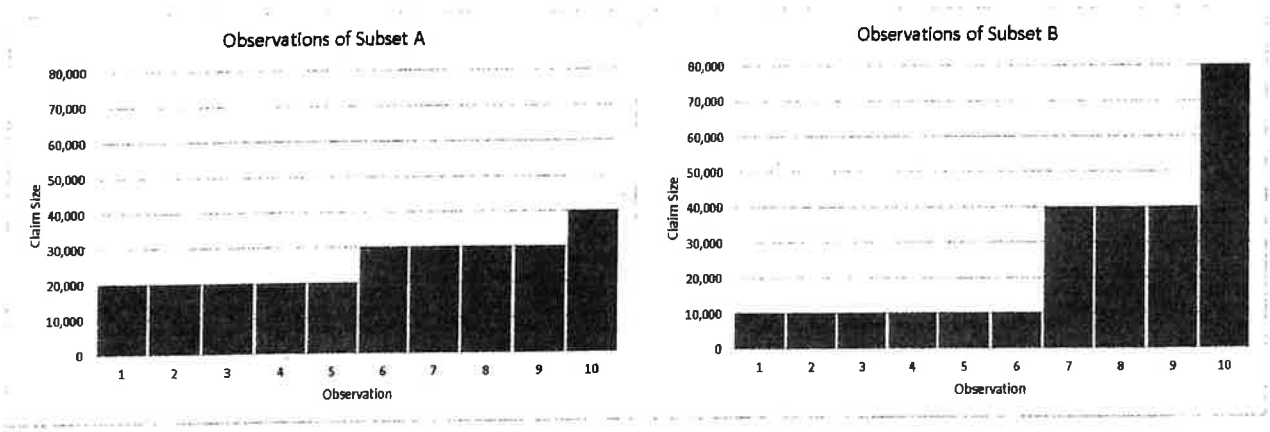
12. (2 points)

An actuary is assessing the current Table M underlying the pricing of a book of business. All policies within the book of business have identical expected losses and are expected to have exactly one claim during the policy period. The actuary divides the book of business into two subsets of policies, Subset A and Subset B, and finds the following distributions of aggregate losses:



a. (0.5 point)

Discuss why the current Table M may not be appropriate for this book of business.

b. (1 point)

Using the observations in Subset B, calculate the insurance charges associated with the following claim sizes:

i. 10,000
ii. 40,000
iii. 80,000

c. (0.5 point)

Briefly describe two considerations when using the Table M calculated in part b. above to support the creation of a Table M for a different line of insurance.

CONTINUED ON NEXT PAGE

SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION 12	
TOTAL POINT VALUE: 2.0	**LEARNING OBJECTIVE(S): B2**

SAMPLE ANSWERS

Part a: 0.5 point

Sample 1

Subset B has a significantly different loss distribution than subset A. When calculating insurance charges, subset A's would be too high and subset B's would be too low.

Sample 2

A and B have different loss distributions, even though they have the same expected loss. B is more volatile than A ➔ it should have a higher insurance charge than A for the same entry ratio ➔ Combining A and B to create 1 table M will underprice B and overprice A.

Sample 3

The severity distribution of A and B are different and the variance of A and B is different. The insurance charge is dependent the severity distribution and variance. If A and B are combined, the charges and savings from the Table M will be incorrect.

Sample 4

The policies in subset A, compared to subset B, have a smaller variance. Table M's are selected based on the variance of losses for an insured. Using a single Table M for the two subsets is not appropriate since they have different levels of volatility.

Sample 5

It seems that subset B has more variation in aggregate losses than subset A, indicating that separate table M's should be calculated for each subset because of the different aggregate loss distributions.

Part b: 1 point

Sample 1

i. $(80k - 10k) \times 0.1 + (40k - 10k) \times 0.3 = 16k$

ii. $(80k - 40k) \times 0.1 = 4k$

iii. 0

Sample 2

i. $\emptyset(10k) = \frac{1\times(80k-10k)+(40k-10k)\times 3}{10} = 16{,}000$

in % ➔ 16k/26k = 61.5%

ii. $\emptyset(40k) = \frac{(80k-40k)}{10} = 4{,}000$

in % ➔ 4k/26k = 15.4%

iii. 0

in % ➔ 0%

Sample 3

$Total\ Area = 10(6) + 40(3) + 80 = 260$

i. $\emptyset(10) = \frac{(80-10)+(40-10)x3}{260} = .615$

ii. $\emptyset(40) = \frac{(80-40)}{260} = .154$

iii. 0, because there are no losses above \$80k

Sample 4

$r\ @\ 10{,}000 = \frac{10}{26} = .385$

$r\ @\ 40{,}000 = \frac{40}{26} = 1.538$

$r\ @\ 80{,}000 = \frac{80}{26} = 3.077$

$\emptyset(.385) = (1.538 - .385) \times .3 + (3.077 - .385).1 = .6151$

$\emptyset(1.538) = (3.077 - .385) \times .1 = .1539$

$\emptyset(3.077) = 0$

Part c: 0.5 point

Sample 1

1. Need to consider if the different line of business has the same expected risk size
2. Should consider if the other line is more or less risky (different variance)

Sample 2

3. The insurance charge depends on the variance and shape of the severity distribution.
4. Consider whether the other line of business is subject to per-occurrence limits

Sample 3

5. The other line of business should have a similar expected loss to the Table M used, around \$26,000
6. It is probably unwise to use a Table M built off of only 10 observations, especially for another line of business.

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EXAMINER'S REPORT

Candidates were expected to demonstrate knowledge of Table M for insurance rating including the calculation of Table M values and the assumptions underlying its use.

Part a

Candidates were expected to note the difference in loss distribution between subset A and B, and explain why this difference in loss distribution made the use of the current table M for both subsets inappropriate or inaccurate. Candidates that noted variation between the two subsets but did not explain the implications of those differences received partial credit.

Common mistakes included:

- Failing to explain why a difference in claim distribution makes the current Table M inappropriate
- Suggesting that the risks in the two subsets were of different sizes (each risk had exactly one claim, so variation was the result of claim severity, not risk size)
- Giving answers that were too vague (e.g. "subsets look different" or "there is too much variance")
- Stating that overall variance of the portfolio makes Table M unreliable

Part b

Candidates were expected to accurately calculate insurance charges. Insurance charges calculated as either dollar amounts or ratios received full credit. Tabular calculations as well as formulas were both acceptable as well.

Common mistakes included:

- Failing to divide by the number of risks (10) when calculating insurance charges in the form of expected aggregate excess losses
- Subtracting 10,000 rather than 40,000 from 80,000 in part 2
- Dividing the loss amounts by the claim sizes rather than expected aggregate excess loss amounts
- Using incorrect insurance charge formulas.

Part c

Candidates were expected to demonstrate knowledge of the important considerations in the application of Table M. Full credit was given to a variety of responses, including but not limited to:

- The other line must have similar risk sizes/expected loss, (or that entry ratios could be used to account for scale difference)
- The other line of business of must have similar severity or aggregate loss distribution/variance
- Noting that the Table M from part B may lack credibility due to limited data
- Noting that the other line of business should be subject to the same limit structure

Common mistakes included:

- Providing two responses that were deemed too similar (e.g. noting that claim variance should be similar for part 1, and claim distributions should be similar for part 2)
- Generic or vague responses that did not apply directly to the posed question
    - E.g. responses about general characteristics of Table M, such as $\phi(r)$ being a decreasing function
    - Suggesting that risks in the new line of business should be similar to part B, without an adequate explanation of the ways in which they must be similar
- Noting that Table M charges should be the same for both lines of business.