9. (2.75 points)

Given the following information:

| | Relativities |
|---|---|
| Territory A | 0.60 |
| Territory B | 1.10 |
| Smoke Detector | 0.90 |
| No Smoke Detector | 1.00 |

| | 2014 Earned Exposures | |
|---|---|---|
| | Territory A | Territory B |
| Smoke Detector | 750 | 600 |
| No Smoke Detector | 150 | 100 |

| | Accident Year 2014 Incurred Loss and ALAE | |
|---|---|---|
| | Territory A | Territory B |
| Smoke Detector | $160,000 | $260,000 |
| No Smoke Detector | $40,000 | $52,000 |

- Base rate = $550.
- All rates are effective January 1 of each year.
- Management has decided that the relativity of the highest-rated territory will not exceed 130% of the lowest-rated territory in any future rate level change.
- Assume data for 2014 is fully credible.

a. (2.25 points)

Considering management constraints, use the loss ratio method to calculate the territorial relativity changes for a revenue-neutral overall change.

b. (0.5 point)

Evaluate the impact that the relativity changes may have on this book of business in the short and long term.

CONTINUED ON NEXT PAGE

| **QUESTION 9** | |
|---|---|
| **TOTAL POINT VALUE: 2.75** | **LEARNING OBJECTIVE: A9** |
| **SAMPLE ANSWERS** | |

**Part a:** 2.25 points

*Sample Answer 1*

| Terr | Current Premium | Loss & ALAE | LR | Ind Rel Change | Indicated Rel | Adjusted Rel | Off-balanced Rel |
|---|---|---|---|---|---|---|---|
| A | 272,250 | 200,000 | 0.7346 | 0.9462 | .6*.9462=.5677 | 1 | 0.7236 |
| B | 387,200 | 312,000 | 0.8058 | .8058/.7764=1.0379 | 1.1*1.0379=1.1417 | 1.3 | 0.9407 |
| Total | | | 0.7764 | | | | |

1.1417/.5677=2.0111 > 1.3, so adjust rel.
Then off-balance factor =
(.6*.9*750+.6*1*150+1.1*.9*600+1.1*1*100)/(1*.9*750+1*1*150+1.3*.9*600+1.3*1*100)
=.7236

*Sample Answer 2*

Territory A Premium = 750*.6*.9*550+150*.6*1.00*550=272,250
Territory B Premium = 600*1.1*.9*550+100*1.1*1.00*550=387,200
Total Premium=659,450

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| A | 0.7346 | 0.9462 | 0.5677 | 0.7236 |
| B | 0.8058 | 1.0379 | 1.1417 | 0.9407 |
| Total | 0.7764 | | | |

(1)=LR=Loss/Prem
(2)=(1)/(1 Total)
(3)=Current Rel *(2)

1.1417/.5622=2.01
(4)=New Rel meeting Requirement
X*(.9*750+1*150)*550 + 1.3X*(.9*600+100)*550=659,450
453,750X+352,000(1.3X)=659,450
X=.7236

*Sample Answer 3*

| Territory | Loss & ALAE | EP | LR | Relativity | Indicated Relativity |
|---|---|---|---|---|---|
| A | 200,000 | 272,250 | 0.7346 | 0.946 | 0.5676 |
| B | 312,000 | 387,200 | 0.8058 | 1.038 | 1.1418 |
| Total | | | 0.7764 | | |

Note that our indicated relativities don't satisfy the management request. Thus we'll cap Territory B relativity to 1.3*.5676=.7379. Now we just need to adjust the base rate to make this revenue-neutral:
Proposed premium= 659,450 =Base Rate*(.5676*(750*.9+150*1)+.7379*(600*.9+100*1))
Base Rate=$701.15, with relativities of .5676 for Territory A and .7379 for Territory B.

*Sample Answer 4*

Territory A Loss Ratio = 200000/((750*.9+150)*550*.6)=.7346
Territory B Loss Ratio = 312000/((600*.9+100)*550*1.1)=.8058
Overall Loss Ratio = 512000/(600*.9*1.1+100*1.1+750*.9*.6+150*.6)=.7764

Uncapped indicated relativity for territory A =.5677
Uncapped indicated relativity for territory B=1.1417
1.1417/.5677>1.3, so set territory B relativity to .78 (1.3x the current territory A relativity), and territory A relativity to .6.

Indicated Base Rate Change=
(600*.9*1.1+100*1.1+750*.9*.6+150*.6)/(600*.9*.78+100*.78+750*.9*.6+150*.6)-1 = 20.6%
Territory A Relativity Change = 0%
Territory B Relativity Change=.78/1.1-1 = -29.1%

**Part b:** .5 point

*Sample Answer 1*

Short term – As rates for Territory A increase and Territory B decrease, risks in A will leave the company. The company will attract more risks in Territory B since it is being subsidized by Territory A.

Long term – The company will write only in Territory B and rates will adjust to Territory B's level.

*Sample Answer 2*

Short term – Likely attract more unprofitable customers from Territory B as it is significantly underpriced and the company will lose/write fewer policies from the overpriced Territory A.

Long term – Loss ratio increases as the company experiences adverse selection.

*Sample Answer 3*

Short term – The company will still make money as it can cover the losses from Territory B with premium from Territory A.

Long term – The company will likely face adverse selection if a competitor is present.

*Sample Answer 4*

Short term – Territory A customers will be subsidizing Territory B customers.

Long term – Territory A customers will leave due to higher price and more Territory B customers will join the company due to lower price, leading to a deteriorating loss ratio.

*Sample Answer 5*

Short term – There aren't significant changes as it's a revenue neutral change.

Long term – Territory A policyholders are subsidizing Territory B so they're likely to non-renew. Territory B policyholders are paying less than they should so Territory B policyholders will buy from this insurer. As more Territory A policyholders leave and more Territory B policyholders come to the insurer, the insurer will be unprofitable.

*Sample Answer 6*

Short term – Territory A customers may change to a lower priced insurer and Territory B customers will switch to this insurer based on low rates.

Long term – This will continue to occur over the long term and eventually this insurer could become insolvent from inadequate pricing.

*Sample Answer 7*

Short term – The company will make a profit on Territory A policies and loss on Territory B policies.

Long term – The company will likely lose a larger portion of low risk policies from Territory A (which are overpriced) to competition and will keep underpriced Territory B policies. The company will need to raise rates to remain profitable.

*Sample Answer 8*

Short term – The relativity change will cause the insurer to write more policies in Territory B and fewer policies in Territory A due to adverse selection, but there can be financial balance in a short period.

Long term – The insurer's financial results will deteriorate due to the adverse selection.

*Sample Answer 9*

Short term – The change will be revenue neutral.

Long term – The company will lose business in Territory A (and gain business in Territory B) since it's overpriced and adverse selection will make the company unprofitable.

**EXAMINER'S REPORT**

**Part a**

Candidates were expected to know how to calculate rating differentials for territorial relativities and apply a cap to the relativities. To receive full credit, candidates needed to utilize the loss ratio method. Many candidates were able to correctly calculate the indicated relativities, but were unable to cap the relativities and apply a revenue-neutral offset factor.

Common mistakes included:

- Using a pure premium method to develop the indicated relativities, rather than the loss ratio method required by the question
- Incorrect calculation of premium by territory
- Incorrectly accounting for the maximum relativity difference
- Not applying the correct revenue-neutral off-balance factor

**Part b**

The candidate was expected to demonstrate an understanding of adverse selection and the conditions that may cause it. In order to receive full credit, candidates were required to evaluate the impact of the relativity changes on both Territory A and Territory B policyholders. The most common error made by candidates was failing to mention the impact on each territory. In addition, some candidates stated short term and long term effects that were not distinct and therefore only received partial credit.