11. (3.75 points)

Consider the following sample of five insurance risks which have been experience rated:

Risk	Mod	Manual Loss Ratio	Standard Loss Ratio
1	0.60	0.60	1.00
2	0.79	0.80	1.01
3	X	0.96	Y
4	1.10	1.10	1.00
5	1.14	1.15	1.01

The actual claims for Risk 3 in the experience period are as follows:

Claim #	Incurred Loss Amount
001	3,200
002	3,000
003	2,800
004	2,700
005	3,300
006	2,900
007	10,000
008	3,100
009	3,000
010	3,100
Total	37,100

- Expected Losses for Risk 3 in the experience period = 32,000
- Credibility factor = 0.75

a. (0.5 point)

Calculate the modification factor, X, for Risk 3.

b. (0.5 point)

Provide a recommendation to improve the effectiveness of experience rating for Risk 3 and briefly justify.

c. (2.75 points)

Show, quantitatively, that the recommendation in part b. above improves the plan. Assume no other risks are impacted by the recommendation.

CONTINUED ON NEXT PAGE

QUESTION 11	
TOTAL POINT VALUE: 3.75	**LEARNING OBJECTIVE(S):** 3, 4

SAMPLE ANSWERS

Part a: 0.5 point

Sample 1
X = Z*(A/E) + (1-Z) = 0.75*(37,100/32,000) + (1 - 0.25) = 1.1195

Sample 2
Mod = X = 1 + (.75)*(37,100 – 32,000)/32,000 = 1.1195

Sample 3
[37,100(0.75) + 32,000(0.25)] / 32,000 = 1.12

Part b: 0.5 point

Sample 1
Cap claims at 4000. This includes all of the smaller claims but prevents larger claims from unduly affecting the mod.
[Various capping thresholds and claim removal proposals were accepted]

Sample 2
Standard LR=Manual LR/Mod
Standard LR for risk 3 = .96 / 1.1195 = .8575
This is not close to other risks' standard loss ratio. Mod should be lower (closer to 0.96) so it should be given less credibility (more weight on expected experience and less on actual experience).

Part c: 2.75 points

Sample 1 (claim capping)
Without update:
Y = 0.96/1.1195 = 0.8575
Efficiency Stat: Var(Manual LR)/Var(Std LR)
Avg Manual LR = (0.6 + 0.8 +… + 1.15)/5 = 0.922
Var(Manual LR) = ((0.6-0.922)^2 + (0.8-0.922)^2 + … + (1.15-0.922)^2)/(5-1) = 0.05092 (using sample variance)
Avg Std LR = (1+1.01+0.8575+1+1.01)/5 = 0.9755
Var(Std LR) = ((1-0.9755)^2 + (1.01-0.9755)^2+ … + (1.01-0.9755)^2)/(5-1) = 0.004376
Eff Stat_w/o update = 0.004376/0.05092 = 0.0859
With update:
New Mod = (0.75*32,100 + 0.25*32,000)/32,000 = 1.0023 (actual losses limited to 5k)
Y = 0.96/1.0023 = 0.9578
Var(Manual LR) = 0.05092 (same as without update)
Avg Std LR = (1+1.01+0.9578+1+1.01)/5 = 0.99556

Var(Std LR) = ((1-0.99556)^2 + (1.01-0.99556)^2+ … + (1.01-0.99556)^2)/(5-1) = 0.0004706
Eff Stat_w/o update = 0.0004706/0.05092 = 0.009242
Since 0.009242 < 0.0859, loss cap improves plan.

Sample 2 (decrease credibility)
New Mod = [0.25(37,100) + 0.75(32,000)]/32,000 = 1.04
Y = 32,000 / (33,333 * 1.04) = 92.3%

Old		New	
Manual	Standard	Manual	Standard
0.60	1.00	0.60	1.00
0.80	1.01	0.80	1.01
0.96	**0.86**	0.96	**0.92**
1.10	1.00	1.10	1.00
1.15	1.01	1.15	1.01

Eff test_Old = 0.00384 / 0.040736 = 0.0715
Eff test_New = 0.001176 / 0.040736 = 0.029 → lower test statistic implies improvement

EXAMINER'S REPORT

Candidates were expected to demonstrate knowledge of experience rating plans, including how to calculate experience rating modification factor, manual and standard loss ratios, evaluation of the effectiveness of an experience rating plan, and how to modify an experience rating plan to improve its effectiveness.

Part a

Candidates were expected to provide the formula used to calculate the modification factor for Risk 3, and to provide the final modification factor in numeric form.

A common mistake included:

- Making a simple calculation error

Part b

Candidates were expected to provide a reasonable recommendation to improve the effectiveness of experience rating for Risk 3, and briefly justify the recommendation.

Common mistakes included:

- Providing a correct recommendation but not justifying it
- Providing a recommendation that did not improve the effectiveness of experience rating for Risk 3.

Part c

Candidates were expected to calculate a new mod and standard loss ratio (X & Y) based on the recommendation in part b, perform an efficiency test on both the original and recommended experience rating plans, and explain the result of the test. Full credit was given for various forms of variance calculation (e.g., sample or population variance or standard deviation). Partial credit was awarded for a qualitative response based on the quintiles test. Candidates should note, though, that Fisher et. al. (p. 10) specifies that the quintiles test is a qualitative test (observing general trends) , and this question specifically asked for a quantitative demonstration (calculating and comparing two quantities to support a conclusion).

Common mistakes included:

- Calculating a test statistic for the recommended plan but failing to calculate one for the original plan
- Not drawing a conclusion on the results of the test
- Multiplying SLR = MLR * Mod rather than dividing SLR = MLR / Mod.