13. (2 points)

A Table M is constructed based on the experience of the following 10 similarly sized risks:

Risk	Aggregate Loss Ratio
1	10%
2	30%
3	35%
4	40%
5	60%
6	75%
7	X%
8	90%
9	110%
10	120%

X is the aggregate loss ratio for Risk 7.

Assume:

- $75\% \leq X \leq 90\%$
- The Table M charge at entry ratio 1.5 is 0.05.

Calculate X.

CONTINUED ON NEXT PAGE

EXAM 8 FALL 2014 SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION 13

TOTAL POINT VALUE: 2 **LEARNING OBJECTIVE: B2**

SAMPLE ANSWERS

Sample 1 (Vertical slices approach)

Average Loss ratio = $\frac{.1+.3+.35+.4+.6+.75+X+.9+1.1+1.2}{10}$ = 0.57+.1X
Loss ratio is between 64.5% and 66%
LR * Entry ratio (1.5) is between 96.75% and 99%
so only losses 9 & 10 contribute to the charge. Therefore:

0.05 = $\frac{[1.2-1.5*(0.57+.1X)]+[1.1-1.5*(0.57+.1X)]}{10*(0.57+.1X)}$
.5*(0.57+.1X) = 2.3 – 3*(0.57+.1X)
3.5*(0.57+.1X) = 2.3
0.57+.1X = 0.657
X=87.14%

Sample 2 (Horizontal slices approach)

Φ(1.5) = 0.05
Unlimited LR mean = $^{1}/_{10}\,[0.1+0.3+0.35+0.4+0.6+0.75+0.9+1.1+1.2+X]=M$
0.57+$^{X}/_{10}$ = M
r = $\frac{\text{risk LR}}{0.57+^{X}/_{10}}=1.5$
risk LR = 0.855+0.15X

since 0.75 ≤ X ≤ 0.9 0.645 ≤ mean ≤ 0.66
0.9675 ≤ risk LR ≤ 0.99

Only 9 & 10 are above 0.9675 and 0.99.

r	LR	# risks	risks above	% risk above	$\Phi(r_i)=\Phi(r_{i-1})+(r_i-r_{i-1})*(\%above)$
1.5			2	0.2	$0.05=Y_1+\left(^{11.1}/_{M}-1.5\right)*(0.2)$
1.667 ≤ r ≤ 1.7057	1.1	1	1	0.1	$\left(\frac{1.2}{M}-\frac{1.1}{M}\right)*(0.1)=Y_1$
1.818 ≤ r ≤ 1.86	1.2	1	0	0	0

M = mean

$0.05 = \left(\frac{1.2}{M} - \frac{1.1}{M}\right) * 0.1 + \left(\frac{1.1}{M} - 1.5\right) * (0.2)$

$0.05 = \frac{0.01}{M} + \frac{0.22}{M} - 0.3$

$0.35 = \frac{0.23}{M}$

$M = 0.657 = 0.57 + \frac{X}{10}$

X = 87.14%

Sample 3

Average Loss ratio = $\frac{.1+.3+.35+.4+.6+.75+X+.9+1.1+1.2}{10}$ = 0.57+.1X

At x = 75%: E(A) = 0.645

r=1.5→ LR_r = 0.9675

$$\frac{{}^{1}/_{10}\left[(1.1 - 0.9675) + (1.2 - 0.9675)\right]}{0.645} = 0.057$$

At x = 82%: E(A) = 0.652

r=1.5 → LR_r =0.978

$$\frac{{}^{1}/_{10}\left[(1.1 - 0.978) + (1.2 - 0.978)\right]}{0.652} = 0.0527$$

At x = 85%: E(A) = 0.655

r=1.5 → LR_r =0.9825

$$\frac{{}^{1}/_{10}\left[(1.1 - 0.9825) + (1.2 - 0.9825)\right]}{0.655} = 0.0511$$

At x = 86%: E(A) = 0.656

r=1.5 → LR_r =0.984

$$\frac{{}^{1}/_{10}\left[(1.1 - 0.984) + (1.2 - 0.984)\right]}{0.656} = 0.0506$$

At x = 87%: E(A) = 0.657

r=1.5 → LR_r =0.9855

$$\frac{{}^{1}/_{10}\left[(1.1 - 0.9855) + (1.2 - 0.9855)\right]}{0.657} = 0.05$$

X = 87%

EXAMINER'S REPORT

This question was more challenging than a standard table M construction question. It required candidates to understand the interplay between the loss ratio, the entry ratio, the charge, and the calculation of the charge. Many candidates scored very well. While some candidates were able to get to the final answer by testing various values of x and calculating the resulting charge, the optimal approach to complete was to set up

the charge calculation in terms of x and set equal to 0.05, which many candidates were not able to do. Both the horizontal and vertical slicing methods of calculating the charge were used successfully.

In any approach, the use of the range was helpful in determining that only risks 9 & 10 would be included in the calculation, but a common mistake was not using that information and including more risks.

Another common mistake was an error in the setup of the equality, such as not dividing the calculation by the average loss ratio. Others set everything up correctly but had an algebra error in solving for x.