12. (1.5 points)

An actuary is evaluating the effectiveness of an experience rating plan and has calculated the following values:

	Standard Loss Ratio		Sample Variance in Loss Ratios	
Risk size	Risks with credit mod	Risks with debit mod	Unmodified	Modified
Small	1.05	1.08	0.07	0.008
Medium	0.98	0.96	0.05	0.004
Large	0.99	1.00	0.04	0.004

a. (0.5 point)

Evaluate whether this plan satisfies the necessary condition for proper credibility.

b. (0.5 point)

Determine which risk size has the most accurate experience rating based on the efficiency test.

c. (0.5 point)

It has been determined that premiums are inadequate for small risks. Discuss whether premium inadequacy is better corrected by changing the manual rates or the experience rating plan.

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QUESTION 12

Total Point Value: 1.50 **Learning Objective: B4**

Sample Answers

Part a: 0.5 point

Sample 1

Necessary condition: credit or debit mods should have equal standard loss ratios in the prospective period.

The debit/credit mod standard LRs are fairly close, thus I'd say the condition is met.

Sample 2

The necessary condition for credibility says that debit and credit risks should have the same permissible loss ratio.

The ratios are not the same, so the plan does <u>not</u> satisfy this condition.

Sample 3

Should equally reproduce the permissible LR. By size, each group seems to be relatively close.

Small 1.05 vs. 1.08

Medium 0.98 vs. 0.96

Large 0.99 vs. 1.00

Could do better for small risks, slightly better for medium risks, but overall meets necessary condition.

Sample 4

Necessary: debit and credit risks should generate same LR.

For total LR: $\frac{1.05+0.98+0.99}{3} \neq \frac{1.08+0.96+1.00}{3}$

Risks with credit mod ≠ risks with debit mod (assuming LR is evenly distributed among the 3 risk sizes)

So necessary condition is not met.

Within each risk size, LR for credit vs. debit are also not the same.

Part b: 0.5 point

Sample 1

Efficiency test statistic = variance(modified LR)/variance(unmodified LR)

Risk Size	Test Statistic
Small	.008/.07 = 0.114
Medium	.004/.05 = **0.08**
Large	.004/.04 = 0.1

Medium risk has the **lowest** statistic, so it has the most accurate experience rating based on the efficiency test.

Sample 2

Medium risk has best experience rating as (modified variance)/(unmodified variance) is lowest so it's the best improvement based on experience rating (0.004/0.05).

Sample 3

Efficiency test statistic = variance(manual LR)/variance(standard LR), **higher** is better

Small	.07/.008 = 8.75
Medium	**12.5**
Large	10

Medium risks have most accurate experience rating.

Sample 4

Efficiency test: [var(unmodified) – var(modified)]/var(unmodified)

Small	(.07-.008)/.07 = 0.8857
Medium	**0.92**
Large	0.9

Medium is the most accurate.

Part c: 0.5 point

Sample 1

It's better to correct with the manual rates, because an overall inadequacy is best handled in the base rates. Experience mod plan is intended to adjust for individual cost differences.

Sample 2

Changing manual rates will be better to correct for inadequacy because if the experience rating plan adjusts for the inadequacy (off-balance increases) then the problem will persist. The off-balance will increase and mask some of the actual rate level needed.

Sample 3

Since many of the small risks will not qualify for the experience rating plan, this is better corrected through manual rates.

Sample 4

It is better to correct the manual rates. Applies to new policies without experience, so no need to wait for experience before premium is accurate.

Examiner's Report

Part a:

- Candidates were expected to understand the necessary condition and how to apply it to the given data.
- Candidates scored very well on part a, with the majority receiving full credit.
- Common mistakes included confusing the sufficient condition with the necessary condition, and comparing standard loss ratios between size groups rather than credit/debit mod groups.

Part b:

- Candidates were expected to know how to conduct the efficiency test and interpret the results.
- Candidates scored very well on part b, with the majority receiving full credit.
- A common mistake was making calculation errors that lead to an incorrect conclusion.
- Candidates who calculated the efficiency test statistic correctly but drew the incorrect conclusion received partial credit.
- Candidate that made small math errors in the calculation but drew the right conclusion received full credit as they were able to demonstrate knowledge and understanding of the concept.

Part c:

- Candidates were expected to understand the purpose of experience rating as a tool to correct for individual risk differences rather than overall premium adequacy.
- Part c was more challenging for candidates, though the majority received at least partial credit.

- A common mistake was identifying the experience rating plan as the better way to correct premium inadequacy.

QUESTION 13
Total Point Value: 3.25 **Learning Objectives: B6, B7**
Sample Answers
Part a: 2.25 points

LDD:

Sample 1
At 18 months, 435,000/6.55 = 66,412 of loss below the deductible is expected to have been paid.
Insured owes the insurer $66,412 as reimbursement.

Retro Policy:

Sample 1
The retro premium formula is R = (b + CL + cF)T.
F is the expected excess loss, which in this case is 650,000 - 435,000 = 215,000.
At 18 months, 435,000/3.75 = $116,000 of loss below the retro limit is expected to have been incurred.
R = (150,000 + (1.1)(116,000) + (1.1)(215,000))(1.045) = 537,235
Insured has already paid $1M in deposit premium, so the insurer owes the insured $462,766.

Sample 2
The retro premium formula is R = (b + CL + cF + cV)T.
F is the expected excess loss, which in this case is 650,000 - 435,000 = 215,000.
At 18 months, 435,000/3.75 = $116,000 of loss below the retro limit is expected to have been incurred.
Assume the insured elects to include V, the retro development. V = 435,000(1 – 1/3.75) = 319,000
R = (150,000 + (1.1)(116,000) + (1.1)(215,000) + (1.1)(319,000))=903,925
Insured has already paid $1M in deposit premium, so the insurer owes the insured $96,075.

Part b: 1.0 points
Sample 1