13. (2.5 points)

An automobile insurance company uses the following information for ratemaking:

Earned Exposures		
	Driver Age	
Vehicle Symbol	Under 25	25 and Older
A	250	100
B	75	200
C	75	500

Driver Age	Incurred Loss and ALAE
Under 25	$235,800
25 and Older	$482,560

Current Rating Factors	
Symbol A	0.80
Symbol B	1.00
Symbol C	1.30
Under 25	1.00
25 and Older	0.75

a. (0.5 point)

Briefly discuss the use of driver age as a rating variable in the insurer's risk classification system with respect to two relevant considerations.

b. (2 points)

Calculate the indicated driver age relativities and the corresponding base rate that would achieve a revenue neutral change. Justify the selection of a methodology.

CONTINUED ON NEXT PAGE

EXAM 5 SPRING 2015 SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION: 13

TOTAL POINT VALUE: 2.5

LEARNING OBJECTIVE(S): A9

SAMPLE/ACCEPTED ANSWERS:

Part a: 0.5 point

Sample 1:

Driver age is a practical rating variable because it is easy and inexpensive to obtain and verify by DMV records or a copy of driver's license.

Sample 2:

Driver age meets the causality consideration, since young and very old drivers are thought to be less safe, due to inexperience or failing faculties.

Sample 3:

It lacks of controllability. People can't control their age, which mean the rating variable doesn't provide incentive for insurer to improve their rate level.

Sample 4:

Social (private): age is not a very private measure so insureds will not object to providing it based on privacy complaints.

Sample 5:

Measurability – this is an objective not subjective variable that can be measured.

Sample 6:

Age is not easily manipulated since it is on official documents; you are one age and it is not in the control of a person.

Sample 7:

Based on the consideration of public acceptability, driver age may be difficult to use as a rating variable because insureds may feel that providing their age is an invasion of privacy.

Sample 8:

It's allowed by law. Most state allow using age as a rating variable.

Sample 9:

EE<25 = 400
EE>25 = 800
PP<25 = 589.5
pp>25=603.20
Statistical: seems to indicate a differentiation between age since PP is diff but not in direction of current rel. May be correlation with symbol so would need to remove in calculation.

Sample 10:

However, risk classification would most likely support more homogeneous groupings than <25 vs. 25+ For instance, drivers age 70+ may have different indicated factors than ages 25-69.

Part b: 2 points

Sample 1:

Since exposures are not evenly distributed among vehicle symbol for each age classification, I will use the adjusted pure premium approach to correct for distributional bias.

Symbol	Factor	<25	>=25
A	0.8	250	100
B	1	75	200
C	1.3	75	500
Total		400	800
Avg Factor		0.93125	1.1625

Age	Adj. Exposure	Pure Premium	Ind Rel	Re-based
<25	372.5	633.02	1.1478	1
>=25	930	518.88	0.9408	0.8197
Total	1302.5	551.52		

[(400*1.00) + (800*0.75)] / 1200 = (BR Adj) * [(400*1.00) + (800*.8197)/1200]
0.833 = (BR Adj)(0.8798)
BR Adj=0.9471

Age	Relativity
<25	1
>=25	0.8197
Rev. BR=0.9471*Current BR	

EXAM 5 SPRING 2015 SAMPLE ANSWERS AND EXAMINER'S REPORT

Sample 2:

Will use adjusted PP method to deal with exposure correlation

U25 Adj exposure = 0.8(250) + 75 + 1.3(500)
=372.5
25 & Up Adj Exp = 0.8(100) + 200 + 1.3(500)
=930

Class	Adj Exp	Adj PP	Curr Rel	Prop Rel	Prop Rel Rebased	% Chg	
Und 25	372.5	633.02	1	1.148	1	0	
25 & up	930	518.88	0.75	0.941	0.819	9.2	
		551.52				6.6	Adj exp wtd avg

Off-bal = (1.066)^(-1)
New BR = (1.066)^(-1)*(Prev BR)

Sample 3:

Under 25 Adj Exp: 250*0.8 + 75*1.0 + 75*1.3
=372.5
>=25 Adj Exp: 100*0.8 + 200*1.0 + 800*1.3
=930

I used relativity adjusted exposure to minimize exposure dist. bias.

Under 25 PP = 235800/372.5
=633.02
Ind Rel: 1.00

Over 25 PP = 482560/930
=518.88
ind Rel = 518.88/633.02
=0.82

Exp Wtd Rel
Current: [1.0*400+0.75*800]/1200 = 0.833
Proposed: [1.0*400+0.82*800]/1200 = 0.888

Proposed Base Rate: B * 0.833/0.888
= 0.934*B (current base rate)

EXAM 5 SPRING 2015 SAMPLE ANSWERS AND EXAMINER'S REPORT

Sample 4:

	Exposures		
Symbol	<25	>=25	Relativity
A	250	100	0.8
B	75	200	1
C	75	500	1.3
Adjusted Exposures	372.5	930	

Age	Adjusted Exposures	Loss/ALAE	PP	Ind Rel	Rel Current	% Chg
<25	372.5	235800	633	1	1	0%
>=25	930	482560	519	0.819	0.75	9.30%
						6.20% wtd by actual exp

Assuming current base rate is 100
New Base Rate = 100/1.062 = 94.17

Use the adjusted pure premium approach to take into consideration the correlation btw exposures.

Sample 5:

DA	Adj Exposure	L&ALAE	PP	Ind to Tot	Ind to Base
Under 25	250*0.8 + 75*1 +7 5*1.3 = 372.5	235.8	0.633	1.1478	1
25 & Older	930	482.56	0.5189	0.9409	0.8197
Total	1302.5	718.3	0.5515	1	

The new differential is 1 and 0.827

Bp = (Pp-Ap) / Sp

Symbol Avg Diff = (280 + 275 + 747.5) / (350 + 275 + 575)
=1.0854

Driver Age = (400 + 800*0.8197) / (400 + 800)
=0.8786

Pp - Ap = (235,800 + 482,560) / 1200
= 598.63

Bp = 598.63 / (0.8786 * 1.0854)
=627.76

The adj PP method and avg differential method chose to encounter different distribution of risks.

EXAMINER'S REPORT:

General Commentary

Candidates performed well on this question.

Part a

The candidate was expected to be able to identify criteria for evaluating the appropriateness of rating variables. The candidate was also expected to be able to evaluate driver age with respect to each of the two criteria.

A common mistake was to identify and describe a relevant criterion but to omit any evaluation of driver age.

Part b

The candidate was expected to be able to apply the adjusted pure premium method to develop rating factors and calculate the corresponding base rate offset.

The candidate was expected to identify the distributional bias in the exposures and recognize the adjusted pure premium method was most appropriate given the bias and the data provided. Most candidates used the correct method. A common error was using the adjusted pure premium method correctly but not justifying the selection of a method.

The candidate was also expected to apply the adjusted pure premium method using the data provided to determine the driver age rating factors. Candidates generally did well on this portion of the question. A common error was incorrectly adjusting the exposures for the average symbol relativities by driver age.

Finally, the candidate was expected to calculate the base rate offset that, when implemented with the new driver age factors, would result in a revenue-neutral change. Since no current base rate was provided, the candidate was expected to calculate the base rate offset/off-balance factor, assuming a current base rate and correctly offsetting to develop a proposed base rate, or to calculate the proposed base rate using the symbol and driver age factors with the assumption that total premiums were equal to total losses and ALAE. Common errors included:

- Calculating the off-balance factor using the change in the driver age factor for one age group rather than for the entire book of business
- Applying the average driver age change directly to the base rate rather than inverting it to calculate an off-balance factor

- Developing the percentage change by driver age group but not doing any additional calculations
- Developing the proposed base rate assuming total premiums equaled total losses and ALAE but did not account for the symbol factors in calculating the base rate