16. (1.25 points)

An actuary calculates the insurance charges on an aggregate deductible for a general liability policy for house painters. All the losses in the historical data used in the analysis resulted from inadequate and/or sloppy paint jobs, which were relatively inexpensive to fix. Later, it is discovered that some paint contained a toxic substance and those painters are liable for very expensive remediation of the painted properties.

The new claims are 10% as common as the historical claims. For every 10 claims that would have been expected before, there are now 11, one of which is cleaning up toxic paint.

Had this been known, the expected cost of a policy would have been twice the cost the actuary used.

a. (0.75 point)

At an entry ratio of 2.00, with no per-occurrence loss limit, explain whether the insurance charge would increase, decrease, or stay the same.

b. (0.5 point)

Explain how a per-occurrence limit would affect the change in the insurance charge for the aggregate deductible.

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Question 16:

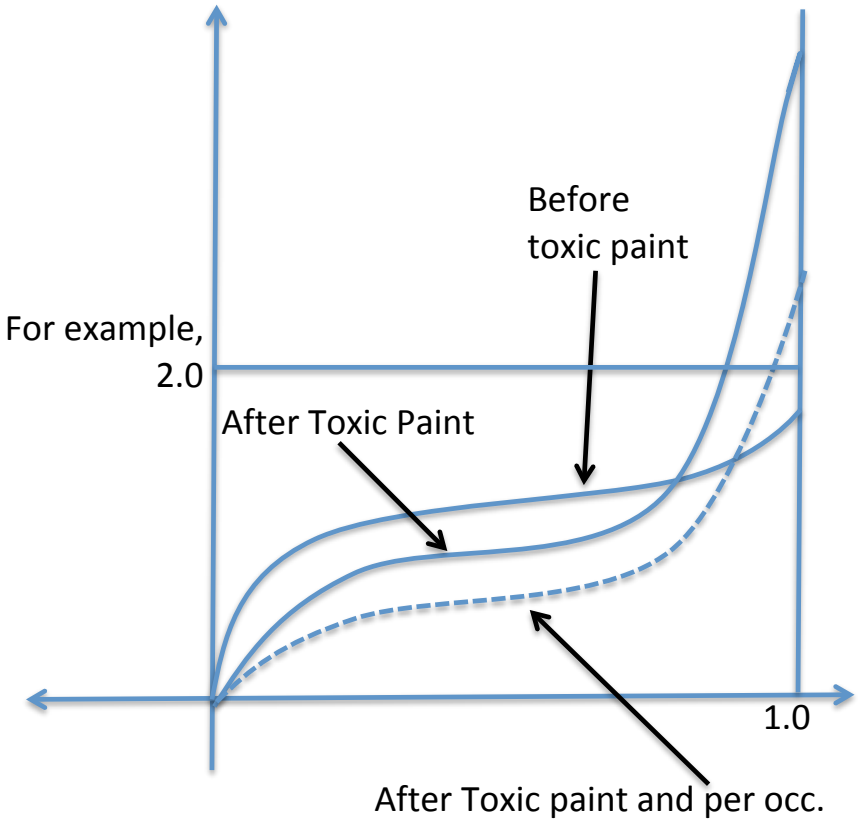
Model Solution 1

a) Since one out of every eleven claims is extremely expensive, the shape of the tail of the distribution changes dramatically.
This will result in increase to the insurance charge at an entry ratio of 2.00.
The actuary used an understated estimate of the expected losses. All else equal, when expected losses are understated the insurance charge is understated.

b) It would mitigate the change in the insurance charge. Since the toxic paint claims would be very large, most of the losses would now become excess losses and not aggregate losses therefore reducing the increase in the insurance charge.

Model Solution 2

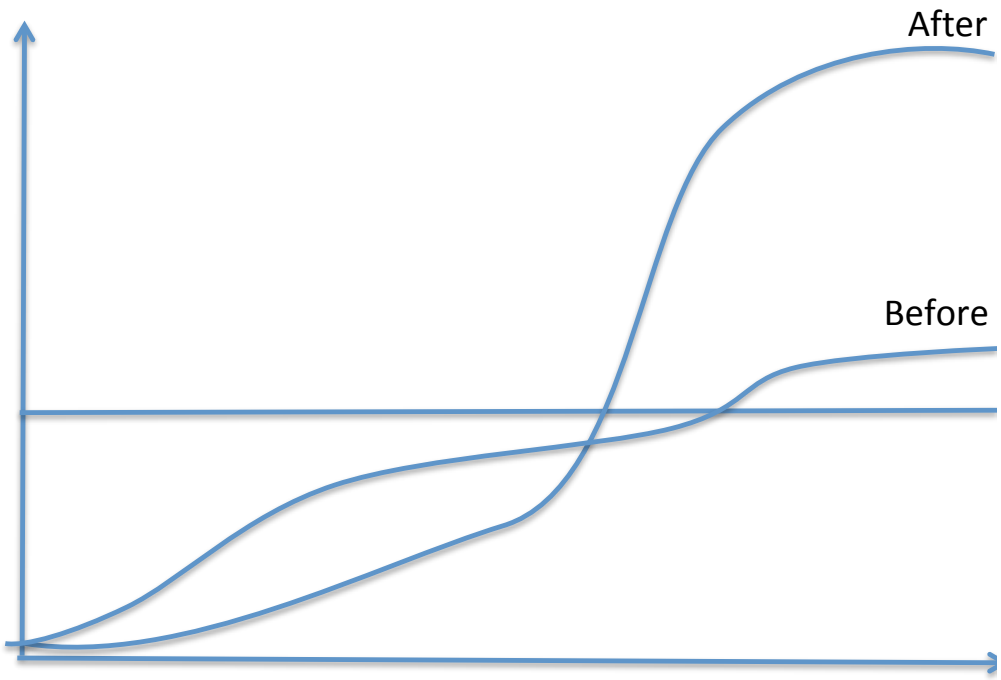
a) The insurance charge will increase because these new toxic paint claims have made the agg loss distribution more volatile, mostly because of the increase in volatility of severity losses.



b) a per occurrence limit would make the change in the insurance charge less. The aggregate loss distribution would be less volatile. See dotted line above.

Model Solution 3

a) I am assuming question meant for next year, i.e. ER 2 of new loss rate. Charge will increase b/c volatility has increased. A larger volatility will increase charges. This is similar to the concept in Venter, that if small and large losses are combined results are more volatile and you can have a loss multiples of the mean which will cause the charge to go up. The Lee diagram below would illustrate how losses shift higher.



b) W per occurrence limit, change in AD would go down b/c losses exceeding the limit would not be counted towards blowing the agg, but would be charged for separately using an ELF.

Model Solution 4

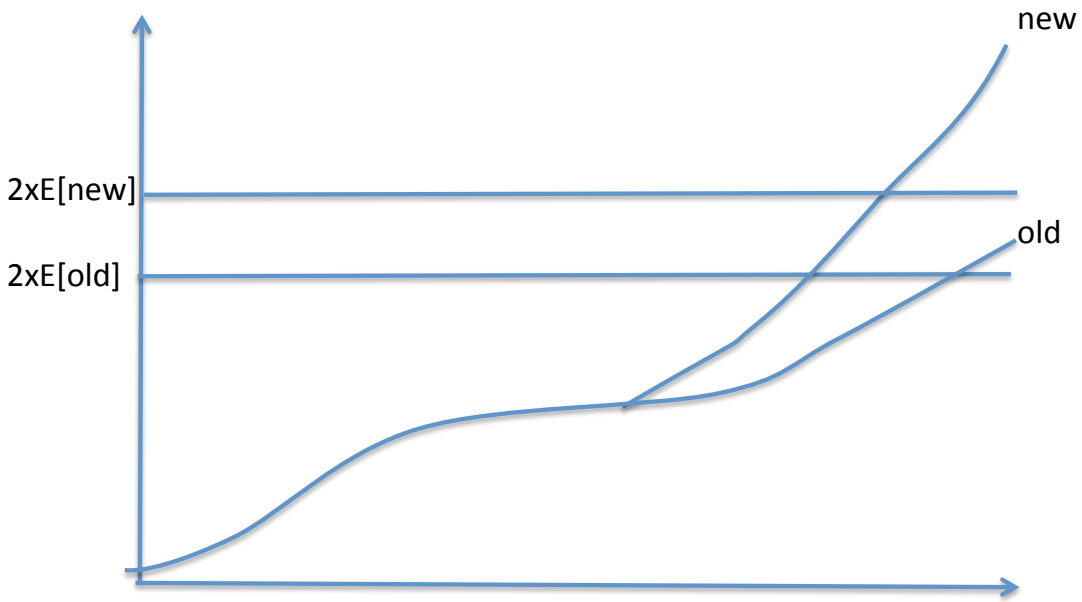
a) The insurance charge would increase because expected losses and the CV of the losses has increased.

b) A per-occurrence limit would reduce the increase in the insurance charge because the new large claims would affect the aggregate deductible less.

Model Solution 5

a) X_1 = old severity distribution
X_2 = toxic severity distribution
$X_{new} = 10/11\ X_1 + 1/11\ X_2$.

Because X_2 affects the tail distribution, for an entry ratio = 2, the insurance charge would increase.



b) Since the per occurrence limit would be very much affected by new higher severity claims and since at high entry ratios a larger portion of the total charge is from the per occurrence limit, I would say the charge would be even higher than in a.

Examiner's Comments:

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Part a

A candidate could interpret the phrase "At an entry ratio of 2.00" as being either the entry ratio under the original assumptions, or under the new assumptions. That is, the actuary might be pricing the next year knowing that the distribution is different and looking at the charge under a new entry ratio of 2.0, or, the actuary might be reserving the previous year and observe that the expected entry ratio shouldn't have been 2.0 but rather should have been 1.0. In both cases, the insurance charge increased, and candidates could get credit for answering under either assumption. However, a key feature of the problem is that the actuary now knows there are individual claims much larger than any historical claims, and candidates could not get full credit without noting that these larger claims increased the

variance/dispersion of the loss distribution, which is the major driver of insurance charge at any given entry ratio. While this situation is, of course, extreme, the NCCI insurance charge contemplates this sort of effect with the state/hazard group adjustment factor.

Some candidates wrote vague verbal answers but included clear and explicit Lee diagrams. In general, if the Lee diagram made the point explicitly enough, candidates were given credit. Many other candidates wrote correct verbal answers but drew Lee diagrams that didn't support that answer. Because the question did not require a Lee diagram, those diagrams were generally not considered.

Many candidates appeared to confuse aggregate charges with excess charges, and gave answers that implied the charge for losses excess of a particular limit would increase, rather than that aggregate losses would increase. While the phrase "insurance charge" is sometimes used to describe the sum of the aggregate and excess charges (for example, in the Skurnick paper) it does not refer to an excess charge alone, especially if there is an aggregate on the policy. So this was an error.

Many candidates explicitly cited inflation. While inflation does have a disproportional effect on an excess charge at a fixed dollar limit, it will generally have no impact on the aggregate charge as a percent of expected loss at a fixed entry ratio. However, candidates could get some credit for just for stating that the charge increased.

Some candidates argued that the charge should decrease, noting that more losses would push the risk into a higher expected loss group and thus reduce the aggregate charge. This is incorrect. It is true that we expect larger policies to have lower aggregate charges when all else is the same, because the law of large numbers suggests the variance of results will be lower when there are more total claims drawn from the same distribution. However, in the situation described all else is very much NOT the same, and the true distribution clearly has more variance than the initially expected distribution.

A few candidates made a lot of observations but never actually addressed the question being asked. In general, these answers scored poorly.

Part b

Part b asked the candidate to explain how a per occurrence limit would affect the change in the insurance charge, described in part a. Depending on whether the candidate wrote about a Table L insurance charge or a Table M insurance charge, a deductible could either increase or decrease the change in the charge. Candidates could get full credit for either answer, so long as their explanation supported the change they described. They could also get credit for clearly stating both answers, although this was not required.

However, candidates did not earn full credit unless they picked a change and supported it. Partial credit was awarded to candidates who correctly described the impact of a per occurrence limit on the insurance charge but did not evaluate the change in the insurance charge after knowing about the toxic claims. Similarly, the candidate was required to give an explanation. No credit was given for an unsupported claim that the charge increased or decreased.

It was possible to earn full credit on part b with an incorrect or partially correct answer in part a. However, many candidates lost credit on this problem for giving extremely generic answers about what a deductible would do to an insurance charge in any situation. The question asked the candidate to explain what would happen to the change described in part a, and to earn full credit the answer had to address the details of the situation – in particular, it had to address how the deductible would differentially affect the newly discovered large claims.
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