22. (3 points)

The current deductible pricing for an auto insurer is based on the following claim distribution:

Size of Loss	Number of Claims
$100	21
$250	50
$500	42
$1,000	37
$5,000	22

An actuary wants to review the effect of loss trend on the insurer's loss elimination ratios.

a. (1 point)

Calculate the loss elimination ratio for a straight $500 deductible assuming no trend adjustment.

b. (1.5 points)

Assuming no frequency trend, calculate the percentage change in the loss elimination ratio for a straight $500 deductible assuming a ground-up loss severity trend of 10%.

c. (0.5 point)

Explain why the loss cost for a given straight deductible policy can increase by more than the ground-up severity trend.

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Question 22:

Part a
Model Solution 1

$$\text{Total Losses} = 182{,}600$$

$$\frac{21(100)+50(250)+500\times[42+37+22]}{182{,}600} = 0.3565$$

Model Solution 2

$$21(100)+50(250)+500\times[42+37+22] = 65{,}100$$

$$21(100)+50(250)+42(500)+37(1{,}000)+22(5{,}000) = 182{,}600$$

$$LER = \frac{65{,}100}{182{,}600} = 0.3565$$

Model Solution 3

$$LER = \frac{\text{Losses Eliminated}}{\text{Total Losses}}$$

$$= \frac{21(100)+50(250)+500\times[42+37+22]}{21(100)+50(250)+42(500)+37(1{,}000)+22(5{,}000)}$$

$$= \frac{65{,}100}{182{,}600} = 35.65\%$$

Examiner's Comments:

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A large majority of candidates received full credit for this question. Most deductions were due solely to simple arithmetic errors. However, there were several candidates that used an incorrect formula (typically something equivalent to 1-LER) which resulted in less credit being received.

A small subset of candidates used an average severity approach and this was an acceptable approach to solve the problem.

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Part b
Model Solution 1

$$\text{Total Losses} = 21(110) + 50(275) + 42(550) + 37(1{,}100) + 22(5{,}500) = 200{,}860$$

$$\frac{21(110) + 50(275) + 500 \times [42 + 37 + 22]}{200{,}860} = 0.3314$$

$$\frac{0.3314 - 0.3565}{0.3565} = -0.07 \text{ or } -7\%$$

Model Solution 2

$$\text{New Total} = 182{,}600 \times 1.1 = 200{,}860$$

$$\text{New Ded} = 1.1\left[100(21) + 250(50) + \frac{500}{1.1}(42 + 37 + 22)\right] = 66{,}560$$

$$\text{New LER} = 0.3314$$

$$\text{\% Change in LER due to inflation} = \frac{0.3315 - 0.3565}{0.3565} = -7.04\%$$

Model Solution 3

Number of Claims	Trended @ 10% (Severity)
21	110
50	275
42	550
37	1,100
22	5,500

$$LER = \frac{110 \times 21 + 275 \times 50 + 500(42 + 37 + 22)}{182{,}600 \times 1.1}$$

$$= \frac{66{,}560}{200{,}860} = 33.14\%$$

$$\text{\% Change in LER} = 33.14\% - 35.65\% = -2.51\%$$

Examiner's Comments:
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Similar to Part a, a large majority of candidates correctly calculated the trend-adjusted LER. However, a good number of candidates stopped there, leaving out the final percent change in LERs that the question asked for. This was by far the most common deduction. It should also be noted that if a candidate got the wrong answer for this question due to an error in Part a, but everything else was done correctly, it was still possible to receive full credit for this part.

A small subset of candidates used an average severity approach and this was approach was an acceptable way to solve the problem.

The final answer was sensitive to the number of decimal places used in interim calculations. Credit was given regardless of the number decimals the candidate chose to use.
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Part c
Model Solution 1

LC for a straight deductible policy can increase more, because the policy is charged on excess of deductible losses. The trend on the excess, tend to increase more than the aggregate trend bc losses that have historically not pierced the layer will now, due to the trend.

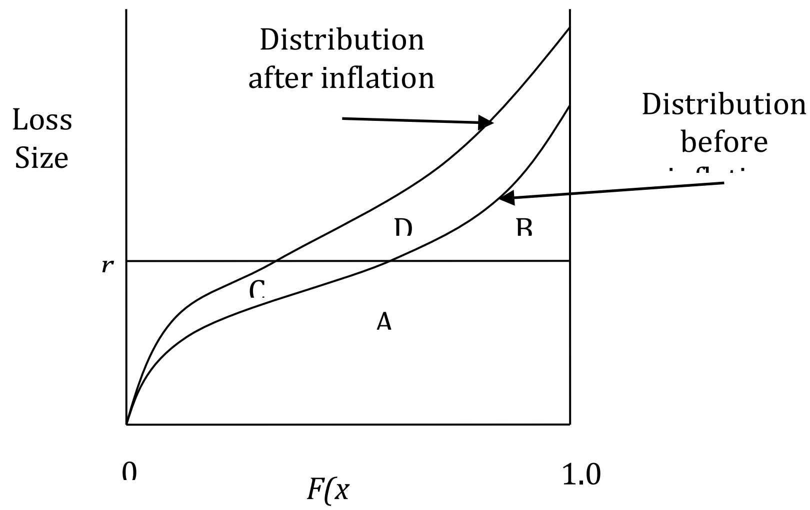
Model Solution 2

Each loss that was previously over the deductible increases by the trend, but after subtracting the unchanging deductible, the % change in the net loss is greater than the trend selection

$$\text{Example: } \left.\begin{aligned} 1{,}000\times 1.1-500=600 \\ 1000-500=500 \end{aligned}\right\} \text{20\% increase for a 10\% trend}$$

Also, new losses pierce the deductible, further increasing total losses after inflation

Model Solution 3



As can be seen graphically, when losses increase due to inflation, excess losses increases more than total losses:

$$\frac{D+B}{B} > \frac{A+B+C+D}{A+B}$$

Examiner's Comments:
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The results of this question were fairly mixed. There were several ways to get full credit here, and while most candidates received some credit, it was common to not receive full credit because of an overly brief statement that didn't fully explain why the deductible policy's loss cost could increase by more than ground-up trend.

Some candidates used a Lee diagram to show the impact of the trend on the loss cost (area above the deductible). When this diagram was accurately constructed and labeled, this approach received full credit.

Simply stating that some claims would pierce the deductible was not enough for full credit. The candidates needed to add a statement with respect to how this affected total losses in the insured layer (loss cost) or something to that effect.

Some candidates mentioned that the number of claims near the deductible, number of claims above the deductible, or some other count, explained why the loss cost could increase by more than the ground-up severity trend. The relative number of

these claims is not the reason for this phenomenon. Credit was not deducted for this statement, but it in of itself, was not enough for full credit.
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