8. (4.75 points)

Given the following information for a book of business as of December 31, 2015:

Rate Change History	
Effective Date	Change
October 1, 2013	+4.5%
April 1, 2015	+2.5%

Calendar Year	2013	2014	2015
Earned Premium	$1,870,000	$2,228,000	$2,404,000
Earned Exposures	1,420	1,530	1,610

Cumulative Reported Loss + ALAE ($) as of (months)

Accident Year	12	24	36
2013	2,150,000	2,395,000	2,495,000
2014	925,000	1,085,000	
2015	1,250,000		

Cumulative Reported Loss + ALAE excluding Catastrophes ($) as of (months)

Accident Year	12	24	36
2013	750,000	895,000	975,000
2014	825,000	975,000	
2015	900,000		

- All policies are semi-annual.
- Exposures are written evenly throughout each calendar year.
- Annual severity trend = 5%.
- Annual frequency trend = -1%.
- Annual premium trend = 2%.
- Fixed expense ratio = 5%.
- Variable expense ratio = 22%.
- Profit and contingencies provision = 6%.
- ULAE provision = 7% of loss and ALAE.
- Projected catastrophe load including ALAE = $235 per exposure.
- There is no loss development beyond 36 months.
- Rates are to be in effect for one year.

Calculate the indicated rate change for policies effective January 1, 2017 using the latest three accident years of experience and assuming full credibility.

CONTINUED ON NEXT PAGE

QUESTION 8

TOTAL POINT VALUE: 4.75 | **LEARNING OBJECTIVE(S): A2, A3, A5**

SAMPLE ANSWERS

Sample 1 (Traditional Loss Ratio Approach)

Accident Year	Area A	Area B	Area C
2013	0.9375	0.0625	0
2014	0.0625	0.9375	0
2015	0	0.5	0.5
Rate	1	1.045	1.071

Average Rate	On Level Factor
1.002813	1.0681
1.04219	1.0278
1.05806	1.01235

AY	EP	OLF	Trend	Trended OLEP
2013	1,870,000	1.0681	1.02^4.25	2,172,722
2014	2,228,000	1.0278	1.02^3.25	2,442,161
2015	2,404,000	1.01235	1.02^2.25	2,544,577
				7,159,468

I will use the data for losses & ALAE excluding catastrophes, since we are given a separate catastrophe load.

AY	12-24	24-36	36-Ult
2013	1.193	1.0894	
2014	1.182		
Selected	1.1875	1.0894	1
ATU	1.2937	1.0894	1

AY	Loss	ATU	Trend	Trended Ult Loss	LR
2013	975,000	1	(0.99*1.05)^4.25	1,149,499	52.91%
2014	975,000	1.0894	(0.99*1.05)^3.25	1,204,680	49.33%
2015	900,000	1.2937	(0.99*1.05)^2.25	1,270,373	49.92%
				3,624,552	50.63%

The loss ratios are pretty stable across the years. I'll select the weighted LR of 50.63%.

Projected CAT load including ALAE = $235/exposure. We can convert it to a ratio by dividing by average trended OLEP for 3 years
CAT load ratio = 235 / (7,159,460 / (1420+1530+1610)) = 14.97%
Indicated Rate change = [(50.63%+14.97%)*1.07+5%]/[1-22%-6%] – 1 = 4.433%.

Sample 2 (Loss Ratio using 2-step approach for premium trend)
2013 OLF = 1.045*1.025 / (15/16+1.045/16) = 1.0681
2014 OLF = 1.071125 / (1/16+15/16*1.045) = 1.0278
2015 OLF = 1.071125 / (0.5*1.045+0.5*1.071125) = 1.0123

CY	OLF	Average on-level earned	Projected Premium – Calc	Projected Premium
2013	1.0681	1,870,000/1420*1.0681 = 1406.6	1420*1511.5*1.02^2.25	2,244,124
2014	1.0278	1496.7	1530*1511.5*1.02^2.25	2,417,965
2015	1.0123	1511.5	1610*1511.5*1.02^2.25	2,544,394
				7,206,483

I'll use a 2 step trending. I'll set the average written premium to the latest level of 1511.5 and then I'll trend Prem 7/1/15 to 10/1/17.

For losses I'll use ldf's from prem triangle that exclude catastrophe since we are using a catastrophe loading in the final rate change calculation. I'll use an all year average.

Maturities	12-24	24-36	36-48
Ldfs	1.187	1.089	1
CDF	1.2934	1.089	

AY	Non-cat reported	CDF	Trend	Projected non-cat
2013	975,000	1	(0.99*1.05)^4.25	1,149,499
2014	975,000	1.089	(0.99*1.05)^3.25	1,204,237
2015	900,000	1.2934	(0.99*1.05)^2.25	1,270,078
				3,023,814

I'll trend from 7/1/XX to 10/1/17.
Loss ratio = [3,623,814 + 235*(1420+1530+1610)]/7,206,483 = 0.65155
Indicated rate change = (0.65155*1.07+0.05)/(1-0.22-0.06) = 3.77%

Sample 3 (Pure Premium Approach)

First Cal Prem
Ind Rate Chg = Ind Avg Prem / OL Trended Avg Prem
Ind Avg Prem = (PP + Fixed Exp)/(1-V-Q) V=22% Q=6%

CY (1)	Earned Prem (2)	OL Factor (3)	Trend (4)	Trended OL Prem (5) = (2)*(3)*(4)	Exposure (6)	OL Trended Avg Prem (7) = (5) / (6)
13	1870k	1.068	1.02^4.25	2,172,519	1420	1529.9
14	2280k	1.028	1.02^3.25	2,499,646	1530	1633.8

15	2404k	1.012	1.02^2.25	2,543,697	1610	1579.9
						Avg = 1581.21

13 OLF = (1.045*1.025) / [(1/4 * 1/2 * 1/2)*1.045 + (1 - 1/4 * 1/2 * 1/2)*1] = 1.068
14 OLF = (1.045*1.025) / [(1/4 * 1/2 * 1/2)*1 + (1 – 1/4 * 1/2 * 1/2)*1.045] = 1.028
15 OLF = 1.025 / (1/2 * 1 + 1/2 * 1.025) = 1.012

Trend period earned premium (1.02)
13: 7/11/13 – 10/1/17 Avg earned date → 4..25 yrs
14: 3.25 yrs
15: 2.25 yrs

Next Cal PP
For non cat loses calculate LDF by using weighted avg
12-24 = 1.187 24-36 = 1.089 36-ult = 1.0

AY (1)	Rep*CDF (2)	Exposure (3)	PP (4) = (2) / (3)	Trend (5) [(1+5%)*(1-1%)] same trend period as Earned Prem	Trended PP (6) = (4) * (5)
13	975,000	1420	686.62	1.179	809.5
14	975,000*1.089	1530	694	1.134	787.1
15	900,000*1.187*1.089	1610	723	1.091	788.85
					Avg =795.2

Total PP = (Non-Cat PP + Cat PP)*(ULAE% +1)
= (795.2 + 235) * 1.07
= 1102.3

Ind Avg Prem = (1102.3 + 5% * 1581.21) / (1 – V – Q)
= 1618.3

So Ind Rate Change Factor = Ind Avg Prem / OL Trended Prem
= 1618.3 / 1581.21
= 1.0234

Ind Rate Change = 1.0234 – 1 = 2.34%

EXAMINER'S REPORT

Candidates were expected to demonstrate an understanding of and perform the calculation for a rate level indication.

Specifically, candidates were expected to demonstrate the following:

- Loss Development: calculate age-ultimate factors based on a non-cat loss development triangle.

- Loss Trend: calculate the average loss date for each accident year and trend to the average accident date in the projection period.
- Total Losses: apply loss development and loss trend to the appropriate accident year reported losses to calculate trended and developed losses.
- Current Rate Level: calculate on-level factors for 3 years given two rate changes during those years, for semi-annual policies.
- Premium Trend: calculate the average earned date for each experience year and trend to the average earned date in the projection period.
- Total Premium: apply current rate level and premium trend to the appropriate experience year earned premiums to calculate the trended premium at current rate level.
- Catastrophe Load: calculate and apply a catastrophe load in the calculation of the overall indication.
- Indication: understand and calculate the formula for a rate level indication, given total losses, ULAE, cat load, total premium, expenses, and profit.

Although it contained many calculations, this question was straightforward, and candidates performed very well on this question.

Common mistakes relating to the calculation of the catastrophe load include:

- Failing to recognize the provision given was a pure premium
- Not expressing the catastrophe provision on the same basis as the non-catastrophe provision (e.g. as a loss ratio or as a pure premium)
- Not considering ULAE in the catastrophe calculation although the question stated that the given provision included only loss and ALAE

Another common mistake made was incorrectly calculating the factors to current level by assuming annual policies although the question stated that the policy term was semi-annual