulative Closed Claim Counts as of (months)			
	12	24	36	48
2010	100	150	180	200
2011	110	165	209	
2012	90	144		
2013	132			

Accident Year	Incremental Closed Claim Counts as of (months)			
	12	24	36	48
2010	100	50	30	20
2011	110	55	44	
2012	90	54		
2013	132			

Accident Year	Ultimate Claim Counts
2010	200
2011	220
2012	180
2013	220

a. (2.5 points)

Assuming the closure rates and inflation observed during calendar year 2013 continue, use a frequency-severity approach to estimate unpaid claims for accident year 2013.

b. (1 point)

Discuss whether or not each of the legislative reform impacts has occurred.

EXAM 5, FALL 2014

18. (1.5 points)

Given the following data as of December 31, 2013:

Accident <u>Year</u>	On-level Earned <u>Premium</u>	Reported <u>Claims</u>	Reported Development Factor <u>to Ultimate</u>	Expected Claims <u>Ratio</u>
2010	25,000	11,000	1.05	57.9%
2011	26,000	13,000	1.10	57.9%
2012	28,000	10,000	1.30	57.9%
2013	30,000	12,000	1.80	57.9%

a. (1.25 points)

Calculate the IBNR for accident year 2013 using the Benktander technique.

b. (0.25 point)

The Benktander technique can be viewed as a credibility weighting of other common techniques. Identify these techniques.

EXAM 5, FALL 2014

19. (2.25 points)

For each situation below an insurer uses the reported development technique based on its historical accident year data to set reserves. For each situation:

- i. Discuss the effect on estimated ultimate claims and
- ii. Identify either an alternate technique or an adjustment to the reported development technique to improve the estimate, if necessary.

a. (0.75 point)

Mid-year the company institutes a new policy for setting case outstanding for open claims, in which case outstanding is set at policy limits.

b. (0.75 point)

The company had historically stable writings, but undertakes an advertising initiative in the second quarter and increases its premium volume written through the end of the year by 300%.

c. (0.75 point)

At the beginning of the year, the company began offering a general liability product covering losses in excess of its basic limits.

EXAM 5, FALL 2014

20. (3.75 points)

The following information is available for an insurance company:

<u>Cumulative Paid Claims</u>					<u>Case Outstanding</u>				
Accident	<u>(\$000) as of (months)</u>				Accident	<u>(\$000) as of (months)</u>			
<u>Year</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>Year</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>
2010	1,050	2,350	4,370	6,250	2010	520	2,200	1,790	1,500
2011	1,100	3,970	6,350		2011	600	1,270	690	
2012	1,160	4,860			2012	730	770		
2013	1,460				2013	920			

<u>Closed Claim Counts</u>					<u>Open Claim Counts</u>				
Accident	<u>(000) as of (months)</u>				Accident	<u>(000) as of (months)</u>			
<u>Year</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>Year</u>	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>
2010	5	7	10	13	2010	3	4	3	1
2011	5	9	12		2011	3	2	1	
2012	5	10			2012	3	1		
2013	6				2013	3			

Accident	<u>Projected Ultimate</u>
<u>Year</u>	<u>Claim Counts (000)</u>
2010	13
2011	13
2012	13
2013	13

The interpolation of cumulative paid claims (in \$000s) by accident year (AY) is as follows:

<u>Closed Claim Counts</u>	<u>AY 2010</u>	<u>Closed Claim Counts</u>	<u>AY 2011</u>	<u>Closed Claim Counts</u>	<u>AY 2012</u>
5	1,050	5	1,100	5	1,160
6	1,700	6	1,818	6	1,900
7	2,350	7	2,535	7	2,640
8	3,023	8	3,253	8	3,380
9	3,697	9	3,970	9	4,120
10	4,370	10	4,763	10	4,860
11	4,997	11	5,557		
12	5,623	12	6,350		
13	6,250				

- The selected annual severity trend rate for all maturities is 5%.
- Use an all-year simple average to determine age-to-age claim development factors.
- There is no development beyond 48 months.

Calculate an estimate of ultimate claims for accident year 2013 utilizing the reported Berquist-Sherman method with adjustments reflecting changes in both case outstanding and claim settlement rates.

EXAM 5, FALL 2014

21. (2 points)

Given the following information for an insurance company:

Accident Year	<u>Gross Cumulative Reported Claims (\$000)</u>			
	<u>12 Months</u>	<u>24 Months</u>	<u>36 Months</u>	<u>48 Months</u>
2010	3,500	8,120	12,180	14,616
2011	3,000	6,840	10,465	
2012	3,300	7,656		
2013	3,250			

Accident Year	<u>Net Cumulative Reported Claims (\$000)</u>			
	<u>12 Months</u>	<u>24 Months</u>	<u>36 Months</u>	<u>48 Months</u>
2010	2,275	5,278	7,917	9,500
2011	2,100	4,788	7,326	
2012	2,475	5,742		
2013	2,600			

- Assume no further development after 48 months.

a. (0.5 point)

Using the data, determine the structure of the company's reinsurance program.

b. (1.5 points)

Estimate the ceded IBNR for accident year 2013.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

22. (1.75 points)

The following information is available for accident year 2013 as of December 31, 2013:

- Selected ultimate claims = \$5,000.
- Reported claims = \$3,000.
- Selected cumulative development factor at 12 months = 6.67.
- Selected cumulative development factor at 24 months = 2.86.

a. (1.25 points)

Calculate cumulative expected reported claims as of July 31, 2014, using linear interpolation.

b. (0.5 point)

Describe why linear interpolation may not be appropriate for estimating the expected reported claims for an immature accident year.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

23. (3.75 points)

The following information is available for an insurance company that began writing business in 2010:

Accident Year	Cumulative Paid Claims as of (months)			
	12	24	36	48
2010	\$198	\$285	\$325	\$347
2011	\$1,220	\$1,763	\$2,044	
2012	\$13,000	\$18,750		
2013	\$11,060			

Calendar Year	Paid ULAE
2010	\$23
2011	\$59
2012	\$814
2013	\$688

- The actuary has selected a 24-month cumulative paid claim development factor of 1.25.
- The initial expected claims for accident year 2013 are \$31,500.
- Case outstanding for accident year 2013 as of December 31, 2013 is \$5,720.

a. (1.25 point)

Estimate IBNR for accident year 2013 as of December 31, 2013 using the paid Bornhuetter-Ferguson technique.

b. (1.25 point)

Estimate unpaid ULAE for accident year 2013 as of December 31, 2013, using the classical technique and the results from part a. above.

c. (0.75 point)

State the key assumptions of the classical technique, and briefly comment on the appropriateness of utilizing the classical technique in estimating unpaid ULAE for this company.

d. (0.5 point)

Describe a refinement to the classical technique that can be used to derive a reasonable estimate of unpaid ULAE for this company.

CONTINUED ON NEXT PAGE

EXAM 5, FALL 2014

24. (2.25 points)

An insurer's policyholders were exposed to a severe storm that occurred on December 1, 2013. As of December 31, 2013, the claims related to the storm have been recorded in the claims system, but payments on the claims have not yet been processed. The claim history does not include any severe storms.

The following information is available for accident year 2013 as of December 31, 2013:

- Reported claims = \$20,000.
- Paid claims = \$5,000.
- Initial expected claims as of the beginning of the accident year = \$100,000.
- 12-month age-to-ultimate factor for reported claims = 8.000.
- 12-month age-to-ultimate factor for paid claims = 20.000.

a. (0.75 point)

Identify a technique that will result in a reasonable estimate of ultimate claims. Calculate ultimate claims for accident year 2013 using the identified technique and briefly describe why the estimate is reasonable.

b. (0.75 point)

Identify a technique that will overstate the estimate of ultimate claims. Calculate ultimate claims for accident year 2013 using the identified technique and briefly describe why the estimate is overstated.

c. (0.75 point)

Identify a technique that will understate the estimate of ultimate claims. Calculate ultimate claims for accident year 2013 using the identified technique and briefly describe why the estimate is understated.

Exam 5

Basic Techniques for Ratemaking and Estimating Claim Liabilities

October 28, 2014

POINT VALUE OF QUESTIONS

QUESTION	VALUE OF QUESTON	SUB-PART OF QUESTION						
		(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	2.00	0.50	0.50	0.25	0.25	0.50		
2	1.50	0.50	0.50	0.25	0.25			
3	2.00	2.00						
4	1.50	1.00	0.50					
5	3.25	3.25						
6	2.25	0.50	1.00	0.75				
7	2.50	2.50						
8	4.25	1.00	3.25					
9	2.75	1.75	0.50	0.50				
10	1.75	0.75	1.00					
11	3.00	2.00	0.50	0.50				
12	2.50	0.50	1.00	1.00				
13	1.50	0.75	0.75					
14	3.00	2.00	1.00					
15	2.00	2.00						
16	1.75	1.75						
17	3.50	2.50	1.00					
18	1.50	1.25	0.25					
19	2.25	0.75	0.75	0.75				
20	3.75	3.75						
21	2.00	0.50	1.50					
22	1.75	1.25	0.50					
23	3.75	1.25	1.25	0.75	0.50			
24	2.25	0.75	0.75	0.75				
TOTAL	<u>58.25</u>							