Exam 5

CASUALTY ACTUARIAL SOCIETY
AND THE
CANADIAN INSTITUTE OF ACTUARIES

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Exam 5

Basic Techniques for Ratemaking and
Estimating Claim Liabilities

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4 HOURS

INSTRUCTIONS TO CANDIDATES

1. This 56.00 point examination consists of 27 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 <u>dark</u> 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. For your Candidate ID number, four boxes are provided corresponding to one box for each digit in your Candidate ID number. If your Candidate ID number is fewer than 4 digits, begin in the first box and do <u>not</u> include leading zeroes. Your name, or any other identifying mark, must not appear.

    *   Do not answer more than one question on a single sheet of paper. <u>Write only on the front lined side of the paper</u> – **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. <u>When a specified number of items are requested, do not offer more items than requested.</u> For example, if you are requested to provide three items, only the first three responses will be graded.

    *   <u>In order to receive full credit</u> or to maximize partial credit on mathematical and computational questions, you must clearly outline your approach in either verbal or mathematical form, <u>showing calculations</u> where necessary. Also, you must clearly <u>specify any additional assumptions</u> 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.

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.

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. Interoffice mail is not acceptable.

   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 9, 2016.

END OF INSTRUCTIONS

1. (1.25 points)

Given the following automobile policies issued during calendar years 2013 through 2015:

Effective Date	Expiration Date	Number of Policies
April 1, 2013	September 30, 2013	100
October 1, 2013	March 31, 2014	110
April 1, 2014	September 30, 2014	105
October 1, 2014	March 31, 2015	100
April 1, 2015	September 30, 2015	110
October 1, 2015	March 31, 2016	105

• All policies have a 6-month term.

a. (0.5 point)

Calculate the written car-years for calendar year 2014.

b. (0.25 point)

Calculate the in-force car-years as of December 31, 2014.

c. (0.5 point)

Calculate the earned car-years for calendar year 2015.

2. (1.5 points)

Given the following:

Effective Date	Rate Change
September 1, 2012	-10%
September 1, 2013	-5%
September 1, 2014	-3%

- A law change mandated a rate decrease of 15% effective February 1, 2015 applicable to all in-force policies.
- All policies are annual.

a. (1 point)

Calculate the on-level factor to current rate level for calendar year 2014 earned premium.

b. (0.5 point)

Identify a weakness with the parallelogram method and briefly describe a solution.

3. (1.5 points)

Given the following data for an insured:

Report Year	Reported Loss ($) by Report Year Lag				
	0	1	2	3	4
2011	75,300	84,000	62,400	59,000	39,800
2012	65,000	63,200	84,000	80,200	62,100
2013	82,100	49,900	55,000	60,600	72,300
2014	90,000	77,000	104,300	45,000	88,300
2015	71,800	89,000	62,000	91,500	46,600

- Policies run from January 1 through December 31.
- The insured's coverage changed from occurrence to claims-made on January 1, 2013 with a retroactive date of January 1, 2013.

a. (0.25 point)

Calculate the reported losses for the 2012 occurrence policy as of December 31, 2015.

b. (0.25 point)

Calculate the reported losses for the 2014 claims-made policy as of December 31, 2015.

c. (0.5 point)

Describe how a switch from occurrence to claims-made coverage could affect an insurer's loss reserve risk.

d. (0.5 point)

Describe how a switch from occurrence to claims-made coverage could affect the target underwriting profit provision.

4. (3.75 points)

Given the following information:

Accident Year	Frequency	Severity
2011	0.100	$25,000
2012	0.090	$27,250
2013	0.081	$30,248
2014	0.082	$33,423
2015	0.080	$36,599

Accident Year	Ultimate Losses ($000)
2013	48,000
2014	55,000
2015	60,000

- Exposures are constant.
- The company only writes semi-annual policies.
- The rate filing will be effective on January 1, 2017.
- Rates will be in effect for one year.

a. (2.5 points)

Calculate the average annual trended ultimate losses that should be used to determine the indicated rate change. Briefly justify the frequency trend and severity trend selections.

b. (0.5 point)

Discussions with the underwriting team reveal that changes in underwriting guidelines in the 2012 policy year resulted in lower claim counts. Describe how this information may change the estimate in part a. above without performing any additional calculations.

c. (0.75 point)

Discussions with the underwriting team reveal that the company has been writing fewer high deductible policies, starting in policy year 2014. Fully describe how this information may change the estimate in part a. above without performing any additional calculations.

5. (2.25 points)

An insurance company purchases per risk excess-of-loss reinsurance each year that covers individual claims that exceed the retention.

Given the following information as of December 31, 2015:

Accident Year	Earned Exposures	Direct Ultimate Losses ($000)	Claim Counts
2013	1,850	185,000	185
2014	1,750	190,000	175
2015	1,650	199,500	165

Ultimate Value of Direct Claims Excess of $500,000		
Accident Year	Claim	Direct Ultimate Loss of Individual Claims ($000)
2013	A	18,400
2013	B	3,200
2014	C	5,700
2014	D	5,200
2015	E	9,500
2015	F	6,200

Accident Year	Retention ($000)
2013	2,000
2014	5,000
2015	10,000

- Policies are annual.
- Policies are written uniformly throughout the year.
- Rates are expected to be in effect for one year.
- Planned rate revision to be effective January 1, 2017.

Calculate the average trended pure premium net of reinsurance at the current $10,000,000 retention.

6. (1.25 points)

The following information is available for a single-state, mono-line insurer:

	Calendar Year ($000)		
	2013	2014	2015
General Expense	4,525	4,175	3,875
Other Acquisition	5,220	6,000	6,750
Commissions/Brokerage	8,700	8,000	7,500
Taxes, Licenses and Fees	3,480	3,200	3,000
Total Expenses	21,925	21,375	21,125

	Calendar Year ($000)		
	2013	2014	2015
Written Premium	87,000	80,000	75,000
Earned Premium	90,500	83,500	77,500

The company's pricing actuary is asked to calculate an expense provision for 2016, and does so using a ratio of three years' total expense to three years' earned premium as follows:

$$\text{Expense provision} = \frac{(21,925,000 + 21,375,000 + 21,125,000)}{(90,500,000 + 83,500,000 + 77,500,000)} = 25.6\%$$

a. (0.75 point)

Briefly discuss three reasons why the actuary's approach is not appropriate.

b. (0.5 point)

Identify an alternative approach to calculate the expense provision and briefly explain its benefit relative to the actuary's approach without performing any additional calculations.

7. (1.75 points)

A regulator wants to benchmark the underwriting profit provisions between companies.

For Company A's rate filing, the following is assumed:

Projected total fixed costs	$50,000
Projected total loss and LAE	$600,000
Projected exposures	2,000
Indicated rate per exposure	$500

For Company B's rate filing, the following is assumed:

Projected total fixed costs	$50,000
Projected total loss and LAE	$600,000
Projected premium at current rates	$900,000
Indicated rate change	16.5%

- The variable expense ratio is the same for each company.

a. (1.25 points)

Determine which company's filing includes the higher underwriting profit provision.

b. (0.5 point)

List two reasons the underwriting profit provision might differ between companies with the same loss, LAE and expense experience.

8. (3.5 points)

Given the following information about an insurance product:

* The product launched on January 1, 2012.
* All policies are annual.
* The rating algorithm is exposures multiplied by a fixed manual rate.
* The average written manual rate per exposure in 2013 = $5,000.
* Exposures are written uniformly throughout the year.
* A large loss of $2 million occurred and was paid in 2014. Underwriting guidelines have been revised such that further losses of this type are not expected.
* Losses do not develop after 36 months.
* The age-to-age factors in the latest diagonal are representative of future loss development.
* Rates will be in effect for two years.

Annual loss cost trend	5%
Annual premium trend	0%
Fixed expense ratio	0%
Variable expense ratio	22%
Profit and contingencies provision	6%
ALAE provision	12% of loss
ULAE provision	7% of loss

Rate Change History	
Effective Date	Change
July 1, 2014	+7.5%
July 1, 2015	+3.0%

Calendar Year	2012	2013	2014	2015
Written Exposures	805	850	825	875

Cumulative Reported Loss ($000)			
Accident Year	12 months	24 months	36 months
2013		1,100	1,150
2014	2,940	4,210	
2015	1,020		

Calculate the indicated rate change for policies effective between July 1, 2017 and July 1, 2019 based on the most recent three accident years of experience and assuming full credibility.

9. (1 point)

Given the following:

General Expenses	$225,000
Written Premium	$3,750,000
Earned Premium	$3,000,000
Other Acquisition Expense	8.0%
Commission	12.0%
Taxes, Licenses & Fees	3.0%

Projected Ultimate Loss and LAE Ratio	62.0%
Target Underwriting Profit Ratio	5.0%

- All expenses are paid at policy inception.
- Commission and Taxes, Licenses & Fees are 100% variable.
- All other expense categories are 50% variable.

Calculate the indicated rate change assuming the data is fully credible.

10. (1 point)

A homeowners insurance company is considering utilizing number of vehicles in the household as an additional risk characteristic within its risk classification system.

Briefly discuss the appropriateness of adding this risk characteristic to the company's risk classification system using four considerations from the Actuarial Standard of Practice No. 12: Risk Classification (for All Practice Areas).

11. (3.25 points)

Given the following ground-up uncapped loss profile for a book of business:

Claim Type	Number of Claims	Loss Amount of each Claim
A	200	$5,000
B	100	$20,000
C	10	$100,000
D	10	$400,000

a. (1.25 points)

Calculate the increased limits factor for an increased limit of $25,000 and a basic limit of $10,000.

b. (1.5 points)

Calculate the severity trend for the layer excess of $50,000 assuming a ground-up severity trend of 10% over the next year.

c. (0.5 point)

Provide one reason why the data above would not be appropriate to determine an increased limits factor for $100,000 and suggest an alternative source that could be used.

12. (1 point)

The following graph provides the output from a generalized linear model (GLM):

Predicted Values
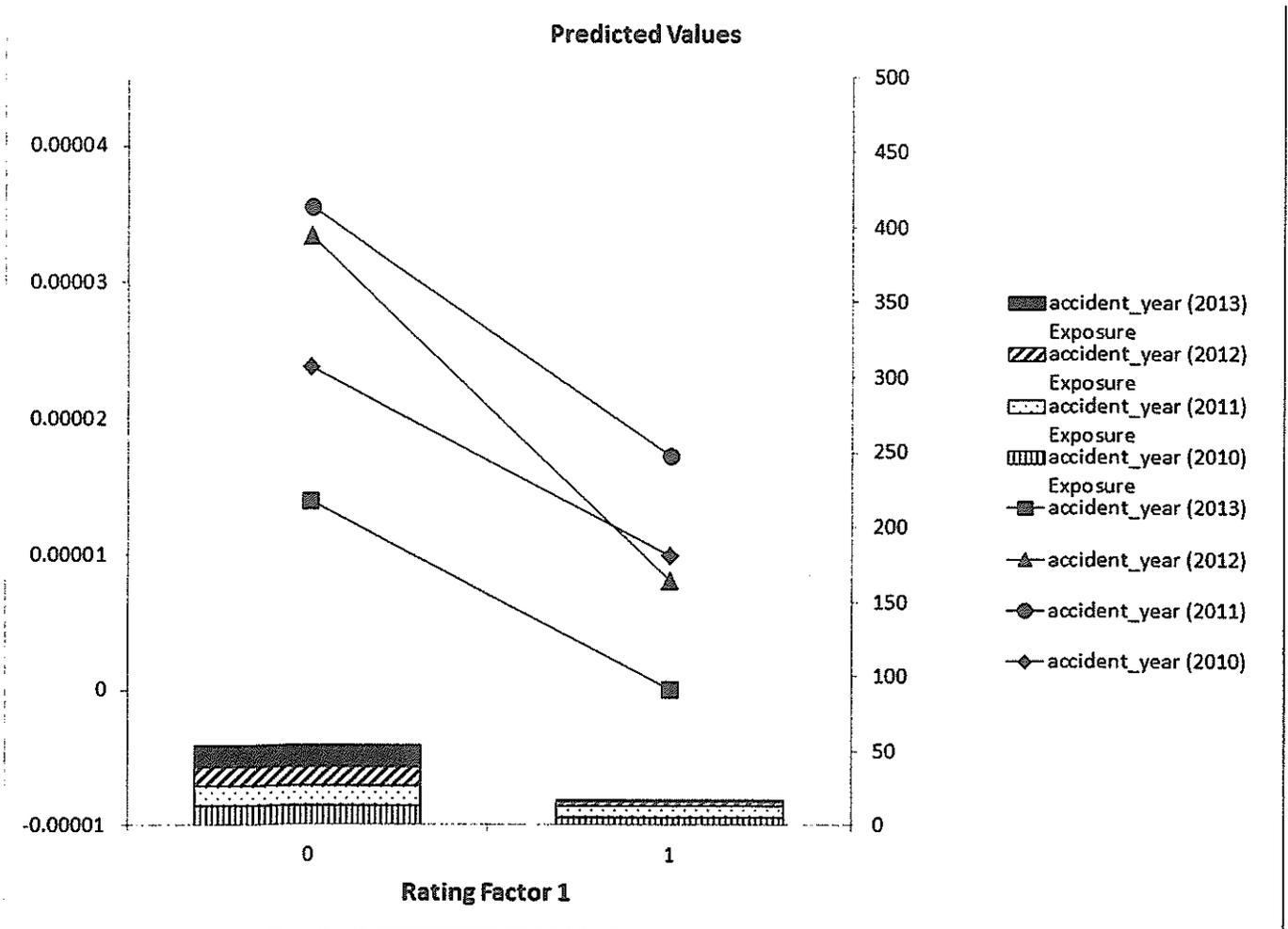
a. (0.5 point)

Briefly explain whether this variable should be included in the rating plan.

b. (0.5 point)

Briefly discuss two reasons why GLM analysis is typically performed on loss cost data instead of loss ratios.

13. (3 points)

An insurance company is considering updating its territorial relativities given the following information:

Territory	Number of Exposures	Trended and Ultimate Incurred Losses & ALAE	Current Territorial Relativity
1	30,000	$3,000,000	1.100
2	50,000	$4,000,000	1.000
3	25,000	$1,500,000	0.850

- The base territory remains the same.
- Exposures are homogeneous within each territory.
- The full credibility standard = 45,000 exposures.
- Partial credibility is determined by the square root rule.
- Complement of credibility is equal to normalized current territorial relativities.

a. (1.5 points)

Calculate the credibility weighted territorial relativities using the pure premium approach.

b. (0.75 point)

Determine the percent change by territory, assuming the indicated relativities are to be adopted and no overall premium change is desired.

c. (0.75 point)

Briefly discuss three reasons why proposed rate changes might deviate from indicated rate changes.

14. (1.25 points)

An insured purchases a $400,000 policy on a property valued at $500,000.

● The coinsurance requirement for the policy is 90% of property value.
● No deductible applies.

a. (0.25 point)

Calculate the coinsurance penalty for a $300,000 loss.

b. (0.25 point)

Calculate the maximum coinsurance penalty.

c. (0.25 point)

Calculate the coinsurance apportionment ratio, assuming the property is valued at $425,000 instead of $500,000.

d. (0.5 point)

Briefly describe two issues associated with underinsured properties.

15. (1.75 points)

Given the following for a workers compensation policyholder:

Individual Claims Reported During the Experience Period
$19,000
$3,000
$102,500
$11,000

- Standard premium = $435,000.
- 3-year payroll = $14,590,000.
- Expected loss rate = 2.40 per $100 of payroll.
- D-ratio = 0.19.
- Primary loss cap = $5,000.
- Primary credibility = 0.75.
- Excess credibility = 0.15.

Calculate the policy's premium under an experience rating plan.

16. (2.5 points)

Given the following information:

Claim ID	Accident Date	2013 Transactions		2014 Transactions		2015 Transactions	
		Calendar Year Payments	Ending Case O/S	Calendar Year Payments	Ending Case O/S	Calendar Year Payments	Ending Case O/S
1	January 1, 2013	80	150	25	100	100	-
2	June 1, 2013	20	50	25	50	100	-
3	May 1, 2014			100	50	50	50
4	December 15, 2014			50	250	150	100
5	April 1, 2015					50	50

a. (0.75 point)

Construct an accident year cumulative paid claims triangle.

b. (0.75 point)

Construct an accident year cumulative reported claims triangle.

c. (0.5 point)

In 2015 the claims department began paying claims faster without changing the adequacy of case reserves. Produce and briefly discuss a triangle that demonstrates that this action has been successfully executed.

d. (0.5 point)

Recommend and briefly justify a technique for calculating ultimate claims for this dataset, given the change noted in part c. above.

17. (2 points)

Actuary A and Actuary B are each performing a reserve analysis for a small insurance company. To enhance credibility:

- Actuary A relies only on internal data, aggregated across all lines of business.
- Actuary B supplements internal data with industry data separately by line of business.

Describe the benefits and deficiencies of each of these two strategies.

18. (2.75 points)

An actuary is estimating unpaid claims for a company using the data below as of December 31, 2015.

| Accident Year | On-Level Earned Premium ($000) | Paid Claims ($000) | Unpaid Claims Estimate | |
			Paid Bornhuetter-Ferguson Technique ($000)	Paid Development Technique ($000)
2012	2,000	1,450	0	0
2013	2,000	1,000	102	100
2014	2,000	700	373	350
2015	2,000	400	622	500

- The actuary uses the same expected claims ratio for all years.

a. (0.75 point)

Calculate the expected claims ratio used in the Bornhuetter-Ferguson technique.

b. (0.5 point)

Select an unpaid claims estimate for accident year 2015 from the two techniques given above and justify the selection.

c. (1.5 points)

After constructing these estimates, the actuary learns of a change in the claims department in 2014 that has led to slower claims payments. Discuss whether the unpaid claims estimate from each technique below would be overstated or understated when calculated without making any adjustments to recognize the slower claims payments:

     i.   Expected claims technique

     ii. Paid Bornhuetter-Ferguson technique

     iii. Paid development technique

19. (2.25 points)

A company that self-insures has the following limited historical information:

Accident	Cumulative Reported Claims ($000) as of (months)			
Year	12	24	36	48
2012	4,000	6,000	7,500	8,250
2013	5,000	7,500	9,375	
2014	6,000	9,000		
2015	7,500			

Accident	Cumulative Paid Claims ($000) as of (months)			
Year	12	24	36	48
2012	1,600	4,000	6,000	7,500
2013	2,000	5,000	7,500	
2014	2,400	6,000		
2015	3,000			

Industry Benchmark
Claims Development Factors

Age-Age	Reported	Paid
60-Ult	1.015	1.100
48-60	1.025	1.150
36-48	1.050	1.250
24-36	1.150	1.500
12-24	1.250	2.500

- Case outstanding for accident year 2011 as of December 31, 2015 = $500,000.

a. (0.75 point)

Use the industry benchmark claims development factors to estimate the unpaid claims for accident year 2011 as of December 31, 2015.

b. (1 point)

Assess the reasonableness of using the industry benchmark reported and paid claims development factors for this company.

c. (0.5 point)

Given the response to part b. above, discuss the reasonableness of the estimate in part a. above.

20. (1.5 points)

An actuary is calculating ultimate claim estimates for a long-tailed line of business using the frequency-severity technique using disposal rates. Given the following information:

- This line of business commonly has partial payments made on claims.
- Recently the statute of limitations was extended, resulting in a significant increase in claim counts at later development periods compared to previous years.
- The claims department has been strengthening case reserves for the last several years.
- There has been significant claim inflation over the last several years.
- The claims department has been attempting to settle claims faster.

a. (0.5 point)

Briefly describe two reasons the frequency-severity technique using disposal rates may be appropriate in the current situation.

b. (0.5 point)

Briefly describe two reasons the frequency-severity technique using disposal rates may not be appropriate in the current situation.

c. (0.5 point)

Briefly describe an adjustment to the frequency-severity technique using disposal rates for each of the issues listed in part b. above.

21. (2 points)

An actuary is estimating the IBNR for a company using the data below, as of December 31, 2015.

Accident Year	Reported Claims ($000)	On-Level Earned Premium ($000)	Reported Development Technique Ultimate Claims Estimate ($000)
2012	1,275	2,400	1,339
2013	1,152	2,300	1,355
2014	932	2,200	1,370
2015	604	2,100	1,332

- The actuary estimates the expected claims ratio to be 60% for all years.
- There is no loss trend.

a. (0.75 point)

Estimate the accident year 2015 IBNR using the Bornhuetter-Ferguson technique.

b. (0.75 point)

Fully assess the reasonableness of the 60% expected claims ratio assumption.

c. (0.5 point)

Recommend and briefly justify a technique that would be more appropriate than the Bornhuetter-Ferguson for this data set.

22. (3 points)

An actuary working at an insurance company is using a frequency-severity technique to estimate ultimate claims. The company made an effort to close claims more quickly starting in 2014. Given the following information:

Closed Claim Counts as of (months)

Accident Year	12	24	36	48
2012	435	600	670	705
2013	520	700	740	
2014	600	650		
2015	620			

Paid Claims ($000s) as of (months)

Accident Year	12	24	36	48
2012	393	650	765	776
2013	511	697	744	
2014	637	825		
2015	722			

Reported Claim Counts as of (months)

Accident Year	12	24	36	48
2012	600	670	720	730
2013	640	715	750	
2014	620	690		
2015	650			

Reported Claims ($000s) as of (months)

Accident Year	12	24	36	48
2012	560	720	780	790
2013	580	720	760	
2014	670	850		
2015	760			

- 48-Ultimate reported claim count factor = 1.03.
- 48-Ultimate closed claim count factor = 1.06.
- 48-Ultimate paid severity factor = 1.15.
- 48-Ultimate reported severity factor = 1.02.

a. (0.5 point)

Determine whether evidence exists to support that claims are closing more quickly starting in 2014.

b. (2.5 points)

Calculate an appropriate frequency-severity estimate of ultimate claims for accident years 2014 and 2015.

23. (2.75 points)

Given the following information as of December 31, 2015:

Case Outstanding ($) as of (months)

Accident Year	12	24	36	48
2012	3,970	4,115	2,730	1,347
2013	3,680	3,760	4,560	
2014	3,690	7,380		
2015	6,230			

Paid Claims ($) as of (months)

Accident Year	12	24	36	48
2012	3,680	7,360	11,040	13,800
2013	3,520	7,040	10,560	
2014	3,360	6,720		
2015	3,520			

Open Claim Counts as of (months)

Accident Year	12	24	36	48
2012	238	245	171	63
2013	222	230	179	
2014	220	255		
2015	270			

Calendar Year	Written Premium
2014	$34,500
2015	$37,500

- Annual severity trend = 10.0%.
- Claims are fully developed by 48 months.
- Accident year 2015 initial expected claim ratio = 65.0%.
- Policies are annual, and are written uniformly throughout the year.
- There have been no rate changes since 2013.
- There is no premium trend.

Calculate the unpaid claims for accident year 2015 using the reported Bornhuetter-Ferguson technique adjusting for the change in case reserve adequacy.

24. (2.5 points)

Given the following information as of December 31, 2014:

Accident	Paid Claims ($) as of (months)		
Year	12	24	36
2011	200	560	570
2012	150	250	400
2013	150	350	
2014	50		

Accident	Received Salvage and Subrogation ($) as of (months)		
Year	12	24	36
2011	20	90	100
2012	16	40	70
2013	15	56	
2014	5		

- Ultimate claims for accident year 2014 = $150.
- There is no development beyond 36 months.
- A simple all-year average is used for all development factors.

a. (0.75 point)

Estimate the ultimate salvage and subrogation for accident year 2014 using the development technique.

b. (1.25 points)

Estimate the ultimate salvage and subrogation for accident year 2014 using a ratio approach.

c. (0.5 point)

Given the following additional information for accident year 2015 as of December 31, 2015:

- Ultimate claims = $175
- Salvage and subrogation received = $12

Recommend and briefly justify an ultimate salvage and subrogation estimate for accident year 2015.

25. (1.75 points)

Given the following information:

Accident	Reported Claims Only ($) as of (months)		
Year	12	24	36
2013	6,000	9,000	10,500
2014	7,500	11,250	
2015	9,000		

Accident	Reported ALAE ($) as of (months)		
Year	12	24	36
2013	150	900	1,575
2014	300	1,125	
2015	525		

- The 36 to ultimate development factor for reported claims only is 1.143.

a. (0.75 point)

Use the reported development technique to calculate ultimate claims only for all accident years.

b. (0.5 point)

Evaluate the reasonableness of combining the reported claims only and reported ALAE provided above to estimate total unpaid liabilities.

c. (0.5 point)

Assess the appropriateness of applying the development technique to the reported ALAE data provided above.

26. (2.25 points)

Given the following information:

Accident Year	Exposures	Ultimate Claims ($)
2012	10,000	1,000,000
2013	10,000	1,020,000
2014	10,000	1,040,000
2015	10,000	1,061,000

Calendar Year	Reported Claims ($)	Paid Claims ($)	Paid ULAE ($)
2012	995,000	990,000	100,000
2013	1,015,000	1,010,000	110,000
2014	1,035,000	1,030,000	121,000
2015	1,056,000	1,051,000	133,100

- Case outstanding as of December 31, 2015 = $180,000.
- IBNR as of December 31, 2015 = $50,000.

a. (0.75 point)

Using the classical paid-to-paid technique, estimate the unpaid ULAE as of December 31, 2015.

b. (1 point)

Fully discuss how a key assumption of the classical technique is being violated in part a. above.

c. (0.5 point)

Discuss whether or not the Kittel refinement will correct the issue identified in part b. above.

27. (1.75 points)

Given the following information:

	As of December 31, 2014		As of December 31, 2015
Accident Year	Selected Ultimate Claim Counts	Reported Claim Counts	Reported Claim Counts
2013	7,500	1,000	3,500
2014	8,600	600	3,400

Maturity	Cumulative Percent of Claim Counts Reported
36	55%
24	30%
12	8%

a. (1 point)

Compare actual reported claim count emergence to expected claim count emergence on reported claim counts in calendar year 2015.

b. (0.75 point)

Briefly describe a potential limitation of the actual vs. expected calculation performed in part a. above and propose an alternative calculation that addresses this limitation.

Exam 5
Basic Techniques for Ratemaking and Estimating Claim Liabilities

POINT VALUE OF QUESTIONS

QUESTION	VALUE OF QUESTON	(a)	(b)	(c)	(d)	(e)	(f)	(g)
1	1.25	0.50	0.25	0.50				
2	1.50	1.00	0.50					
3	1.50	0.25	0.25	0.50	0.50			
4	3.75	2.50	0.50	0.75				
5	2.25	2.25						
6	1.25	0.75	0.50					
7	1.75	1.25	0.50					
8	3.50	3.50						
9	1.00	1.00						
10	1.00	1.00						
11	3.25	1.25	1.50	0.50				
12	1.00	0.50	0.50					
13	3.00	1.50	0.75	0.75				
14	1.25	0.25	0.25	0.25	0.50			
15	1.75	1.75						
16	2.50	0.75	0.75	0.50	0.50			
17	2.00	2.00						
18	2.75	0.75	0.50	1.50				
19	2.25	0.75	1.00	0.50				
20	1.50	0.50	0.50	0.50				
21	2.00	0.75	0.75	0.50				
22	3.00	0.50	2.50					
23	2.75	2.75						
24	2.50	0.75	1.25	0.50				
25	1.75	0.75	0.50	0.50				
26	2.25	0.75	1.00	0.50				
27	1.75	1.00	0.75					

TOTAL 56.00

EXAM 5 FALL 2016 SAMPLE ANSWERS AND EXAMINER'S REPORT

GENERAL COMMENTS:

- Candidates should note that the instructions to the exam explicitly say to show all work; graders expect to see enough support on the candidate's answer sheet to follow the calculations performed. While the graders made every attempt to follow calculations that were not well documented, lack of documentation may result in the deduction of points where the calculations cannot be followed or are not sufficiently supported.
- Candidates should justify all selections when prompted to do so. For example, if the candidate selects an all year average and the question prompts a justification of all selections, a brief explanation should be provided for the reasoning behind this selection. Candidates should note that a restatement of a numerical selection in words is not a justification.
- Incorrect responses in one part of a question did not preclude candidates from receiving credit for correct work on subsequent parts of the question that depended upon that response.
- Candidates should try to be cognizant of the way an exam question is worded. They must look for key words such as "briefly" or "fully" within the problem. We refer candidates to the Future Fellows article from December 2009 entitled "The Importance of Adverbs" for additional information on this topic.
- Some candidates provided lengthy responses to a "briefly describe" question, which does not provide extra credit and only takes up additional time during the exam.
- Candidates should read each question carefully and answer the question as it is presented.
- Candidates should note that the sample answers provided in the examiner's report are not an exhaustive representation of all responses given credit during grading, but rather the most common correct responses.
- In cases where a given number of items were requested (e.g., "three reasons" or "two scenarios"), the examiner's report often provides more sample answers than the requested number. The additional responses are provided for educational value, and would not have resulted in any additional credit for candidates who provided more than the requested number of responses. Candidates are reminded that, per the instructions to the exam, when a specific number of items is requested, only the items adding up to that number will be graded (i.e., if two items are requested and three are provided, only the first two are graded).`

EXAM STATISTICS:

- Number of Candidates: 767
- Available Points: 56.00
- Passing Score: 40.25
- Number of Passing Candidates: 292
- Raw Pass Ratio: 38.07%
- Effective Pass Ratio: 40.95%

QUESTION 1	
TOTAL POINT VALUE: 1.25	**LEARNING OBJECTIVE: A1**
SAMPLE ANSWERS	

Part a: 0.5 point

Sample Answer 1

Written Car-years for CY 2014 = (105+100) × 0.5 = 102.5

Sample Answer 2

Policy Effective Date	Expiration Date	Number of Policies	Term of policy year	Contribution to CY2014
Apr 1, 2013	Sep 30, 2013	100	0.5	0
Oct 1, 2013	Mar 31, 2014	110	0.5	0
Apr 1, 2014	Sep 30, 2014	105	0.5	1
Oct 1, 2014	Mar 31, 2015	100	0.5	1
Apr 1, 2015	Sep 30, 2015	110	0.5	0
Oct 1, 2015	Mar 31, 2016	105	0.5	0

Only two periods are covered
1. Apr 1, 2014: 105 × 0.5 × 1 = 52.5
2. Oct 1, 2014: 100 × 0.5 × 1 = 50
   52.5 + 50 = 102.5

Sample Answer 3

Since policies are semi-annual, each one contributes 0.5 car-years

CY 2014 written exposures = 0.5 × (105+100) = 102.5

Sample Answer 4

There are 6 policies I will refer to the policies by the order they are listed in

Policies 3 and 4 contribute to 2014 CY Written exposure

Policy 3: 0.5 car-years × 105 policies =52.5 car-years

Policy 4: 0.5 car-years × 100 policies = 50 car-years

Total 2014 CY : 52.5+50=102.5 car-years

Part b: 0.25 point

Sample Answer 1

In-force car-years as of Dec 31, 2014 = 100 × 0.5 = 50

Sample Answer 2

Group effective date	Inforce at 12/31/2014	Inforce car-year
A: 4/1/2013	N	0
B: 10/1/2013	N	0
C: 4/1/2014	N	0
D: 10/1/2014	Y	100×0.5=50
E: 4/1/2015	N	0
F: 10/1/2015	N	0

Sample Answer 3

Policy 4 is the only policy inforce at 12/31/14

0.5 car-years × 100 policies = 50 car-years in-force

Part c: 0.5 point

Sample Answer 1

Earned Car-years for CY 2015

= (100 × 0.5 +110 + 105 × 0.5) × 0.5

=106.25

Sample Answer 2

Policy with effective dates (Apr 1, 2013; Oct 1, 2013; Apr 1, 2014) contribute nothing to earned car-years for CY 2015

		I	II	III	IV=I*II*III
Policy Effective Date	Expiration Date	Number of Policies	% Earned in CY 2015	Term of policy year	Earned car-year in CY 2015
Oct 1, 2014	Mar 31, 2015	100	0.5	0.5	25
Apr 1, 2015	Sep 30, 2015	110	1	0.5	55
Oct 1, 2015	Mar 31, 2016	105	0.5	0.5	26.25
			Total Earned car-years:		**106.25**

Sample Answer 3

Written car-year in 2015=110 × 0.5 +105 × 0.5 = 107.5

Unearned car-year at 2015 year end = 105 × 0.5 × 0.5 = 26.25

Unearned car-year at 2014 year end = 100 × 0.5 × 0.5 = 25

Earned car-year in 2015=written car-year in 2015 +

(Unearned car-year at 2014 year end - Unearned car-year at 2015 year end)

=107.5 − 1.25 = 106.25

Sample Answer 4

Policies Oct12-mar15 earned month in 2015: 3/6=0.5   policies=100

Policies Apr15-Sep15 earned month in 2015: 6/6=1   policies=110

Policies Oct15-Mar16 earned month in 2015: 3/6=0.5   policies=105

Earned Exposure × 0.5 = 50×0.5 + 110×0.5 + 52×0.5 = 106

EXAMINER'S REPORT
Part a
Candidates were expected to demonstrate how to calculate written exposures for 6-month policies. Common mistakes included: • Not taking half of the exposures to account for the 6-month term since exposure is defined as one car-year • Not including all the written policies in Calendar Year 2014 • Calculating earned exposures instead of written exposures
Part b
Candidates were expected to demonstrate how to calculate in-force exposures for 6-month policies. Common mistakes included: • Not taking half of the exposures to account for the 6-month term since exposure is defined as one car-year • Including policies not in-force as of Dec. 31, 2014.
Part c
Candidates were expected to demonstrate how to calculate earned exposures for 6-month policies. Common mistakes included: • Some candidates used the parallelogram method to calculate the earned exposures, however, this method is an approximation assuming all policies were written evenly throughout the year. This is not the case for this question. • Not taking half of the exposures to account for the 6-month term since exposure is defined as one car-year • Missing the 100 policies effective October 1, 2014

QUESTION 2	
TOTAL POINT VALUE: 1.5	LEARNING OBJECTIVE: A2
SAMPLE ANSWERS	
Part a: 1 point	

Sample Answer 1
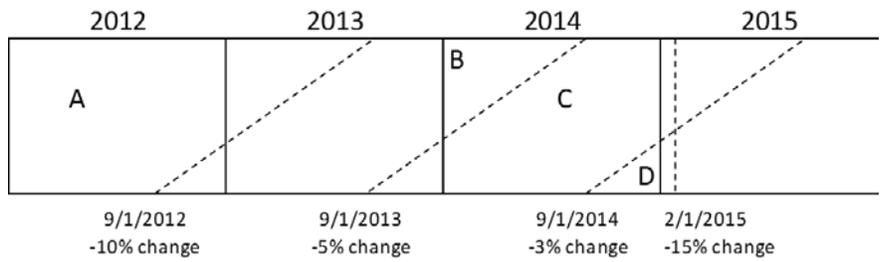
2012   2013   2014   2015

A   B   C   D

9/1/2012   9/1/2013   9/1/2014   2/1/2015
-10% change   -5% change   -3% change   -15% change

Period	B	C	D
Weight in CY 2014	= .5 x (8/12) x (8/12) = .2222	= 1 - Area B - Area D = .7222	= .5 x (4/12) x (4/12) = .0556
Cumulative Rate Level	1	0.95	= 0.95 x 0.97 = .9215

2014 Average Rate Level = .2222 x 1 + .7222 x .95 + .0556 x .9215 = .959528

Current Cumulative Rate Level = 1 x .95 x .97 x .85 = .783275

On-Level Factor for 2014 = .783275 / .959528 = .816313

Sample Answer 2

2012   2013   2014   2015

A   B   C   D

9/1/2012   9/1/2013   9/1/2014   2/1/2015
-10% change   -5% change   -3% change   -15% change

Period	B	C	D
Weight in CY 2014	= .5 x (8/12) x (8/12) = .2222	= 1 - Area B - Area D = .7222	= .5 x (4/12) x (4/12) = .0556
Cumulative Rate Level	.90	= .9 x .95 = .855	= .9 x .95 x .97 = .82935

2014 Average Rate Level = .2222 x .9 + .7222 x .855 + .0556 x .82935 = .863575
Current Cumulative Rate Level = .9 x .95 x .97 x .85 = .704948
On-Level Factor for 2014 = .704948 / .863575 = .816313

Part b: 0.5 point

Sample Answer 1

One weakness is the assumption of uniform writings of policies throughout the year. A way to improve upon this is to use extension of exposures to rerate all policies using current rates/relativities.

Sample Answer 2

It assumes premiums are written evenly within each period. For seasonal lines of business, this may not be very applicable. Using parallelogram method on quarterly or monthly data may be able to increase accuracy.

Sample Answer 3

Parallelogram method is only able to project to current an average rate impact and therefore leads to inaccurate results when rate has been targeted towards particular segments (classification ratemaking) and the mix of business changes. This can be resolved via the extension of exposure method where policies are individually (by a computer, generally) rerated using the current rates.

EXAMINER'S REPORT

Part a

Candidates were expected to demonstrate how to calculate an earned premium on-level factor using the parallelogram method. This included calculating the weights and average rate level for a calendar year, the cumulative rate level, and the final factor itself.

Common mistakes included:
- Misapplying the law change, such as using a 15% increase instead of a decrease or applying the change to 2/1/2014 instead of 2/1/2015
- Switching rate changes and effective dates, misreading values, or forgetting to include rate or law changes in the CRL or 2014 average rate level calculations
- Incorrectly calculating the weights for each rate level within calendar year 2014. The most common miscalculation was calculating the weights as if the rate changes were occurring on 10/1 rather than 9/1

Part b

Candidates were expected to know a weakness with the parallelogram method as well as a correct solution to the given weakness.

Common mistakes included:
- Not fully identifying either the weakness or solution, such as only mentioning "uniform distribution" without context regarding issuing policies or the time period
- Confusing the concept of uniform issuing of policies with uniform earning of premium

QUESTION 3	
TOTAL POINT VALUE: 1.5	**LEARNING OBJECTIVE: A3**
SAMPLE ANSWERS	

Part a: 0.25 point

65,000 + 49,900 + 104,300 + 91,500 = 310,700

Part b: 0.25 point

90,000 + 77,000 = 167,000

Part c: 0.5 point

Sample Answer 1

Reduces the insurer's reserve risk, because there is no IBNR to account for past the policy period for the C-M policy.

Sample Answer 2

Claims-made policies project less further into the future so are less affected by pattern changes so reduces reserve risk.

Sample Answer 3

Reserve risk goes down, as occurrence has report lag risk and development risk where C-M has only development risk.

Part d: 0.5 point

Sample Answer 1

Would need to increase underwriting profit for C-M policy because C-M policy earns less investment income than Occurrence policy (due to shorter period between premium received and losses paid).

Sample Answer 2

It could reduce the UW target profit since there will be less reserve/pricing risk.

EXAMINER'S REPORT

Part a

Candidates were expected to know what losses would be covered under an occurrence policy.

A common mistake was summing across the loss year instead of down the diagonal.

Part b

Candidates were expected to know what losses would be covered under a claims-made policy with a retroactive date.

A common mistake was missing the retroactive date and summing across all report lags for the loss year.

Part c
Candidates were expected to recognize the primary difference in reserving between claims-made and occurrence is in IBNR and tail length. Candidates needed to make a statement about the lack of IBNR or shortening of the tail as well as mention how this would affect reserve risk. Common mistakes included: • Forgetting to mention the effect to reserve risk • Speaking of loss reserve dollars instead of loss reserve risk
Part d
Candidates were expected to recognize that the shorter tail for claims-made would reduce investment income or would reduce risk, as well as how that would affect the target underwriting profit provision. Candidates needed to state both the direction that the target underwriting profit provision would move as well as a corresponding reason why. Common mistakes included: • Not recognizing that the target underwriting profit provision would move in an opposite direction of the investment income • Discussing actual profits rather than the target underwriting profit provision

QUESTION 4	
TOTAL POINT VALUE: 3.75	**LEARNING OBJECTIVE: A3**
SAMPLE ANSWERS	

Part a: 2.5 points
Frequency 2011 to 2012: 0.090/0.100 = 0.900 or -10.0% 2012 to 2013: 0.081/.090 = 0.900 or -10.0% 2013 to 2014: 0.082/.081 = 1.012 or +1.2% 2014 to 2015: 0.080/.082 = 0.976 or -2.4% Severity 2011 to 2012: 27,250/25,000 = 1.090 or +9.0% 2012 to 2013: 30,248/27,250 = 1.110 or +11.0% 2013 to 2014: 33,423/30,248 = 1.105 or +10.5% 2014 to 2015: 36,599/33,423 = 1.095 or +9.5% Frequency: Selected -0.6% using AYs 2013-2015 given change in frequency from AY 2013 and forward. Frequency seems stable in recent years so selected trend of 0%. Severity: Stable so select average of all years of +10.0%. Trend to average accident date of 10/1/2017 from 7/1/201x. 2013: 48,000 * (1.1*0.994)^(4.25 years) = 70,154 2014: 55,000 * (1.1*0.994)^(3.25 years) = 73,518 2015: 60,000 * (1.1*0.994)^(2.25 years) = 73,351 Calculate the average: $72,341

Part b: 0.5 point
Sample Answer 1 This can change the selected frequency trend because we may choose to exclude accident years 11 and 12 and have a frequency trend close to 1. It would bring trended ultimate losses higher by increasing the frequency trend. *Sample Answer 2* This would explain the drop in frequency we see in AY 2012. I might further adjust my frequency trend in part a (possible trend at 0). This would result in higher trended ultimate losses. *Sample Answer 3* This won't change my estimate as I used the most recent data after 2012 that takes this change into account already.

Part c: 0.75 point
Fewer high deductible policies mean that frequency will increase, since the high deductibles decrease frequency since there are some claims not reported below the high deductibles. Severity will decrease, as high–deductible policies tend to have higher severities since there are no small nuisance claims. If this is a trend that will continue in the future, severity trend should decrease, frequency trend should increase, and pure premium trend increase resulting in projected ultimate losses increase.

EXAMINER'S REPORT

Part a
Candidates were expected to demonstrate how to calculate frequency and severity trends. Additionally, candidates were expected to make reasonable selections for the purposes of projecting past losses to future experience periods, requiring candidates to be able to determine appropriate trending time periods, apply selected trends, and determine an appropriate selection of average ultimate loss. Common mistakes included: • Miscalculations in time periods • Lack of justification for trend selections • Not computing an average
Part b
Candidates were expected to know how a change in underwriting policy which lowers claim counts impacts the frequency trend and trended ultimate losses. To receive full credit, candidates were expected to address whether the frequency trend would increase, decrease, or stay the same based on the response to part a and how it would impact the trended ultimate loss. Common mistakes included: • Discussing the change as if it could happen and not relate it to subpart a) • Not addressing how it would impact the trended ultimate loss
Part c
Candidates were expected to know how a change in the mix of business to less high deductible policies impacts the frequency and severity trends and trended ultimate losses. A common mistake was not addressing how it would impact the trended ultimate loss

QUESTION 5	
TOTAL POINT VALUE: 2.25	**LEARNING OBJECTIVE: A3**
SAMPLE ANSWER	

Calculate or identify that there was no trend (or 0% trend) in frequency rate. Calculate the average direct loss severity for each year (total direct losses divided by claim count), calculate the severity trend, and select a trend rate:

AY	Frequency	Sev	Trend
2013	0.100	$100.00	
2014	0.100	$108.57	8.6%
2015	0.100	$120.91	11.4%

Selected Trend Rate: 10.0%

Identify the trend period: 7/1/xx – 1/1/2018

Apply the severity trend to the large losses, and calculate the losses excess of the current reinsurance:

AY	Loss		Trend Factor		Trended Ultimate	XS of current Reinsur
2013	18,400	x	1.1^4.5	=	28,254	18,254
2013	3,200	x	1.1^4.5	=	4,914	0
2014	5,700	x	1.1^3.5	=	7,957	0
2014	5,200	x	1.1^3.5	=	7,259	0
2015	9,500	x	1.1^2.5	=	12,056	2,056
2015	6,200	x	1.1^2.5	=	7,868	0

Apply the severity trend to the direct losses, and calculate the net losses by removing the trended excess of current reinsurance. And finally, divide by exposures to calculate the historical net pure premium and select a pure premium estimate.

AY	Direct Loss	Trend Factor	Trended Direct		XS of Curr Reins		Trended Net Loss		Exposure		Pure Premium
2013	185,000	x 1.1^4.5 =	284,079	-	18,254	=	265,824	/	1,850	=	143.69
2014	190,000	x 1.1^3.5 =	265,233	-	0	=	265,233	/	1,750	=	151.56
2015	199,500	x 1.1^2.5 =	253,177	-	2,056	=	251,121	/	1,650	=	152.19
							782,179		5,250		148.99

Selected Pure Premium: 148.99

EXAMINER'S REPORT
Candidates were expected to demonstrate their ability to calculate and select trend rates, and identify the trending period. Candidates were also expected to demonstrate their understanding of how to apply trend rates to large losses to calculate excess losses and how to use the correct method to calculate trended net losses. Finally, candidates were expected to calculate a pure premium to provide the answer requested in the question. Common mistakes included: • Removing the amount excess of current reinsurance (untrended) from the direct loss prior to calculating the average severity and then applying the selected trend to the "net" direct losses. This fails to recognize that losses close to but under the current reinsurance level may, after trend, result in excess losses • Using the gross average severity to calculate the trend rate, but netting out the excess prior to applying that trend • Aggregating the large losses and applying the $10M retention to the aggregate accident year losses rather than separately applying this limit to each of the large losses

QUESTION 6	
TOTAL POINT VALUE: 1.25	**LEARNING OBJECTIVE: A4**
SAMPLE ANSWERS	

Part a: 0.75 point

Sample Answers (need three distinct responses for full credit):

- Actuary's approach divides all expenses by earned premium which assumes that all expenses are incurred over duration of policy when in fact commissions/brokerage and other acquisition expenses tend to be incurred at policy inception
- Shouldn't use all variable expense assumption, since the premium is decreasing/not stable. Should split fixed expense and variable expense
- The book is shrinking, so using a total avg gives more weight to older years which is likely inappropriate as recent years are likely more reflective
- The actuary should calculate the expense ratios by year for each expense category (dividing by the appropriate written or earned premium), to see if any trends/patterns exist within each expense category that might influence the selected "best estimate" future expense ratio for that category
- The expense ratio for each year is slightly higher than the previous year. The actuary should consider expense trend may be higher than premium trend, and may need to adjust.

Part b: 0.5 point

Sample Answer 1

Use the exposure based approach, which divides total dollar amount of fixed expense by exposures, and then use % to premium for variable expenses. The benefit is the fixed expenses are the same, isn't affected by premium change. If use all variable expense approach, will overcharge when premium is above average, and undercharge when low premium

Sample Answer 2

Instead of the all-variable approach we could use the Premium-based approach
- It prevents us from over/under-estimating fixed expenses in situations where the avg prem is different from the initial by splitting var. & fixed components
- It allows us to apply a fixed expense trend if needed (if prem trend is different from fixed exp. Trend)

Sample Answer 3

Calculate expense loads for each year as:

$$\frac{\text{General Expense}}{\text{Earned Premium (EP)}} + \frac{\text{Other Acq} + \text{Comission} + \text{TLF}}{\text{WP}}$$

Actuary should then select a load given year ratios. This better matches expenses with premium based on how they are incurred.

Sample Answer 4
I would assume some expenses are fixed, find a fixed expense provision for each year, see if there is a trend, and then trend my fixed expense provision to 2016 levels as well as separating out true variable expenses and dividing by earned or written premium depending on expense type. Expenses are increasing relative to premium each year in this example, so my method will correctly estimate future expense while the actuary's approach will underestimate 2016 expenses.

Sample Answer 5
An alternative approach would be first determine the ratios of each expense component to its corresponding premium amount, e.g, general expense to earned premium, commissions/brokerage to written premium. Then, take an average of the ratios across the three years or judgmentally select a ratio for each expense component. This method would result in better estimation of the expenses for 2016 for each component, since it accounts for patterns in expense amounts and the relationship of each expense component to the premium amounts.

EXAMINER'S REPORT

Part a

Candidates were expected to know how expense types are typically incurred as well as the potential distortions caused by the All Variable Expense Method. To receive full credit, candidates were expected to include three valid reasons the actuary's expense ratio approach is not appropriate.

Common mistakes included:
- Suggesting that not trending or current rate leveling premium was a reason the actuary's approach is not appropriate. This response was only provided credit if accompanied by further explanation that this would be with regards to fixed expenses or that the expenses need to be trended as well. Otherwise, for expenses that are more fully variable in nature, trending/current rate leveling historical premiums alone would further distort the provision
- Suggesting that certain expenses should use countrywide data. The question explicitly states that the insurer operates in one state and therefore, countrywide data would not be available for use.
- Identifying improvements that were already contemplated in the actuary's approach (e.g. general expenses should be divided by earned premium)

Part b

Candidates were expected to demonstrate an understanding of expense ratio calculation methods, citing an appropriate advantage to justify their selection of an alternative method. To receive full credit, candidates were expected to include an applicable improvement (e.g., exposure/policy-based projection method, premium-based projection method, all variable expense method with modifications to the expense ratio denominators, etc.), and had to briefly explain its relevant benefit over the actuary's approach.

Common mistakes included:
- Alternative method provided was not an improvement over the actuary's method
- Not describing the benefit of the recommended approach

QUESTION 7	
TOTAL POINT VALUE: 1.75	**LEARNING OBJECTIVE: A4, A6**
SAMPLE ANSWERS	

Part a: 1.25 points

Company A: $500 = ((600+50)/2)/(1-V-Q_A)$ $0.65 = 1-V-Q_A$
Company B: $0.165 = ((600+50)/900)/(1-V-Q_B) -1$ $0.62 = 1-V-Q_B$
Since the variable expense ratios are the same, Q_B is 3% higher than Q_A

Part b: 0.5 point

Sample Answer 1
If 1 company has longer-tail business and expects more investment income to make up for lower UW profit.
A company may choose a lower UW provision if they want to grow their business quickly.

Sample Answer 2
One company may be underwriting higher risk insureds and thus justify a higher UW profit provision.

Sample Answer 3
One company may be reducing provision to gain market share.

Sample Answer 4
Companies may have different regulatory requirements that restrict allowable profit provisions used.

EXAMINER'S REPORT

Part a

Candidates were expected to setup the overall rate indication calculations for both companies and compare the profit provisions between the companies.

Common mistakes included:
- Calculating total projected profit rather than the profit provision
- Mishandling fixed expenses in the formulas
- Mishandling the indicated rate change for company B

Part b

Candidates were expected to identify reasons that would cause companies to target different profit provisions.

Common mistakes included:
- Identifying reasons that impact expected losses and expenses
- Identifying reasons that impact the rate implemented rather than the target profit provision

QUESTION: 8	
TOTAL POINT VALUE: 3.5	**LEARNING OBJECTIVES: A2, A3, A4, A5**
SAMPLE ANSWERS	

Sample Answer 1

Current Rate Level

5,536 =
5,000*1.075*1.03

Earned Exposures

CY	Earned Exposure	
2013	827.5	= 805 * 50% + 850 * 50%
2014	837.5	= 850 * 50% + 825 * 50%
2015	850.0	= 825 * 50% + 875 * 50%

On-leveled Earned Premium

CY	Earned Exposures	Current Rate Level	OL EP
2013	827.5	5,536	4,581,247
2014	837.5	5,536	4,636,609
2015	850.0	5,536	4,705,813
			13,923,669

Calculate Loss Development Factors

	12	24	36	
2013		1,100	1,150	
2014	940	2,210		<< Adjusted to exclude $2m Loss in 2014
2015	1,020			

	LDFs			CDFs
12 to 24	2.351		12 to Ult	2.458
24 to 36	1.045		24 to Ult	1.045

Trended Ultimate Loss

AY	Incurred (000s)	CDF	Loss Trend	Trend Period	Trended Ult Loss
2013	1,150	1.000	1.05	5.5	1,504
2014	2,210	1.045	1.05	4.5	2,878
2015	1,020	2.458	1.05	3.5	2,974
					7,355,635

Calculate Loss Ratio   52.8%   = 7,355,635 / 13,923,669

Indicated Rate Change   -12.7%   = 52.8% * (1 + .12 + .07) / (1 - .22 - .06) - 1

Sample Answer 2

Current Rate Level

5,536 = 5,000 * 1.075 * 1.03

Earned Exposures

CY	Earned Exposures	
2013	827.5	= 805 * 50% + 850 * 50%
2014	837.5	= 850 * 50% + 825 * 50%
2015	850.0	= 825 * 50% + 875 * 50%

Calculate Loss Development Factors

	12	24	36	
2013		1,100	1,150	
2014	940	2,210		<< Adjusted to exclude $2m Loss in 2014
2015	1,020			

	LDFs			CDFs
12 to 24	2.351		12 to Ult	2.458
24 to 36	1.045		24 to Ult	1.045

Trended Ultimate Loss & Pure Premium

AY	Incurred (000s)	CDF	Loss Trend	Trend Period	Trended Ult Loss	Earned Exposures	Pure Premium
2013	1,150	1.000	1.05	5.5	1,503,969	827.5	1,817
2014	2,210	1.045	1.05	4.5	2,877,725	837.5	3,436
2015	1,020	2.458	1.05	3.5	2,973,941	850.0	3,499
					7,355,635	2,515.0	2,925

Indicated Pure Premium 4,834 = 2,925 * (1 + .12 + .07) / (1 - .22 - .06)

Indicated Rate Change -12.7% = 4,834 / 5,536 - 1

EXAMINER'S REPORT

On-Leveled Premium Calculation

Candidates were expected to know how to calculate CY earned exposures from PY written exposures as well as calculate and apply the current rate level to calculate on-leveled EP.

Common mistakes included:
- Not on-leveling the premium at all
- Using written exposures instead of earned

Trended Ultimate Loss
Candidates were expected to be able to adjust a loss development triangle for an abnormal large loss and develop losses accordingly. Candidates were also expected to demonstrate the ability to trend losses.

Common mistakes included:
- Not adjusting the development triangle for the $2M loss
- Not excluding that loss from the 2014 incurred when calculating an ultimate
- Incorrect trend periods

Indicated Rate Change
Candidates were expected to calculate an indicated rate change contemplating LAE, variable expenses, and profit.

Common mistakes included:
- Multiplying the ALAE and ULAE loads together (1.12 * 1.07) instead of adding the loads together (1 + .12 + .07) before applying to the ultimate loss or loss ratio

QUESTION 9			
TOTAL POINT VALUE: 1		**LEARNING OBJECTIVE(S): A4, A5**	
SAMPLE ANSWERS			

Category	Total %	Fixed Expenses %	Variable Expenses %
General Expenses	225k/3750k=6%	3%	3%
Other Acquisition Expense	8%	4%	4%
Commission & Brokerage	12%		12%
Taxes, Licence & Fees	3%		3%
		7%	22%

$$\text{Indicated Rate change} = \frac{62\% + 7\%}{1 - 22\% - 5\%} - 1 = -5.48\%$$

EXAMINER'S REPORT

Candidates were expected to determine appropriate general expenses ratio using written premium, appropriately separate the expense ratios into fixed and variable components, and determine the indicated rate change.

Common mistakes included:
- Using earned premium instead of written premium to derive the General Expense ratio
- Missing negative sign in final answer

QUESTION 10	
TOTAL POINT VALUE: 1	**LEARNING OBJECTIVE(S): A2**
SAMPLE ANSWERS	

Sample Answer 1

Causality – the number of vehicles does not seem to have an intuitive relationship to homeowners' losses, so this criteria may be violated

Easy to verify – this would be easy to verify by checking vehicle records

Existing Law – there is no current law which prohibits the use of number of vehicles in the risk classification system

Objective – the number of vehicles is well defined and unambiguous.

Sample Answer 2

Credibility – Larger size categories (e.g., those with more than 5 vehicles) may lack enough volume to satisfy credibility concerns. Perhaps homes with more than 5 vehicles could be grouped together to determine loss costs for those homes associated with a large number of vehicles

Relation to Expected Losses – Having a larger number of vehicles doesn't necessarily correlate with higher homeowner losses

Industry Practices – number of vehicles is not a commonly used risk characteristic associated with homeowners' policies

Practical – this characteristic should be easy to collect and verify

EXAMINER'S REPORT

Candidates were expected to be knowledgeable of the characteristics of an exposure base/rating variable. The question was open-ended, asking the candidate to list any four of the considerations associated with a risk characteristic delineated in ASOP 12.

A common mistake was neglecting to 'briefly describe' each characteristic

QUESTION 11	
OTAL POINT VALUE: 3.25	LEARNING OBJECTIVE: A8
SAMPLE ANSWERS	

Part a: 1.25 points

Sample Answer 1

LAS(10K) = [200*5K+(100+10+10)*10K]/[200+100+10+10] = 6.875K

LAS(25K) = [200*5K+100*20K+(10+10)*25K]/[200+100+10+10] = 10.9375K

ILF(25K) = 10.9375/6.875 = 1.591

Sample Answer 2

Losses at Increased limits: 200*5000+100*20000+20*25000 = 3,500,000

Losses at basic limits = 200*5000+120*10000 = 2,200,000

ILF = 3,500,000/2,200,000 = 1.591

Sample Answer 3

LAS(10,000) = [5000*200 + (100+10+10)*10000]/320 = 6875

LAS(between 25,000, 10,000) = [10000*100+15000*10+15000*10]/[320] = 4062.5

ILF = [6875+4062.5]/6875 = 1.591

Part b: 1.5 points

Sample Answer 1

XS 50,000	Trended Claim Amount	New XS 50,000
0	5,500	0
0	22,000	0
50,000*(10)	110,000	60,000*(10)
350,000*(10)	440,000	390,000*(10)
4,000,000		4,500,000

Severity trend = 4,500,000/4,000,000 = 12.5%

Sample Answer 2

Current severity in excess of 50k

= [10*(100,000-50,000)+10*(400,000-50,000)]/20

= 200,000

Next year's excess severity (apply 1.1 trend)

= [10*(100,000*1.1-50,000)+10*(400,000*1.1*50,000)]/20

= 225,000

Excess Severity Trend = 225,000/200,000 = 1.125 (12.5% trend)

Part c: 0.5 point

Sample Answer 1

There are too few losses above $100,000 to be credible. One could use industry ILF factors instead.

Sample Answer 2

There is a small amount of claims that are large or equal to 100000, the calculated ILF would not be credible.

One can use the data for several similar business combined to calculate ILF(100000)

Sample Answer 3

Too few claims with sev at or above 100,000. Results could be volatile, so curve fitting might be better.

Sample Answer 4

The data would not be approp to det ILF for 100k as there are very few claims @ the 100k & even higher. One alt. source is competitor filings/rate pages approved.

EXAMINER'S REPORT

Candidates were expected to calculate an increased limits factor, excess trend, comment on credibility of excess data, and propose an alternative source for ILFs.

Part a

Candidates were expected to know how to calculate an increased limits factor. Since the data provided was ground up & uncapped and both layers had the same frequency, the candidate could calculate either limited average severities or total capped losses at both $25k and $10k.

Common mistakes included:
- Calculating the Limited Average Severity as the total capped loss instead of taking the average.
- Taking a straight average of the loss amounts instead of incorporating the claim count distribution.

Part b

Candidates were expected to apply the ground up trend factor to the ground up losses, then calculate either the average claim size or the total claim amount excess of $50k both before and after trend. The excess trend is the ratio of the two calculated values.

Common mistakes included:
- Simply adding the various losses excess of $50k rather than taking the average or total losses in the layer.
- Calculating the average claim size for the excess layer including all claim counts. The average excess severity includes only the 20 claims that reach the excess layer.

Part c
Candidates were expected to note the small amount of claims excess of $100k and comment on the lack of credibility in the data due to size. A number of alternative sources were accepted such as industry data (from rating bureaus such as NCCI or ISO, or from other external sources such as RAA), competitor's analysis, additional internal data either from another similar line of business or by incorporating more years, and fitting a loss distribution curve to the data and modeling output for higher layers. Common mistakes included: • Assuming that the decrease in claim counts at higher layers violates the assumption that frequency be the same for various layers in an ILF analysis. Fewer claims at higher amounts is not necessarily a decrease in frequency but rather a product of a loss distribution where larger claims are not as common.

QUESTION 12	
TOTAL POINT VALUE: 1	**LEARNING OBJECTIVE: A8**
SAMPLE ANSWERS	

Part a: 0.5 point

Sample Answer 1

Yes. It seems that all years exhibit similar downward slope for this rating factor. So it seems the rating variable has predictive power

Sample Answer 2

The 4 years all show a consistent indication, just as various levels. 2012 appears to have a larger changes to factor 1. The indication between rating factors is very small, the exposure for factor 1 is also very low. Even though somewhat consistent by AY, the lack of volume in factor 1 exposure and the minor change between variables, I would not include in plan.

Sample Answer 3

The variable should be included.
While the exposure for level 1 seems low, the loss cost estimates show a clear and significant differential, consistent from 2010-2013. Level 1 is significantly lower in loss cost compared to level 0.

Sample Answer 4

Even though there appears to be predictive value for this variable based on the decreasing trend for all AYs, there is not enough exposure in each group for this to be credible (only ~20 exposures total per AY). Do not include.

Part b: 0.5 point

Sample Answer 1
1) No need to on-level premiums, which can be difficult at the granular level
2) There is no standard probability distribution for loss ratios

Sample Answer 2
1) Experienced actuaries typically have preconceived ideas of what frequency of severity to expect; not the same can be said for loss ratios
2) There are no typical "go-to" models for loss ratios, unlike loss cost (Poisson frequency with Gamma severity)

Sample Answer 3
1) Loss ratios include a variety of extra pieces such as UW expenses and target UW profit that are prone to change and could impact the analysis
2) In addition, Loss Cost data is often available from industry resources such as NCCI, allowing to test across the market as a whole instead of a particular book

Sample Answer 4
1) Actuaries often have an a-priori expectation of frequency and severity trends but not necessarily loss ratio trends. So the actuary can check to see if the model results match this initial expectation with the loss cost data but not loss ratio data.
2) Loss cost data allows the actuary to gain insight into the claims process by separating out severity from frequency. This cannot necessarily be done with loss ratio data.
EXAMINER'S REPORT
Part a
Candidates were expected to recognize the consistent downward pattern across accident years between two levels in this consistency test of Rating Variable 1. Full credit was given to responses that identified this pattern which indicates potential predictive power, even if they would choose not to include it in a rating plan due to one or several confounding factors.   A common mistake was focusing on absolute values rather than relativities or trends
Part b

Candidates were expected to recall two reasons that Actuaries generally model loss costs instead of loss ratios in GLMs
 	
 Common mistakes included:
    •   Focusing on advantages of GLMs over univariate methods.
    •   Giving same reason twice

QUESTION 13	
TOTAL POINT VALUE: 3	**LEARNING OBJECTIVE: A8, A9**
SAMPLE ANSWERS	

Part a: 1.5 points

Sample Answer

Territory	Pure Premium	Credibility	Ind PP Rel	Norm Curr Terr Rel	Cred Wtd Rel	Cred Wtd Rel @ Base Terr
1	100	81.6%	1.235	1.108	1.212	1.226
2	80	100.0%	0.988	1.007	0.988	1.000
3	60	74.5%	0.741	0.856	0.770	0.780
Total	81			0.993		1.012

Calculations for Terr 1:

Pure Premium = Ult Inc Loss & ALAE/Exposures = 3,000,000/30,000 =100 (Total = 80.95)

Credibility = $(30,000/45,000)^{1/2}$ = .816

Ind PP Rel = 100/80.95 = 1.235

Norm Curr Rel = Curr Rel/Tot Avg Curr Rel = 1.1/.993 = 1.108

Cred Wtd Rel

 =Cred*Ind PP Rel + (1-Cred)*Norm Curr Rel=.816*1.235+(1-.816)*1.108=1.212

Cred Wtd Rel @ Base Terr = 1.212/.988 = 1.226

All Totals are exposure weighted

Part b: 0.75 point

Sample Answer 1

Territory	Ind Terr Rel Chg	Offset = 1/(1.013)	% Chg with Off-Balance
1	11.5%	0.987	10.0%
2	0.0%	0.987	-1.3%
3	-8.3%	0.987	-9.5%

Calculations for Terr 1:

Ind Terr Rel Chg

 = Cred Wtd Rel @Base Terr/Curr Rel -1 = 1.226/1.10 = +11.5%

Exp Wtd Total = (30,000 * 11.5% + 50,000 * 0% + 25,000 * -8.3%)/(105,000) = 1.3%

Offset = 1/(1+Exp Wtd Total) = 1/(1+.013) = .987

% Change with Off-Balance = (1 + Ind Terr Rel Chg)*Offset -1= (1.115*0.987)-1=10.0%

Sample Answer 2

Territory	Ind Terr Rel Chg	% Chg with Off-Balance
1	11.5%	9.4%
2	0.0%	-1.9%
3	-8.3%	-10.0%
Total	1.9%	0.0%

Calculations for Terr 1:
Ind Terr Rel Chg
   = Cred Wtd Rel @Base Terr/Curr Rel -1 = 1.226/1.10 = +11.5%
% Change with Off-Balance = (1 + Terr 1 Ind Terr Rel Chg)/(1 + Total Ind Terr Rel Chg) -1=
(1.115/1.019)-1=9.4%

Part c: 0.75 point

Sample Answers (needed three reasons for full credit)
- Regulation might restrict large rate increases or decreases
- Large premium swings might be avoided to avoid customers leaving
- Competitive concerns: the company may be worried that an increase in rates could reduce market share
- Insurer might look at the lifetime profitability of the business and realize losses are usually higher for new policies than for renewal policies and may choose a long-term pricing approach

- For volatiles lines of business where very large indications are expected due to the volatility and credibility of data, actuarial judgment may be used to propose a more reasonable change
- The insurer has decided to address the imbalance in rates by revising underwriting guidelines to restrict business from being written at inadequate rates
- Indicated rates may not be fully implemented due to system/operational constraints like a factor requiring new systems

Note that this list is not exhaustive, and other reasonable answers were accepted provided they were adequately supported.

EXAMINER'S REPORT

Part a

Candidates were expected to know how to calculate territorial relativities using the pure premium approach, including calculating partial credibility, the credibility-weighted indicated relativities, and normalizing the current and indicated relativities to the correct base.

Common mistakes included:
- Miscalculating the normalized current territorial relativities
- Credibility weighting the indicated pure premium relativities balanced to the base territory with the normalized current territorial relativities balanced to the average rating factor

Part b

Candidates were expected to be able to calculate the indicated factor change by territory, use the results to determine the base rate offset needed to achieve a revenue-neutral rate change, and calculate the final percentage change by territory.

Common mistakes included:
- Not calculating the offset, simply dividing the indicated territorial relativities from part a by the current territorial relativities
- Calculating the wrong offset by using either the current territorial relativities or the indicated territorial relativities, but not both, in the calculation
- Not converting the territorial impacts to a final percentage change

Part c

Candidates were expected to know why, generally, proposed changes might deviate from indicated changes.

A common mistake was explaining why actual performance could be different than indicated performance.

QUESTION 14	
TOTAL POINT VALUE: 1.25	**LEARNING OBJECTIVE: A10**
SAMPLE ANSWERS	

Part a: 0.25 point

400000/(0.9*500000) = 0.889
(1-0.889)*300000 = 33,300

Part b: 0.25 point

0.9*500000 = 450000
400000*(1-0.889) = 44,400

Part c: 0.25 point

a = min (F / (c * V), 1) = min (400,000/(425,000 * 0.9), 1) = 1

Part d: 0.5 point

Sample Answer 1
Insured's will not be fully insured for a loss
Expected losses are higher for underinsured policies when partial losses are possible

Sample Answer 2
Premium will not be equitable for underinsured vs. fully insured policies
Premium will not be adequate for underinsured policies

Sample Answer 3
Regulator might force an insurer to pay above the policy limit for underinsured policies in the event of a catastrophe
The insurance payment will not be sufficient to cover loss amounts that exceed the policy face value. Therefore, the insured will not be returned to the pre-loss condition.

EXAMINER'S REPORT

Candidates were expected to show an understanding of the problems associated with underinsurance, as well as performing co-insurance calculations.

Part a

Candidates were expected to know how to calculate a coinsurance penalty.

A common mistake was a calculation error.

Part b

Candidates were expected to know how to calculate a coinsurance penalty.

A common mistake was a calculation error.

Part c
Candidates were expected to know how to correctly calculate a coinsurance apportionment ratio. A common mistake was stating that there would be no insurance penalty, but not writing that the apportionment ratio = 1.
Part d
Candidates were expected to demonstrate an understanding of the issues associated with underinsurance. Common mistakes included: • Stating that premium would be inequitable but didn't specify that this meant underinsured properties with respect to fully insured properties • Stating "loss not covered for underinsured policies" vs. "loss not *fully* covered for underinsured policies" • "Insurer needs to be careful when inflation causes property value to increase" – this is an issue for both underinsured and fully insured properties, and was not awarded credit

QUESTION 15	
TOTAL POINT VALUE: 1.75	**LEARNING OBJECTIVE: A11**
SAMPLE ANSWERS	

Sample Answer 1

Ap = 5000 + 3000 + 5000 + 5000 = 18,000
Ae = 14,000 + 0 + 97,500 + 6000 = 117,500

Exp Loss = 2.4 (14,590,000/100) = 350,160
Ep = .19 (350,160) = 66,530.4
Ee = (1-.19) (350,160) = 283,629.6

Prem = 435,000 x 18,000 (.75) + 66530.4 (.25) + 117,500 (.15) + 283,629.6 (.85)
                                          350,160

          = 358,826.25

Sample Answer 2

w = .15 / .75 = .2

Ap = 5 + 3 + 5 + 5 = 18,000
Ae = 14 + 0 + 97.5 + 6 = 117,500

Ep = .19 (2.40) (14590000/100) = 66530.40
Ee = (1-.19) (2.40) (145900) = 283629.6

E = Ep + Ee = 350160

.75 = 350160 / (350160 + B) => B = 116720

Exp Mod: 18000 + .2(117500) + .8 (283629.6) + 116720
                              350160 + 116720

          = .825

policy prem: 435000 (.825) = 358,826

EXAMINER'S REPORT

The candidates were expected to be able to calculate:
- Primary (i.e. capped) and excess losses from individual claims and loss cap provided
- Expected losses using the provided payroll and loss rate, along with the primary and excess components using the provided D-ratio OR expected losses and expected excess losses along with the B & w factors used in the NCCI alternative formula
- The experience modification factor, using the components above along with the provided primary and excess credibility factors
- The final premium using the experience modification factor and the provided premium

In addition, candidates were expected to know that the experience rating modification calculation uses an experience period of 3 policy years.

Since the standard premium includes experience mod, any answer where the experience mod was calculated was given full credit. The vast majority of candidates calculated policy premium as standard premium * experience mod as per the sample solutions.

Common mistakes included:
- Assuming a one year experience period and dividing the payroll by 3 to determine the annual expected losses
- Reversing Ep and Ae in the experience modification formula
- Using the expected primary losses formula for the expected excess losses or the expected excess losses formula for the expected primary losses, e.g. calculating the expected excess losses as the expected loss multiplied by the D-ratio rather than 1 minus the D-ratio
- Calculating the final premium by multiplying the provided premium by 1 plus the experience modification factor or 1 minus the experience modification factor rather than simply the experience modification factor
- For candidates using the NCCI alternative formula, using either the primary or excess credibility factor for the weighting factor rather than the ratio of the credibility factors

QUESTION 16	
TOTAL POINT VALUE: 2.5	**LEARNING OBJECTIVE: B2, B4**
SAMPLE ANSWERS	

Part a: 0.75 point

Cumulative Paid Claim Triangle

Accident Year	12	24	36
2013	100	150	350
2014	150	350	
2015	50		

Part b: 0.75 point

Cumulative Reported Claim Triangle

Accident Year	12	24	36
2013	300	300	350
2014	450	500	
2015	100		

Part c: 0.5 point

Sample Answer 1

Paid-to-Reported Triangle

Accident Year	12	24	36
2013	0.333	0.5	1.0
2014	0.333	0.7	
2015	0.5		

The paid-to-reported triangle shows an increase in the paid-to-reported ratio in calendar year 2015 (latest diagonal) supporting the claims department statement that claims are being paid faster without changing case reserves.

Sample Answer 2

Paid Claims / Reported Triangle

Accident Year	12	24	36
2013	0.333	0.500	1.000
2014	0.333	0.700	
2015	0.500		

Increasing Paid Claims/Reported Claims ratio indicates that paid claims are increasing faster than reported claims; this is occurring from CY 2014 to CY 2015 as evidenced by the two arrows above at 12 months and 24 months. This indicates either that claims are settling faster or that average case per claim is decreasing. We are given in the problem that the claims department hasn't changed case reserve adequacy, so change must be due to quicker settlements.

Part d: 0.5 point
Sample Answer 1
I would recommend using the reported development technique as the payment pattern has changed so paid LDFs would not be accurate in predicting ultimate claims so the paid development technique is not accurate. The reported LDFs should still be accurate because it is not affected by payment patterns and case adequacy has not changed.   *Sample Answer 2*   Since the claims are settled faster, Berquist-Sherman paid method can be used to adjust the paid claim triangle to the level of the new settlement rate.
EXAMINER'S REPORT
Part a
Candidates were expected to build accident year paid claim triangles using transactional claim data.   A common mistake was calculating cumulative case reserves instead of cumulative paids.
Part b
Candidates were expected to build accident year reported claim triangles using transactional claim data.   A common mistake was not including all claims for a particular evaluation date.
Part c
Candidates were expected to create a paid/reported diagnostic triangle to demonstrate the claims department has been paying claims faster. Further, candidates were expected to comment on how the increased ratio of paid claims to reported claims in the latest diagonal demonstrates faster payments. Full credit was also given to candidates who created a reported/paid diagnostic triangle and commented on the decreasing ratio of reported claims to paid claims in the latest diagonal.   Common mistakes included: • Creating a diagnostic triangle other than a paid/reported (or reported/paid triangle) such as paid/case, average paid severity or average case outstanding   • Using paid LDFs as a diagnostic   • Neglecting to explain the ratio increase in the latest diagonal of the paid/reported triangle is a result of faster payments.

Part d

Candidates were expected to know how to adjust the data and estimation techniques when there is a change in the claims handling process. Candidates were expected to explicitly state a technique that was appropriate for the new claims handling process and give sufficient reasoning why the stated technique will accurately calculate ultimate claims.

For candidates to obtain full credit, they could have selected any technique relying on reported claims and mention that this technique is unaffected by the faster payments. Full Credit was awarded to candidates who selected the expected claims method, the reported B-F method or the Cape Cod method, as long as the candidate explained how these methods were not impacted by the change in settlement rates.

Full credit was also awarded to candidates who selected the Paid Berquist Sherman technique and mentioned this technique will restate or adjust the historical paid triangle for the recent change in settlement rates.

Common mistakes included:
- Insufficient reasoning given for the selected technique
- Incorrect technique given
- For candidates who selected the Paid Berquist Sherman technique, some neglected to discuss the fact that the historical paid triangle needs to be restated to account for the faster payment pattern.
- For candidates who selected a reported claims technique, some only mentioned the case adequacy has not changed. It was important to also state the fact that the reported claims technique is not impacted by changes in settlement rates.

QUESTION 17	
TOTAL POINT VALUE: 2	**LEARNING OBJECTIVE: B1**
SAMPLE ANSWERS	

Sample Answer 1
Actuary A Benefits: Combining [all lines of business] will give credibility if the mix of claims and product characteristics are relatively similar along with similar loss distribution and development patterns.

Actuary A Deficiencies: Different lines of business can have drastically different rates of settlement, different claim severity and frequency, etc. Combining them will distort estimates. Also, most estimation methods do not perform well where the mix of business is changing.

Actuary B Benefits: The benefit for Actuary B is that the industry data separated by lines of business will keep the data homogeneous in the treatment of claims, keeping long-tailed lines and short-tailed lines separate.

Actuary B Deficiencies: The deficiency for Actuary B is that the underwriting and claim reserve strategy may not be the same for the company and the industry which could cause inaccurate reserves.

Sample Answer 2
Actuary A Benefits: Actuary A's method will have the benefit that it incorporates company-specific operations such as settlement rates and case reserving practices. If all lines of business have similar development patterns and payout rates, this will allow the actuary to produce more credible factors.

Actuary A Deficiencies: This is a small company so aggregating all lines might still not be stable enough to produce an accurate result, and it's unlikely that all lines will be appropriate for each individual line since typically development patterns and experience differs by line.

Actuary B Benefits: Separating by line allows reserves to be set by line so that development factors should not be affected by changes in mix of business. Incorporating outside data allows for credibility weighting so the results aren't too volatile since the book is likely small.

Actuary B Deficiencies: Don't know coverage level, underwriting guidelines, development patterns & mix of business of the industry data.

Sample Answer 3
Actuary A Benefits: This could be reasonable if the sample size is small within each LOB. It would take into account your book mix and you would not have to worry about adjusting industry data to match your book.

Actuary A Deficiencies: Lines are not homogenous, ie, mix long-tail with short-tail lines may be inappropriate.

Actuary B Benefits: Have a lot of volume since using industry data too which increases credibility. Analyzing lines separately helps improve homogeneity.

Actuary B Deficiencies: The data could be insufficient to give credible volume. Also, the external data may be much different than the companies and will need to be adjusted.

EXAMINER'S REPORT

Candidates were expected to understand the role of homogeneity and credibility of data in the process of estimating unpaid claims. The candidates were expected to provide both a benefit and deficiency of the approach that Actuary A and B utilized.

Common mistakes included:
- Providing vague responses that did not address the methodology used by Actuary A and B. For example, some candidates did not reference the use of external data in coming up with a reserve estimate.
- Responses that were unclear in whether the benefit or deficiency applied to Actuary A or B.
- Providing a list of desirable qualities for a complement of credibility rather than addressing homogeneity and credibility considerations of the reserve analysis strategy.

QUESTION 18	
TOTAL POINT VALUE: 2.75	**LEARNING OBJECTIVE: B3, B5, B8**
SAMPLE ANSWERS	

Part a: 0.75 point

AY	Paid CDF	% Unpaid	ECR
12	1	0	NA
13	1.1	9.09%	0.561
14	1.5	33.30%	0.5595
15	(500+400)/400 = 2.25	1 - 1/2.25 = 55.5%	0.5598
		Avg =	0.5601

ECR = .56 is approximately equal for each AY. Selected avg and rounded to .01.

Part b: 0.5 point

Sample Answer 1
The implied 12-ultimate CDF from the paid development method is 900/400 = 2.25, which is somewhat high and could be leveraged to impact our ultimates and unpaid. Furthermore, the paid BF method consistently produces higher estimates than the paid development method despite no change in premiums, thus I assume there was a decrease in the settlement rate. The BF method won't react to this as much so I will select its AY 2015 unpaid amount, $622,000.

Sample Answer 2

AY	BF Implied LR	Paid Dev Implied LR
	1450/2000 =	1450/2000 =
2012	.725	.725
2013	0.551	0.55
2014	0.5365	0.525
2015	0.511	0.45

Both methods show that the loss ratio is declining. Since the BF method is not fully responsive to the changes, the paid development method is preferred. Selection for AY 2015 unpaid claims estimate = $500,000.

Part c: 1.5 points

Subpart (i)
Unpaid claims would be correct; emergence is low because of slower payments, but we still expect the same ultimate. E(claims) ultimate is unresponsive to emergence.

Subpart (ii)
Sample Answer 1
The paid BF technique will underestimate unpaid claims as the % unpaid will be too high (development factors too low). The BF will underestimate less than paid development as the unpaid amounts are determined by an a priori claims ratio and % unpaid.

Sample Answer 2
The paid BF method would be understated, but to a lesser extent than the paid development technique, because it is a credibility weighted average of the expected claims technique and the paid development technique.

Subpart (iii)
Paid development technique will apply historical LDF that assumed a faster payment to a lower amount paid, which will understate unpaid claims.

EXAMINER'S REPORT

Part a

Candidates were expected to use their knowledge of the development and BF technique to back into the ECR used in the expected claims method.

Common mistakes included:
- Using BF unpaid to infer the claim development factor instead of the development method.
- Using the paid development unpaid when setting up the BF formula
- Setting unpaid equal to paid + OLEP*EP*%unpaid, which is the formula for the ultimate.
- Dividing the ultimate claims by the OLEP and inferring the ECR from that

Part b

Candidates were expected to choose one of two provided unpaid claim estimates and use their knowledge of either the paid development method or the BF method to justify their selection. Averages (such as a simple, weighted, or Benktander) were accepted for full credit.

Common mistakes included:
- Selecting the BF unpaid claim estimate and explaining that it is more stable without explaining why it provides stability.
- Selecting the ultimate loss instead of an unpaid claims choice.
- Observing that decreasing paids down the column represent a slowdown in claims when actually these are claim payments at y/e 2015 and thus reflect paids in different stages of development.
-

Part c

Subpart (i)
Candidates were expected to know that the unpaid claims estimate for the EC method is EP * ECR - Paid. The first term remains unchanged with the slowdown in payments but the paid decreases. Therefore the unpaid claims estimate will respond to the increase and will neither be over or understated.

Common mistakes included:
- Describing that the ultimate claim estimate remains unchanged without discussing how the paid responds.
- Asserting that the ECR is incorrect because it might be based on data influenced by the slowdown.
- Properly identifying that the paid claims decreases but instead stating that the unpaid claims estimate is over or understated.
- Phrasing the answer in terms of ultimates and not unpaids (though if candidates didn't specify either ultimate or unpaid we gave them the benefit of the doubt)

- Simply stating the position without any kind of discussion

Subpart (ii)
Candidates were expected to know either that the paid BF technique is a credibility weighted average between the paid DM and the ECM technique or that the BF unpaid estimate = EP * ECR * % unpaid and that the % unpaid is lower because the historical development factors used in the paid DM are too low. Candidates did not lose credit for deviating from the language used in the question so long as it was clear that the correct direction was intended.

Common mistakes included:
- Discussing that a method understates "but not as much as the paid DM".
- Discussing only that the ultimates are under/overstated with discussing how the unpaids will be as well
- Phrasing the answer in terms of ultimates and not unpaids (though if candidates didn't specify either ultimate or unpaid we gave them the benefit of the doubt)
- Simply stating the position without any kind of discussion

Subpart (iii)
Candidates were expected to know that the historical claim development factors are too low to be used in the current environment where payments are developing at a slower rate. Candidates were also expected to know that the unpaid claims estimate will be lower because the payments made to date are also lower.

Common mistakes included:
- Using knowledge that the paid BF is understated but the paid DM will understate more.
- Confusing the direction of the claim development factors due to the slowdown
- Phrasing the answer in terms of ultimates and not unpaids (though if candidates didn't specify either ultimate or unpaid we gave them the benefit of the doubt)
- Simply stating the position without any kind of discussion

QUESTION 19	
TOTAL POINT VALUE: 2.25	**LEARNING OBJECTIVE: B3, B8**
SAMPLE ANSWERS	

Part a: 0.75 point

Sample Answer 1

Case Development Factor = [paid CDF * (reported CDF – 1)]/[paid CDF – reported CDF] +1

= [1.1 * (1.015-1.1)]/(1.1-1.015) = 1.194

Unpaid Claims = Factor * case outstanding

=1.194 * 500,000 = 597,059

Sample Answer 2

	(1)	(2)	(1) X (2) = (3)
AY	Case Outstanding	Factor	Unpaid
2011	500,000	1 – 1/1.1	597,059
		1/1.015 – 1/1.1	

Part b: 1 point

Reported Age-to-Age

AY	12-24	24-36	36-48
12	1.5	1.25	1.1
13	1.5	1.25	
14	1.5		
Selected	1.5	1.25	1.1
Industry	1.25	1.15	1.05

The reported claims are developing much faster than the industry benchmarks.

Paid Age-to-Age

AY	12-24	24-36	36-48
12	2.5	1.5	1.25
13	2.5	1.5	
14	2.5		
Selected	2.5	1.5	1.25
Industry	2.5	1.5	1.25

The paid development/settlement pattern is in line with the industry.

The industry reported development CDF's should not be used for this company. The industry paid CDF's are appropriate to be used for this company. Overall, there is a difference in case reserve philosophy for this company versus industry.

Part c: 0.5 point

The response in a) is not reasonable given that the reported LDF for the industry are not representative for the company. Likely this LDF is too low, meaning the estimate in a) was too low (understated).

EXAMINER'S REPORT
Part a
Candidates were expected to calculate unpaid claims for AY 2011 using the case outstanding technique.

Common mistakes included:
- Not using the correct formula for case outstanding factor.
- Using a 12-ult CDF instead of 60-ult CDF.
- Not including the case outstanding amount for AY 2011 in the final answer. |
| **Part b** |
| Candidates were expected to calculate development factors for the company using the given historical company data and then compare the calculated company factors to given industry benchmark factors. Candidates were then expected to assess the reasonableness of using the industry factors for the company based on the comparison to the calculated company factors.

Common mistakes included:
- Not stating whether or not the given paid and reported industry factors were reasonable based on the comparison to the calculated company factors. |
| **Part c** |
| Candidates were expected to indicate that the estimate in a) would be understated and therefore unreasonable.

Common mistakes included:
- Candidates stated that the response in a) was inaccurate but did not state that the result in a) was understated.
- Indicating that the response in a) was overstated. |

QUESTION 20	
TOTAL POINT VALUE: 1.5	**LEARNING OBJECTIVE: B4**
SAMPLE ANSWERS	

Part a: 0.5 point

Sample Answer 1
A disposal rate analysis uses only paid claims and will not be affected by the change in case reserves.

Sample Answer 2
Frequency severity is good for long tailed lines of business because it does not leverage underdeveloped data like the development method.

Sample Answer 3
Claim inflation can be directly addressed through a severity trend.

Part b: 0.5 point

Sample Answer 1
Frequency development is distorted by the recent change in claims processing and increase of statute of limitations. Historical frequency data may not be predictive of future frequency.

Sample Answer 2
Partial payments invalidate the assumption for freq/sev technique in that there are no partial payments and all claims are paid at close.

Sample Answer 3
The change in claim definition is problematic with the statute of limitations change. Frequency and severity techniques require a consistent definition of claim counts.

Sample Answer 4
Frequency severity method heavily depends on severity trend. Significant inflation makes it difficult to select the most accurate severity trend.

Sample Answer 5
Disposal rate technique relies on stable disposal rates over time (stable settlement) which will not be the case due to the statute of limitations extension.

Part c: 0.5 point

Sample Answer 1
Use Berquist-Sherman method to restate data based on changes to claim settlement rates and then apply the frequency severity disposal rates technique.

Sample Answer 2
Partial paid claims can be excluded from severity and then reapplied to the period in which the corresponding claim closes.

Sample Answer 3
Use judgment/external information to select disposal rates to deal with statute of limitations change.

Sample Answer 4
Use industry data as a complement of credibility to more effectively select a severity trend rate.

Sample Answer 5
You could do a study of how development has changed, and restate historic development to match the new pattern.

EXAMINER'S REPORT

Part a

Candidates were expected to understand the third frequency severity method using disposal rates and understand what factors in the problem are appropriate for the method

A common mistake was listing bullet points from the problem but did not briefly describe why the method was appropriate for that issue.

Part b

Candidates were expected to understand the third frequency severity method using disposal rates and understand what factors in the problem are inappropriate for the method.

Common mistakes included:
- Candidates listed bullet points from the problem but did not briefly describe why the method was inappropriate for that issue.
- Some candidates referenced the strengthening of case reserves as a problem

Part c

Candidates are expected to understand the third frequency severity method using disposal rates and understand adjustments can be made to the items listed in part b) to allow the method to be used.

Common mistakes included:
- Candidates did not find a reasonable adjustment to the problems identified in part b)
- Some candidates referenced using Berquist-Sherman for case reserve levels rather than claims settlement rates

QUESTION 21	
TOTAL POINT VALUE: 2	**LEARNING OBJECTIVE: B3, B5**
SAMPLE ANSWERS	

Part a: 0.75 point

2015 % Unreported = (1332 - 604) / 1332 = 0.5465

2015 IBNR = 0.5465 × 0.6 × 2100 = 688.65

Part b: 0.75 point

AY	Claims Ratio
2012	0.558
2013	0.5891
2014	0.6227
2015	0.6343

The claims ratio appears to be steadily increasing and a 60% selection is understated for both 2014 and 2015. I do not think it is a reasonable selection since the BF technique assumes the claims ratio is constant.

Part c: 0.5 point

Sample Answer 1
The Cape Cod technique will use a claims ratio that is calculated from experience data. It will be more responsive to the deteriorating claims ratio.

Sample Answer 2
Since the ECR looks to be deteriorating, the BF method would not be responsive enough. I would recommend the reported development method since it will accurately respond to changes in the ECR

EXAMINER'S REPORT

Part a

Candidates were expected to calculate IBNR by calculating a percent unreported by constructing development patterns and then multiplying the given expected claims ratio by the premium.

Common mistakes included:
- Simply subtracting the 2015 reported development technique ultimate by the reported, in effect, the reported development IBNR
- Subtracting the expected claims from 2015 (OLEP multiplied by the ECR) and then subtracting the reported, in effect, the expected claims IBNR
- Multiplying by the percent reported, not the percent unreported
- Confusing the BF Ultimate with the IBNR

Part b
Candidates were expected to list out the claims ratios for the 4 accident years, note an upward trend, and opine that the upward trend in claim ratio invalidated the 60% ECR. Common mistakes included: • Excessive hedging or second-guessing as to the opinion, or not stating a clear answer • Some candidates stated, without support, that the increasing claims ratio was random fluctuation • Neglecting to state any opinion • Neglecting to note trend

Part c
Candidates were expected to argue for either the Cape Cod method or the Reported Development method (the Paid Development method was also accepted). Candidates were expected to provide justification including, but not limited to: • The selected method is more responsive to the updated data • The BF method uses an early initial estimate which doesn't use updated data, unlike the selected method • The selected method can incorporate the higher loss ratios Partial credit was awarded when an appropriate technique was listed, although not supported with a valid justification. Common mistakes included: • Discussing an irrelevant method or a method which does not directly address the issue of increasing claims ratios. • The Berquist-Sherman method, while an extension of the Reported Development method, was not awarded credit. Berquist-Sherman accounts for changes/trends in settlement patterns while this question deals with trends in loss ratios.

QUESTION 22	
TOTAL POINT VALUE: 3	**LEARNING OBJECTIVE: B3, B5**
SAMPLE ANSWERS	
Part a: 0.5 point	

Sample Answer 1

Paid to Rpt Triangle

AY	12	24	36	48
12	0.70	0.903	0.981	0.982
13	0.88	0.968	0.979	
14	0.951	0.971		
15	0.95			

Increase in CY 14 & 15 closed claims (last 2 diagonals). This matches company's effort.

Sample Answer 2

Closed/Reported

	12	24	36	48
12	.725	.896	.931	.97
13	.8125	.979	.987	
14	.97	.942		
15	.954			

Closed to Reported Ratio is increasing clearly showing an increase in the claims closing rate.

Sample Answer 3

Reported CC Age-Age

AY	12-24	24-36	36-48	Tail		AY	Rept. CC Ults
12	1.117	1.075	1.014			12	752
13	1.117	1.049				13	783
14	1.113					14	765
Avg.	1.116	1.062	1.014	1.03		15	650(1.238)=805
CDF	1.238	1.109	1.044	1.03			

Disp. Rates = closed counts/ult. cc

AY	12	24	36	48
12	.578	.798	.891	.938
13	.664	.894	.945	
14	.784	.850		
15	.770			

There is enough evidence to support that claims are closing more quickly starting 2014. Starting in 2014 and 2015, the disp. rates are much higher than the CY 2012 and 2013 disp. rates.

Part b: 2.5 points

Sample Answer 1

Since the rate of payment is increasing, I will use reported data to mitigate the effect of this change.

Reported counts

AY	12-24	24-36	36-48	48-Ult
2012	1.117	1.075	1.014	
2013	1.117	1.045		
2014	1.113			
Selected	1.116	1.062	1.014	1.03

All-year average used since factors are similar.

Reported Severity

AY	12	24	36	48
2012	0.933	1.075	1.083	1.082
2013	0.906	1.007	1.013	
2014	1.081	1.232		
2015	1.169			

Reported Severity Age-Age

AY	12-24	24-36	36-48	48-Ult.
2012	1.152	1.007	0.999	
2013	1.111	1.006		
2014	1.140			
Selected	1.139	1.007	0.999	1.02

All-year average used since factors are similar

AY 2014 Ult. Count = 690*1.067*1.014*1.03
          = 765
     Ult, Sev. = 1.232*1.007*.999*1.02
          = 1.264
   Ult. Claims = 967,000

AY 2015 Ult. Count = 650*1.116*1.062*1.014*1.03
          = 805
     Ult, Sev. = 1.169*1.134*1.007*.999*1.02
          = 1.36
   Ult. Claims = 1,095,000

Sample Answer 2

Since there is a change in settlement pattern, use reported claims data to avoid distortion.
Use weighted average to calculate A-A factor

Reported claim counts

	12-24	24-36	36-48	48-Ult.
A-A	1.116	1.061	1.014	1.03
A-U	1.237	1.108	1.014	1.03

AY 2014 690*1.108 = 765
  2015 650*1.237 = 804

Reported Severity

AY	12	24	36	48
12	933	1075	1083	1082
13	906	1007	1013	
14	1081	1232		
15	1169			

	12-24	24-36	36-48	48-Ult
A-A	1.1349	1.0067	0.999	1.02
A-U	1.1642	1.0258		

AY 2014 Ult claims : 765*1232*1.0258 = 966,796
  2015 Ult claims : 804*1169*1.1642 = 1,094,203

EXAMINER'S REPORT

Part a

Candidates were expected to use the available data to create one of three triangles that can provide evidence of increased claim closure rates and accurately interpret the triangle created in reference to the question posed. Candidates were then expected to provide data, point out the relevant trend in the data, and state that this trend does indicate a speed up in claim closure rates. Finally, candidates were expected to give accurate descriptions of an increasing trend in claim closure rates or a large increase in calendar year 2014.

Common mistakes included:
- Using paid claim count Age-to-Age factor triangles to show an increase in claim closure rate when that data only shows a slowdown in claim closure rates for periods after 12 months.
- Misinterpreting AY 2014 12-24 month data as CY 2014. Many candidates cited the decrease in the paid to reported ratios at 24 months from AY 2013 to AY 2014 as evidence that no speed up occurred, when the increase in the ratio at 24 months from AY 2012 to AY 2013 is the relevant comparison from that column.

Part b
Candidates were expected to recognize that the change in claim closure rate requires the use of reported rather than paid/closed data in the frequency-severity estimate. Candidates were then expected to use separate frequency and severity triangles to develop LDFs, CDFs, and estimates for ultimate claim count and severity, then finally combine the ultimate frequency and severity to produce an estimate of ultimate claims. Common mistakes included: • Using paid severity and/or closed claim counts to estimate ultimate severity and claim counts. This is not appropriate where claim closure rates are changing. • Using a disposal rate method that involved calculating incremental severity. This approach assumes no partial payments in the paid claims data.

QUESTION 23	
TOTAL POINT VALUE: 2.75	LEARNING OBJECTIVE: B3, B5, A2
SAMPLE ANSWERS	

Sample Answer 1

Berquist-Sherman adjustment for change in case adequacy

Average Case Outstanding
Case Outstanding / Open Claim Count

AY	12	24	36	48
2012				21.38
2013			25.47	
2014		28.94		
2015	23.07			

Adjusted Average Case Outstanding
Detrend latest diagonal using 10% trend

AY	12	24	36	48
2012	17.34	23.92	23.16	21.38
2013	19.07	26.31	25.47	
2014	20.98	28.94		
2015	23.07			

Adjusted Reported Claims
Adjusted Average Case Outstanding * Open Claim Count + Paid Claims

AY	12	24	36	48
2012	7,806	13,220	15,000	15,147
2013	7,753	13,091	15,120	
2014	7,975	14,100		
2015	9,750			

Loss Development

AY	12-24	24-36	36-48	Tail
2012	1.694	1.135	1.010	
2013	1.688	1.155		
2014	1.768			Tail
Str Avg	1.717	1.145	1.010	1.000
CDF	1.985	1.156	1.010	

<u>Earned Premium</u>

<u>1/1/2015</u>
UEPR = (0.5) * (34,500) = 17,250

<u>1/1/2016</u>
UEPR = (0.5) * (37,500) = 18,750

CY Earned Premium = CY Written Premium - Change in Unearned Premium Reserve

CY 2015 EP = 37,500 - (18,750 - 17,250) = 36,000

<u>BF Projected Ultimate</u>

BF Ultimate = (CL Proj Ult)*(% Rept) + (ELR Proj Ult)*(% Unrept)

% Rept = 1.0 / 1.985 = .504
% Unrept = 1.0 - .504 = .496
CL Proj Ult = (3,520 + 6,230) * (1.985) = 19,354
ELR Proj Ult = (.65)*(36,000) = 23,400

BF Ultimate = (19,354)*(.504) + (23,400)*(1.0 - .504)
BF Ultimate = 21,361

<u>Unpaid</u>

Unpaid = Ultimate - Paid = 21,362 - 3,520 = 17,841

<u>Sample Answer 2</u>

Berquist-Sherman adjustment for change in case adequacy

<u>Average Case Outstanding</u>
Case Outstanding / Open Claim Count

AY	12	24	36	48
2012				21.38
2013			25.47	
2014		28.94		
2015	23.07			

<u>Adjusted Average Case Outstanding</u>
Detrend latest diagonal using 10% trend

AY	12	24	36	48
2012	17.34	23.92	23.16	21.38
2013	19.07	26.31	25.47	
2014	20.98	28.94		
2015	23.07			

<u>Adjusted Reported Claims</u>
Adjusted Average Case Outstanding * Open Claim Count + Paid Claims

AY	12	24	36	48
2012	7,806	13,220	15,000	15,147
2013	7,753	13,091	15,120	
2014	7,975	14,100		
2015	9,750			

<u>Loss Development</u>

AY	12-24	24-36	36-48	
Vol Wgt	1.717	1.145	1.010	1.000
CDF	1.985	1.156	1.010	

<u>Earned Premium</u>
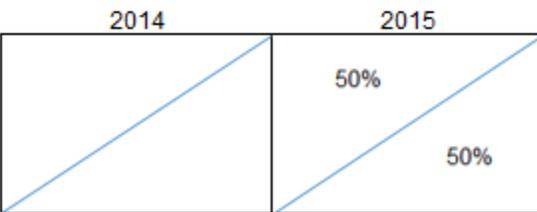
2015 EP = (0.5)*(34,500) + (0.5)*(37,500) = 36,000

<u>BF Projected IBNR</u>

BF IBNR = Expected Unreported = (ELR)*(EP)*(% Unrept)

BF IBNR = (.65)*(36,000)(1.0 - (1.0 / 1.985))
BF IBNR = 11,612

<u>Unpaid</u>

Unpaid = IBNR + Case Outstanding = 11,612 + 6,230 = 17,842

EXAMINER'S REPORT

Candidates were expected to calculate unpaid claims for accident year 2015 using the reported Bornhuetter-Ferguson technique adjusting for the change in case reserve adequacy. Since the question stated to adjust for the change case reserve adequacy, candidates were expected to recognize the need for a Berquist-Sherman adjustment. This would result in a more appropriate development pattern than that given by the standard reported development (Chain Ladder) technique being performed on a triangle with no adjustments.
 	
Common mistakes included
    • Detrending case outstanding instead of average case outstanding
    • Using CY 2015 WP in the BF calculation instead of deriving CY 2015 EP
    • Using the reported development ultimate in calculation of unpaid claims instead of the reported BF ultimate
    • Calculating the BF expected unreported amount (i.e. IBNR) as a final answer, neglecting to add the accident year 2015 case outstanding.

QUESTION 24	
TOTAL POINT VALUE: 2.5	**LEARNING OBJECTIVE: B6**
SAMPLE ANSWERS	

Part a: 0.75 point

<u>S&S - Age-to-Age Factors</u>

Accident Year	<u>12-24</u>	<u>24-36</u>
2011	4.500	1.111
2012	2.500	1.750
2013	3.733	
Selected AtA	3.578	1.431
AtU	5.118	1.431

2014 Ult S&S :   5 x 3.578 x 1.431 = $25.59

Part b: 1.25 points

Sample Answer 1

<u>Ratio of S+S to Paid Claims</u>

Accident Year	<u>12</u>	<u>24</u>	<u>36</u>
2011	0.100	0.161	0.175
2012	0.107	0.160	0.175
2013	0.100	0.160	
2014	0.100		

<u>Ratio Development</u>

Accident Year	<u>12-24</u>	<u>24-36</u>
2011	1.607	1.092
2012	1.500	1.094
2013	1.600	
2014		
Selected AtA	1.569	1.093
AtU	1.714	1.093

Ultimate
Ratio: 0.100 x 1.714 = 0.1714

2014 Ult S&S
:   150 x 0.1714 = $25.72

Sample Answer 2

Ratio of S+S to Paid Claims

Accident Year	12	24	36
2011	0.100	0.161	0.175
2012	0.107	0.160	0.175
2013	0.100	0.160	
2014	0.100		

Additive Ratio

Accident Year	12-24	24-36
2011	0.061	0.015
2012	0.053	0.015
2013	0.060	
2014		
Selected AtA	0.058	0.015
AtU	0.073	0.015

Ultimate
Ratio: 0.100 + 0.73 = 0.173

2014 Ult S&S
:   150 x 0.173= $25.93

Part c: 0.5 point

Sample Answer 1

I recommend applying a selected S/S ratio of 0.1 with the S/S ratio CDF to get au ultimate of 175(0.1)(1.1714) = $30 . The direct S/S development technique would be highly leveraged and would overstate the estimate of S/S. The ratio approach is more stable and would produce a more reasonable estimate.

Sample Answer 2

Ultimate S/S = 175 x 0.175 = 30.63

I choose the ratio approach since the development factors in a) are very volatile. The selected ratio of 0.175 is consistent with ratios from prior years. This is more stable and reliable than applying the S/S development factor.

Sample Answer 3

AY 2015 is an immature year and the development factors based on the development technique are highly leveraged. Thus to produce a more stable estimate, I'd recommend the ratio approach.

2015 Ultimate S/S = (0.1 x 1.569 x 1.093) x 175 = 30.01

EXAMINER'S REPORT
Part a
Candidates were expected to calculate the ultimate salvage and subrogation using the development technique given paid claims and received salvage and subrogation triangles. A common mistake was not calculating the development triangle.
Part b
Candidates were expected to calculate the ultimate salvage and subrogation using the ratio approach. Candidates were expected to calculate the Salvage+Subrogation-to-paid claims triangle, calculate the development triangle of the ratios, and apply the selected CDF to the undeveloped ratio to calculate ultimate salvage and subrogation. Common mistakes included: • Selecting directly an ultimate ratio instead of calculating development factors and applying the CDF. • Selecting development factors based on a single pair of ratios instead of using the whole triangle. • Incorrectly calculating the CDF or the ultimate Salvage+Subrogation ratio or dollar amount.
Part c
Candidates were expected to recognize that the development factors in part a) were highly leveraged and would result in a more volatile answer whereas the ratio approach provided stability. Candidates were expected to recommend the ratio approach and point out the stability of the ratio method over the highly leverage development method. Common mistakes included: • Recommending an ultimate using the development technique • Using undeveloped Salvage+Subrogation to ultimate claims ratio • Not adequately justifying the recommendation of the ratio approach

QUESTION 25	
TOTAL POINT VALUE: 1.75	**LEARNING OBJECTIVE: B3, B7**
SAMPLE ANSWERS	

Part a: 0.75 point

<u>Reported Indemnity Claims - Age-to-Age</u>
<div align="center">Factors</div>

Accident Year	<u>12-24</u>	<u>24-36</u>	<u>36-Ult</u>
2013	1.500	1.167	
2014	1.500		
2015			
Selected AtA	1.500	1.167	1.143
AtU	2.000	1.334	1.143

<u>Ultimate Indemnity Claims</u>

Accident Year	
2013	12,000
2014	15,000
2015	18,000

Part b: 0.5 point

Sample Answer 1
The development patterns appear noticeably different, and the ratio of ALAE to indemnity appears to be strengthening (or consistent after 24 Mos), Ideally, indemnity and ALAE would be estimated separately in this situation (or combine if consistent after 24 Mos).

Sample Answer 2
The ALAE dollars are fairly small compared to indemnity. A separate ALAE analysis may be unstable or not provide enough credibility, so combining the two may help dodge those issues.

Sample Answer 3
Upon reviewing the Age-to-age factors of the combined triangles it appears that the pattern is stable, combining the two may be appropriate.

Sample Answer 4
Reported ALAE is very small and volatile. Combining it with claims would enhance the credibility of the ALAE development without greatly distorting the reported claims development. I find this to be a reasonable approach given the wild LDFs you would get from developing ALAE separately.

Sample Answer 5

ALAE Age-to-Age Factor

Accident Year	12-24	24-36	36-Ult
2013	6.000	1.750	
2014	3.750		
2015			

Based on the age-to-age factors, it seems that ALAE is being reported a lot slower than claims only. Given the difference in the age-to-age factors, I don't think it is reasonable to combine the two to estimate unpaid liabilities.

Part c: 0.5 point

Sample Answer 1

The ratio of ALAE to indemnity appears to be increasing at 12 months, but not at 24 months in the available data. This suggests the claims department may be recognizing future ALAE spend faster than in prior years, and this change distorts the development technique.

Sample Answer 2

Age-to-age factors appear leveraged at early maturities. This makes selection of appropriate age-to-age factors difficult, so the development technique may not provide a reliable estimate.

Sample Answer 3

A development technique applied to reported ALAE or a ratio of ALAE to Loss, may be appropriate. However, the 12-24 development factor pick will be difficult and may require additional information.

Sample Answer 4

ALAE Age-to-Age Factor

Accident Year	12-24	24-36	36-Ult
2013	6.000	1.750	
2014	3.750		
2015			

The LDFs for ALAE alone are highly leveraged so I would not recommend. Instead, the ratio approach seems to be more appropriate. Assumptions also needs to be made about the ALAE tail.

Sample Answer 5

The age-to-age factors are very volatile due to the small ALAE amounts. Volatile LDFs may produce erratic results; I do not recommend using the development technique directly on ALAE.

EXAM 5 FALL 2016 SAMPLE ANSWERS AND EXAMINER'S REPORT

EXAMINER'S REPORT
Part a
Candidates were expected to calculate age-to-age factors using the reported claim triangle given, select age-to-ultimate factors and appropriately apply the LDFs to each accident year. Common mistakes included: • Candidates added reported claims & ALAE triangles and calculated ultimate losses with combined LDFs. • Candidates neglected to calculate ultimate losses for ALL accident years.
Part b
Candidates were expected to evaluate the appropriateness of developing reported claims and reported ALAE together by comparing the LDFs of ALAE to claims, consistency of ALAE to claim ratios, and/or the amount of ALAE relative to claims. Answers of combining or separating claims & ALAE were both accepted as long as the candidate could give an actuarially sound argument using the information given. Common mistakes included: • Candidates did not draw a conclusion at the end. • Candidates argued that ULAE information is needed to evaluate unpaid liabilities.
Part c
Candidates were expected to evaluate if development method/chain ladder method is appropriate to develop reported ALAE, using the data given. A common mistake was interpreting the question incorrectly and repeated their answer to part b.

QUESTION 26	
TOTAL POINT VALUE: 2.25	**LEARNING OBJECTIVE: B7**
SAMPLE ANSWERS	

Part a: 0.75 point

Sample Answer 1

Calendar Year	Paid Claims	Paid ULAE	ULAE Ratio
2012	990,000	100,000	0.101
2013	1,010,000	110,000	0.109
2014	1,030,000	121,000	0.117
2015	1,051,000	133,100	0.127

Since ratio increases each year, pic, most recent ratio of 0.127

Unpd ULAE = 0.127*(50,000+180,000*.5)=17,780

Sample Answer 2

Calendar Year	Paid Claims	Paid ULAE	ULAE Ratio
2012	990,000	100,000	10.1%
2013	1,010,000	110,000	10.9%
2014	1,030,000	121,000	11.7%
2015	1,051,000	133,100	12.7%

Selected Paid ULAE to Paid Claims Ratio: (10.1%+10.9%+11.7%+12.7%)/4=11.4%

Unpaid ULAE = 11.4%*(180,000*.5+50,000)=15,960

Part b: 1 point

Sample Answer 1

Classical technique assumes ULAE inflation is the same as claims inflation

CY	Pd ULAE	Pd Claims
2012-2013	10%	2.02%
2013-2014	10%	1.98%
2014-2015	10%	2.04%

ULAE inflates at 10% per year, while claims inflate about 2% per year => pd to pd approach isn't appropriate

Sample Answer 2

The key assumption is that the insurer's ULAE-to-claim relationship has achieved a steady-state so that the ratio of paid ULAE-to-paid claims provides a reasonable approximation of the relationship of the ultimate ULAE-to-ultimate claims.

Accident Year	Exposures	Ultimate Claims	*Loss Costs*	Year-over-Year Chg
2012	10,000	1,000,000	100	
2013	10,000	1,020,000	102	2.0%
2014	10,000	1,040,000	104	2.0%
2015	10,000	1,061,000	106	2.0%

Calendar Year	Paid ULAE	Year-over-Year Chg
2012	100,000	
2013	110,000	10.0%
2014	121,000	10.0%
2015	133,100	10.0%

The trend in loss costs is different than the trend in claims handling costs (ULAE). Loss costs are trending at 2%, while claims handling costs are trending at 10%. This leads to a gradually changing paid-to-paid ratio.

Part c: 0.5 point

Sample Answer 1

Kittel Refinement will not correct the issue as it also assumes claims and ULAE inflate at same rate
Kittel refinement is intended to correct for increasing book size, which isn't evident since exposures are constant

Sample Answer 2
The Kittel refinement does not correct for the issue in part b.
The Kittel refinement cannot correct for changes in the rates of inflation between ULAE and claims.

EXAMINER'S REPORT

Part a

Candidates were expected to know how to calculate ULAE ratios by calendar year using the classical paid-to-paid technique and make a ULAE ratio selection. Candidates were then expected to use their selection to compute unpaid ULAE estimate using classical paid-to-paid technique. The candidates were expected to provide an unpaid ULAE estimate as of 12/31/2015 using the information provided and the above mentioned classical actuarial technique.

Common mistakes included:

• Some candidates just used the latest year or a weighted average ULAE ratio without calculating each year's ULAE ratio in order to select an appropriate ratio. • Not using paid claims to calculate ULAE ratio • Using case outstanding and IBNR other than that which was provided as of 12/31/2015, such as these values for year 2015 only
Part b
Candidates were expected to know the key assumption that is being violated. While there are two key assumptions for the classical technique, only one could be identified as the one that was violated based on the provided information in the question. Candidates were then expected to elaborate on why the assumption is being violated. To earn full credit, candidates were expected to identify the right key assumption, quote both loss cost (or paid losses, or ultimate losses) and ULAE trends. Common mistakes included: • Not identifying the key assumption being violated • Not showing ULAE and loss cost trend and identifying that they are different
Part c
Candidates were expected to know the Kittel refinement and discuss if the refinement will correct the violated issue. A common mistake was did not elaborating that the Kittel refinement actually does not eliminate the inconsistency in trends between the paid ULAE and paid losses/claims, and thus the paid ULAE-to-paid losses trend will still be present.

QUESTION 27	
TOTAL POINT VALUE: 1.75	**LEARNING OBJECTIVE: B8**
SAMPLE ANSWERS	

Part a: 1 point

AY 2013: (7,500 – 1000) * (0.55 – 0.30) / (1 - 0.30) = 2,321
AY 2014: (8,600 – 600) * (0.30 – 0.08) / (1 – 0.08) = 1,913
Total Expected Emergence in CY 2015 = 2,321 + 1,913 = 4,234

AY 2013: (3,500 – 1000) = 2,500
AY 2014: (3,400 – 600) = 2,800
Total Actual Emergence in CY 2015 = 2,500 + 2,800 = 5,300

5,300 > 4,234

Both accident years greatly underestimate the expected emergence

Part b: 0.75 point

Sample Answer 1
We know that claims tend to be reported earlier in the year, however this approach looks at the year as a whole. Claims reported is high at the beginning but decreases throughout the year. I would instead look at shorter time increments.

Sample Answer 2
This approach is reasonable when the prior selected ultimate claim counts for all accident years are based on the reported claim count development technique. If different techniques are used to select ultimate claim counts, the development pattern from the reported claim count development technique may not be appropriate. An alternative approach is to compare the historical closed claim count development triangle to the final value of selected ultimate claim counts to derive an emergence pattern for use in the actual to expected comparison.

Sample Answer 3
Some claims may be immaterial. Perhaps there's been a change in number of small claims -> This would change actual/expected ratio for claim # but total losses may develop the same if larger claims are involved. We could create disposal rate triangles and make Berq. Sherman adjustments to bring a new pattern for claims emergence.

Sample Answer 4
The limitation of the actual vs. expected method is that it uses prior CDFs. If there has been any speed up in development, the expected claims counts would continually underestimate. The method doesn't adjust to the changes in operation as quickly. Alternative would be to do an incremental closed method.

Sample Answer 5
Does not account for potential shifts in claim reporting or mix of business. You could look at expected paid claim counts (or closed) to see if that provides a different indication.

EXAM 5 FALL 2016 SAMPLE ANSWERS AND EXAMINER'S REPORT

EXAMINER'S REPORT
Part a
Candidates were expected to calculate the actual and expected emergence in CY15 for AY13 and AY14 and provide a comparison of actual versus expected, either subtraction or division, or showing both values and commenting on which was higher Common mistakes included: - Not calculating the CY emergence for actual   - Only calculating CY emergence for one AY, not both   - Forgetting to show the Actual versus Expected, saying simply that it "doesn't match" or only displaying the results beside each other with no commentary or comparison
Part b
Candidates were expected to provide a limitation to the method used in part a), along with an alternative methodology which corrects this limitation and a brief description of the limitation and/or how the alternative corrects for it. Common mistakes included: - Suggested limitation was due to inaccurate calculation of % reported or ultimate   - Not recognizing that these were claim counts rather than claim dollars and suggesting limiting dollar amounts   - Suggested use of industry data in response to highly leveraged data (which would still be highly leveraged at an early maturity, even with more data)