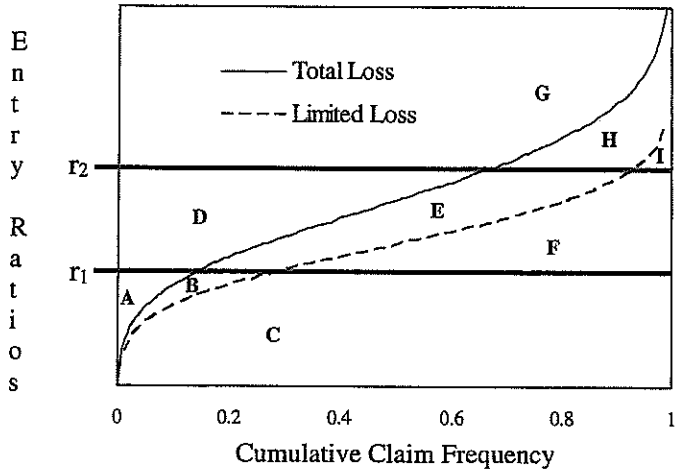
15. (3.25 points)

The following diagram depicts a book of business for a retrospectively rated workers compensation plan:



The descriptions of the labels on the diagram are as follows:

- r_1 = Aggregate minimum.
- r_2 = Aggregate maximum.
- Total loss - Total aggregate losses with no per-accident limit.
- Limited loss - Total aggregate losses after application of a per-accident limit.

a. (1.5 points)

Using the letter labels above to represent portions of the graph, describe the following quantities:

1.) ϕ - The Table M insurance charge at r_2.
2.) ψ – The Table M savings at r_1.
3.) ϕ^* - The Table L insurance charge at r_2.
4.) ψ^* - The Table L savings at r_1.
5.) I - The amount expected to be paid by the insured with an aggregate limit but no per-accident limit.
6.) I* - The amount expected to be paid by the insured in the presence of both an aggregate and a per-accident limit.

<<QUESTION 15 CONTINUED ON NEXT PAGE>>

b. (0.75 point)

A change in relevant workers compensation law goes into effect that causes a significant increase in the most severe losses. Briefly explain what effect this is likely to have on the areas of E and H in the above diagram.

c. (1 point)

Assume loss frequency and severity are independent, all individual losses come from the same distribution, and the only difference between large and small accounts is the number of expected claim counts. Determine whether the above diagram is accurate for both large and small accounts. Justify your answer.

CONTINUED ON NEXT PAGE

Question 15:

Part a
Model Solution 1

1. H+I
2. A
3. I + B + E + H
4. A + B
5. A + B + C +E + F
6. A + B + C + F

Model Solution 2

1. H+I
2. A
3. I + B + E + H
4. A + B
5. H + I - A
6. H + I + E - A

Model Solution 3

1. H+I
2. A
3. I + B + E + H
4. A + B
5. Assuming plan in balance, should pay for expected losses
H + I + E + F + B + C
6. H + I + E + F + B + C, same reasoning as 5

Examiner's Comments:
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Most candidates answered all parts of this question correctly. On part 5 and 6, several answers were accepted: some candidates interpreted the question to mean the expected amount to be paid in total, others only gave the net insurance charge, and others gave the total expected losses minus the net insurance charge; all of these answers were accepted for full credit.
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Part b
Model Solution 1

E&H section will get much larger. Since the law change affects the most severe losses, these are likely already over the occurrence limit, so the limited loss curve will not change much. However the total loss curve will increase, widening the gap

between the two curves. This will affect the right region (higher aggregate loss region) of the graph more. So E&H will increase in comparison to other regions. (After everything is renormalized to 1.)

Model Solution 2

If there is an increase in most severe losses, then by limiting losses, the LER becomes higher (a higher portion of losses is eliminated by the limit).
LER = B + E + H, therefore E & H will increase in area.

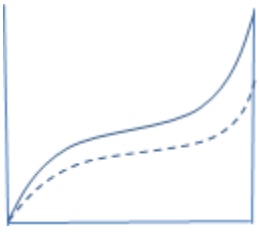
Examiner's Comments:
****
Most candidates received full credit on part b. The most common errors were candidates who either indicated that the Lee diagram was a severity distribution rather than an aggregate distribution, and candidates who did not explicitly identify that the change in the areas of E and H occurs because of the different impact on limited and unlimited losses.
****

Part c
Model Solution 1

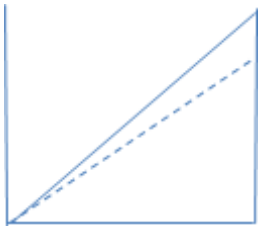
No. Large account are more stable than small account due to law of large numbers, for small accounts, the curve should be steeper, or the insurance charge should be higher to reflect this. Therefore the same curve is not appropriate for large and small accounts. Different size accounts should have different curves, like different ELGs in NCCI manual have different charge values.

Model Solution 2

No, the diagram will look different for large and small accounts. Even if the individual losses come from the same distribution, the aggregate distribution will look different (something approaching but not quite the curve predicted by the law of large numbers)



Large



Small

Examiner's Comments:

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Candidates received credit for noting that there would be a significant difference in the shape of the large and small accounts aggregate loss curves due to relative variance between the two (either discussing account stability, relative variance, law of large numbers, or differences between ELGs in the NCCI plan.) Many candidates incorrectly focused on the normalization of entry ratios by loss ratio as a reason why the curves would be appropriate for both. Other candidates wrongly implied that large accounts would have a higher chance of breaching the respective aggregate limit, disregarding that the aggregate shown is an entry ratio limit rather than a fixed dollar limit.

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