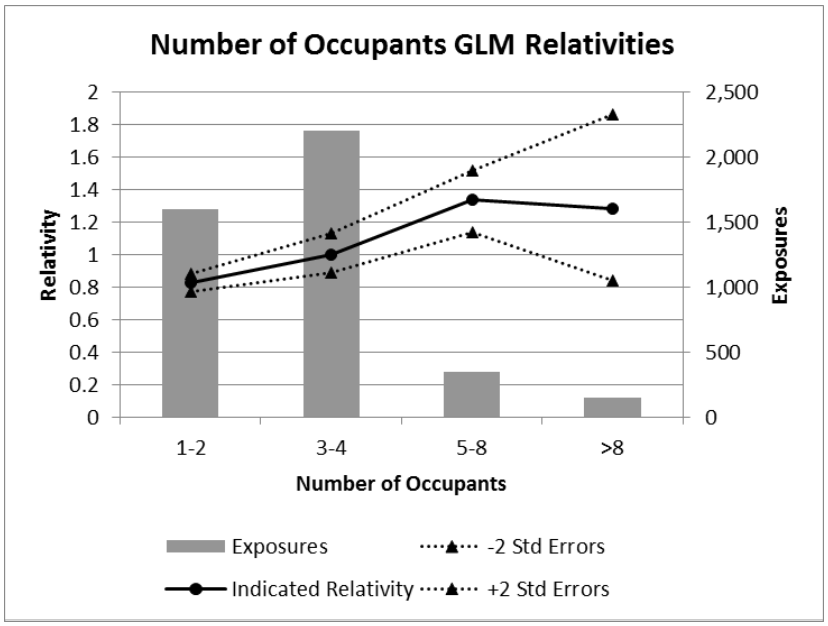
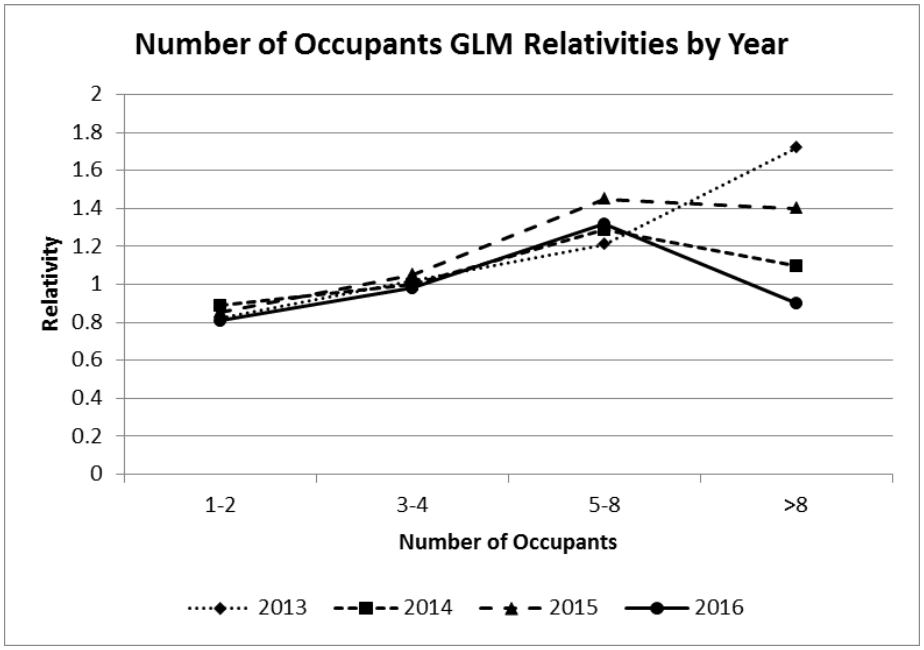
8. (1.75 points)

A company's current rating plan for fire coverage for personal property insurance only includes territory. The following GLM outputs and experience are from a recent analysis of pure premium:



Number of Occupants	1-2	3-4	5-8	>8
Indicated Relativity	0.83	1.00	1.34	1.28



- Number of occupants chi-squared percentage (entire variable) = 3.2%

<QUESTION 8 CONTINUED ON NEXT PAGE>

8. (continued)

a. (0.75 point)

Fully justify whether number of occupants would be an appropriate addition to the rating classification plan.

b. (1 point)

Identify and briefly describe two types of insurance environments which may discourage use of multivariate methods.

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EXAM 5 SPRING 2017 SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION 8	
TOTAL POINT VALUE: 1.75	**LEARNING OBJECTIVE: A8**

SAMPLE ANSWERS

Part a: 0.75 point

Sample 1

Number of occupants would be an appropriate addition to the rating classification plan.

There's a clear upward trend in the indicated relativity with the increasing number of occupants clearly showing in the 1st graph and the CI is very small for # occupants 1-2 & 3-4 which has a clear different indicated relativity. Even though the CI for >8 is quite wide, it's due to lack of data.

In the second graph, the indicated relativity is very consistent through 2013-2016, which means the number of occupants is a good rating variable. The >8 variable is not consistent again due to lack of data.

Overall the chi-squared percentage is small enough.

Sample 2

I believe it would, but I would combine the 5-8 and 8+ groups into one as they are both quite small and the 8+ group is very volatile (not credible). However, there is a clear relationship in the data and a logical relationship that more people in the home means greater potential for fire or accidents.

Sample 3

Number of occupants should be a new rating variable.

Statistical significance: the expected loss increases as the number of occupants increases except for class >8: the results are statistically significant with acceptable confidence – the indicated relativity is within 2 std error lines.

The expected loss cost by class is fairly consistent over the years with 2013 year has a slightly different pattern. This is due to low volume of data in class >8. The fix is to group class 5-8 and >8 together.

Objective: the variable is objective and well-defined. It will be easy to administer.

Legal: this variable should comply with law and regulations review needed upon implementation

Part b: 1 point

Sample 1

A tightly regulated department of insurance might disallow the use of multivariate methods and impose restrictions on the local insurance environment.

When entering a brand new type of insurance market, often data is too limited to be able to accurately implement a multivariate method and other approaches are preferred.

Sample 2

Regulation – If a prescribed method is enforced by law which is not a multivariate method then it must be used.

Operational constraints – If the insurer does not have the Systems/computing power to make use of multivariate methods and the cost/benefit does not favor upgrading systems then multivariate methods would be discouraged

Sample 3

Some regulatory bodies do not allow multivariate methods for pricing. One example is California Private Passenger Auto where the process uses simple factor selection combined with the adjusted pure premium method.

Large commercial policies, such as large deductible or retro rated policies. The multivariate methods would likely have difficulty due to the volume of data and unique characteristics of each policy.

Sample 4

If an insurer is a monopolistic or otherwise competitive limited environment, there will be little competitive pressure to go through the costly hassle of multivariate ratemaking

An insurer may operate in a territory or LOB where regulators deem the multivariate ratemaking is inequitable, and may require the insurer to use community rating.

EXAMINER'S REPORT

Candidates were expected to interpret the graphs displayed, to determine whether number of occupants should be added to the insurers' rating plan for the fire coverage. Candidates were also expected to identify and explain two environments where use of multivariate methods would be discouraged.

Part a

Candidates were expected to interpret the sample GLM output to determine that the variable was statistically significant because it 1) had an increasing trend with fairly narrow standard errors, 2) was relatively consistent over time, and 3) had a chi-square statistic below the 5% threshold for determining if a variable should be used in a model.

Common errors included:

- Describing the variable simply as "statistically significant" without providing rationale and interpretation of the results.
- Recommending to implement the variable only based on narrow standard errors and not mentioning the slope of the indicated relativities.
- Recommending not to implement the variable solely due to the volatility of the >8 category.
- Not providing a recommendation on if the variable should be implemented.

Part b

Candidates were expected to identify and briefly explain two environments where multivariate methods were discouraged.

Candidates did not receive full credit for describing regulatory challenges due to inability to implement the insurer's desired rating variables. Regulatory limitations in allowable rating variables is not solely a reason to discourage use of multivariate methods.

Candidates did not receive credit for mentioning an environment where it's known the variables have no correlation. Multivariate methods analyze factors to account for possible correlation between variables, even if the correlation is not intuitive.

Common errors included:

- Listing only one environment/explanation.
- Providing two environments that were nearly identical and not distinct from one another.
- Stating that insurers should forgo multivariate methods due to regulatory limitations in allowable rating variables.
- Stating that multivariate methods would be discouraged solely due to non-intuitive results for a factor in the model.