11. (2.25 points)

Given the following information:

	Policies with a $100,000 Limit		Policies with a $250,000 Limit		Policies with a $500,000 Limit	
Size of Loss	Claims	Losses	Claims	Losses	Claims	Losses
X <= $100,000	100	$8,000,000	35	$1,800,000	35	$1,800,000
$100,000 < X <= $250,000			40	$7,400,000	25	$3,900,000
$250,000 < X <= $500,000					15	$5,200,000

Limit	Indicated factor (pure premium generalized linear model analysis)
$100,000	1.00
$250,000	0.95
$500,000	1.15

For the $250,000 policy limit:

a. (1.25 points)

Calculate the indicated increased limits factor, assuming a basic limit of $100,000.

b. (0.5 point)

Explain the difference between the indicated increased limits factor calculated in part a. above and the generalized linear model results.

c. (0.5 point)

Select an increased limit factor and briefly explain the rationale for the selection.

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Exam 5 – Question #11

A. LAS(look) = 8,000,000 + 1,800,000 + 1,800,000 + 100,000 x (40 + 25 + 15) = 19,600,000

19,600,000/250 = 78400
↓
# of Claims

Avg. loss in layer 100k – 250k = 7,400,000 – 40 x 100,000 + 3900000 – 25 x 100,000 + 15 x 150,000
7,050,000/150 = 47000
↓
Claims in layers with limit ≥ 250k

$$ILF = \frac{78400 + 47000}{78400} = 1.59949$$

Or

A. $$LAS(100k) = \frac{8000k + 1800k + 1800k + (40 + 25 + 15) \times 100k}{100 + 35 + 35 + 60 + 25 + 15} = 19{,}600k/250 = 78{,}400$$

$$LAS\ (100k – 250k) = \frac{7400k – 40 \times 100k + 3900k – 25 \times 100k + (250k – 100k) \times 15}{40 + 25 + 15} = 7050k/80 = 88{,}125$$

LAS(250k) = 78,400 + 88,125 x 80 / (80 + 35 + 35)= 125,600

ILF (250k) = 125,600/78,600 = 1.599

B. GLM does not assume that the frequency is the same for all risks. It takes into account both the limiting of losses and behavioral differences of insureds. This can result in counter intuitive results, like lower ILFs for higher policy limits.

Or

B. The calculation in part A assumes equivalent claimant behavior and frequency throughout each level whereas a GLM will account for the differences in the model. The GLM will sometimes create results that are counter intuitive.

C. Want to also look at 500K LDF
Avg loss in layer 250k – 500k = [5,200,000 – 15 x 250,000]/75 = 19,333

$$\text{ILF (500k)} = \frac{78400 + 47000 + 19333}{78400} = 1.84609$$

For selection, should rely on GLM output – it takes into account behavioral differences, and better handles the analysis when there are fewer claims in the larger layers. 250k ILF should be > 1 and less than 500k ILF and 1.15. I would select 1.10 since ILFs tend to increase at a decreasing rate as you hit higher layers, due to smaller probability of having a loss that large.

Or

C. Despite the fact that the GLM accounts for frequency differences between limits, the calculated ILF for 250k using the GLM analysis does not make intuitive sense. It is smaller than the ILF @ 100k – but, we'd expect more losses when moving to a higher limit. Therefore, I'll select 1.6 (which was calculated in (a) above).

Or

C. Sel 1.1

GLM output unconventional due to frequency (part b)
Doesn't make sense to charge less premium for a higher policy limit.
250k ILF should be between 100 k and 500k ILFs. 1.10

Or

C. I would select a factor of 1.09375 = (150/400)(.15) + 1
It is not reasonable to assume uniform frequency. However, due to the reversal in the GLM, I interpolated linearly between the indicated factor for $100k and $500k.

11.

a. The majority of candidates scored well on this part. This question involved a straightforward calculation.

b. Almost half of all candidates received full credit on this part for indicating that, unlike the traditional ILF approach used in part a., the GLM approach does not assume frequency is the same for all limits, or that the GLM approach recognizes behavioral differences among insureds at different limits.

   A small group of candidates received partial credit for indicating that the GLM approach considers correlations between rating variables or for making a less-than-fully-formulated attempt to explain that the GLM method is influenced by frequency or behavioral differences.

   A large group of candidates received no credit for stating that the GLM-indicated ILF considers all variables simultaneously , considers other variables, considers correlation between limits, is distorted due to low volume, is distorted due to low credibility, considers variability in higher layers, etc. While these statements may be true, they are not the correct explanation for the difference between the two indicated ILFs in this problem. Certain arguments, such as sparse data and low credibility were pointed out to critique one of the methods without addressing that this issue would in fact impact both methods and addressing the degree to which each of the methods would be impacted. Some candidates assumed the GLM used a curve-fitting procedure and thus better dealt with sparse data, which does not appear consistent with the indicated ILFs from the GLM.

c. The majority of candidates received full credit on this part, providing both an acceptable selection and rationale for that selection. Candidates received full credit for selecting the traditionally-calculated ILF and citing that the GLM-indicated ILF results in a counterintuitive/unreasonable/nonsensical factor relative to the factors for the $100K and $500K limit, or in discontinuities/reversals. However, candidates who selected the GLM-indicated factor, due to its recognition of frequency or behavioral differences, its sophistication/comprehensiveness, or its recognition of correlations between rating variables also received full credit. Similarly, weightings of the two, if appropriately determined, were awarded full credit.

   Another large group of candidates received partial credit, typically for providing a reasonable selection as discussed above, though without any supporting explanation, or with inapplicable support.