7. (2.5 points)

An actuary is modeling the impact of dispersion on loss development and excess ratios. The actuary has assumed that undeveloped losses are uniformly distributed between $0 and $120,000.

a. (1 point)

Calculate the excess ratio at $75,000.

b. (1 point)

Assume a simple dispersion model such that each loss has an equal likelihood of developing by a multiplicative factor of 0.75, 1.00 or 1.25.

Given the following, calculate the excess ratio at $75,000 with simple dispersion.

Loss	Excess Ratio
$50,000	0.3403
$56,250	0.2822
$60,000	0.2500
$93,750	0.0479
$100,000	0.0278
$110,000	0.0069

c. (0.5 point)

Briefly explain two impacts that simple dispersion has on excess ratios.

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Question 7:

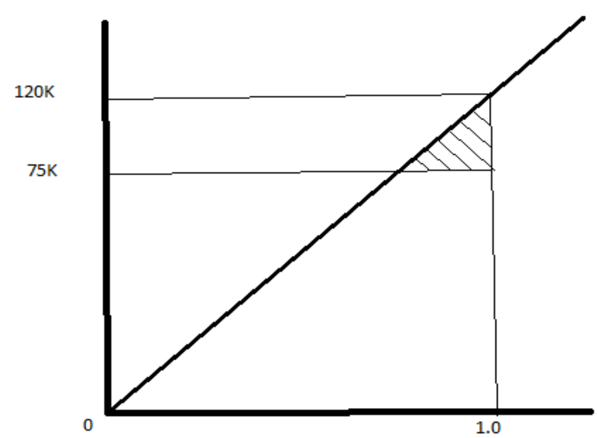
Part a
Model Solution 1

$$E(X) = \frac{1}{120}\int_0^{120} x\,dx = \frac{1}{120} * \left(\frac{120^2}{2}\right) = 60$$

$$R(75) = \frac{\left[\frac{1}{120} * \int_{75}^{120} (x - 75)\,dx\right]}{E(x)}$$

$$R(75) = \frac{8.4375}{60} = 0.1406$$

Model Solution 2



Excess ratio at 75,000 = {(120-75)/120}^2 = 0.1406

Examiner's Comments:
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Part (a) was very straightforward and most candidates did very well.

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Part b
Model Solution

$$R\hat{}(75) = \frac{1}{3}\left[0.75 * R\left(\frac{75}{0.75}\right) + 1.00 * R\left(\frac{75}{1.00}\right) + 1.25 * R\left(\frac{75}{1.25}\right)\right]$$

$$R\hat{}(75) = \frac{1}{3}[0.75 * R(100) + 1.00 * R(75) + 1.25 * R(60)]$$

R(75) = 0.1406 (from part a)

R(100) = 0.0278 (from excess ratio table)

R(60) = 0.25 (from excess ratio table)

$$R\hat{}(75) = \frac{1}{3}[0.75 * 0.0278 + 0.1406 + 1.25 * 0.25] = 0.1580$$

Examiner's Comments:

****

On part (b), most candidates did well and utilized the developed loss excess ratio formula correctly. The most common mistakes were:

- Confusing multipliers with divisors
- Simply averaging R(60,), R(75) and R(100) instead of weighting them by the multiplier

If the candidate interpolated the value of R(75) from the table using linear interpolation, instead of using the answer from part (a), we have given full credit for this approach. The interpolated value of R(75) = 0.1602

There were a handful of candidates that calculated the values of R(100) and R(60), instead of picking the values directly from the table. If the calculation was done correctly, the answer should be the same as the value in the table and they were not penalized for this.

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Part c
Model Solution

Impacts of dispersion on excess ratios:

- Dispersion produces more excess losses without affecting total expected losses.
- Dispersion raises the excess ratios for higher limits and alters those for lower limits.

Examiner's Comments:
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On part (c), points were given to other valid answers that were not listed in the model.

<u>Other possible solutions:</u>

- The higher the variation (or C.V) of dispersion, the higher the excess ratio
- Dispersion increases the variation (CV /uncertainty/variability) of excess ratio
- Simple dispersion will result excess ratio > 0, when excess ratio = 0 when no simple dispersion
- The impact of simple dispersion on excess ratios is less than the impact of the Gamma distribution.
- The impact of uniform dispersion on excess ratios is less than the impact of simple dispersion

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