17. (3.5 points)

A large insured is considering a retrospectively rated policy for its workers compensation coverage with the following characteristics:

Standard premium:	$1,000,000
Unlimited expected loss ratio:	65%
Expense ratio:	20%
Loss conversion factor:	1.10
Premium tax rate:	4.0%
Maximum premium:	$1,200,000
Minimum premium:	$750,000

The actuary will use the following tables for rating:

Entry Ratio	Expected Loss Group (ELG)					
	31	30	29	28	27	26
0.70	0.4026	0.4000	0.3975	0.3949	0.3924	0.3898
0.80	0.3912	0.3826	0.3740	0.3656	0.3581	0.3489
0.90	0.3519	0.3426	0.3334	0.3242	0.3189	0.3060
1.00	0.3135	0.3037	0.2938	0.2839	0.2809	0.2642
1.10	0.2777	0.2673	0.2570	0.2464	0.2416	0.2254
1.20	0.2519	0.2413	0.2307	0.2200	0.2093	0.1986
1.30	0.2300	0.2194	0.2088	0.1981	0.1874	0.1766
1.40	0.2081	0.1975	0.1868	0.1761	0.1654	0.1547
1.50	0.1863	0.1756	0.1649	0.1542	0.1435	0.1327
1.60	0.1644	0.1537	0.1429	0.1322	0.1215	0.1107

ELG	Expected Loss Range
31	630,000 - 720,000
30	720,001 - 830,000
29	830,001 - 990,000
28	990,001 - 1,180,000
27	1,180,001 - 1,415,000
26	1,415,001 - 1,744,000

Per Occurrence Limit	Excess Loss Factor
$50,000	0.214

a. (0.5 point)

Determine the guaranteed cost premium.

<<QUESTION 17 CONTINUED ON NEXT PAGE>>

b. (2.25 points)

Determine the basic premium for a $50,000 per occurrence limit.

c. (0.75 point)

The insured's risk manager believes the retrospective premium can be reduced by selecting a higher per occurrence limit because the insured will assume a greater portion of the losses.

Evaluate the risk manager's assertion.

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EXAM 8 FALL 2014 SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION 17

TOTAL POINT VALUE: 3.5 **LEARNING OBJECTIVE: B5, B6**

SAMPLE ANSWERS

Part a: 0.5 point

$$GCP = (e + E)T \cdot SP$$

$$T = \frac{1}{1-\tau} = \frac{1}{1-.04}$$

$$GCP = \frac{(.2 + .65)}{.96} \cdot 1{,}000{,}000 = 885{,}417$$

Part b: 2.25 points

$$Adj\ E = \frac{1 + .8LER}{1 - LER} \cdot E \cdot SP = \frac{1 + .8(.214/.65)}{1 - (.214/.65)} \cdot 650{,}000 = 1{,}224{,}266 \Rightarrow ELG\ 27$$

Set up balance equations:

$$r_G - r_H = \frac{G - H}{c\hat{E}T} = \frac{1.2 - .75}{\frac{(1.1)(.65 - .214)}{.96}} = .9008$$

$$\hat{X}_H - \hat{X}_G = \frac{e + E - {}^{H}/_{T}}{c\hat{E}} = \frac{.2 + .65 - (.75)(.96)}{(1.1)(.65 - .214)} = .2711$$

In ELG 27, $r_G = 1.6$ and $r_H = .7$, and $\hat{X}_G = .1215$ and $\hat{X}_H = .3924$, satisfy both equations.

Calculate the savings at r_H as

$$\hat{S}_H = \hat{X}_H - 1 + r_H = .3924 - 1 + .7 = .0924$$

Now calculate the basic premium factor:

$$\hat{b} = e - (c-1)E + c\hat{I} = e - (c-1)E + c\left(\hat{X}_G - \hat{S}_H\right)\hat{E}$$
$$= .2 - (1.1 - 1)(.65) + (1.1)(.1215 - .0924)(.65 - .214) = .148956$$

$$\Rightarrow basic\ premium = \$148{,}956$$

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Part c: 0.75 point

Sample 1
(*Assuming "retrospective premium" means "expected"*)

If per occ. Limit is higher, the charge for it is lower, but the losses that enter the calculation are higher. If the plan is balanced, expected retro premium = guaranteed cost. Changing the per occ limit does not change GCP and so expected retro premium stays the same.

Sample 2
(Assuming "retrospective premium" means "expected")

$E(R^*) = (b + c*E(L^*) + cPF)*T$

If the plan is balanced than $E(R^*) = GCP$ so the exp. Retro prem. Should stay the same, i.e., when per occ limit increases the charge for this limit goes down (cPF above), but portion of insureds converted expected loss $c*E(L^*)$ will go up accordingly. If these two offset as in a balanced plan, then the insured is paying the same prem regardless of the per-occ limit.

Sample 3
(Assuming "retrospective premium" means "actual")

A higher per occurrence limit would actually result in more of the losses being included in the retro premium calculation from a single accident, so the impact on premium would depend on the insureds expected losses. A higher per occurrence would mean a lower excess loss factor in the Retro Prem = (b +cF+cL)T equation so if they had smaller losses than the current per occurrence limit anyways, then it may be more beneficial to increase the per occurrence since those losses are not going to hit the higher limit.

EXAMINER'S REPORT

General Commentary

Overall, this question tested a candidate's ability to calculate components of retro premium, and to describe impacts of parameter shifts on this premium.

Part c was challenging and required a solid understanding of the mechanics of retro plans and premium. Many candidates who received full or almost full credit on parts a and b still struggled on part c, citing irrelevant facts or incorrectly interpreting how retrospective premium is actually calculated (e.g believing retro premium is based on actual excess losses, or that the insurance charge changes with experience).

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Part a

This question required the candidate to recall two formulas. To get full credit, the candidate needed to know the formula for guaranteed cost premium and the tax multiplier, and to perform the calculation correctly.

Most candidates received partial or full credit. By far the most common error was to miscalculate the tax multiplier T. Many candidates assumed T = 1.04, which is incorrect.

Part b

This question tested the candidate's ability to perform the ICRLL procedure, to use the balance equations with a per occurrence limit, and to calculate a basic premium. To get full credit, the candidate needed to recall and execute this entire process, as well as perform all calculations.

Candidates' scores varied widely as would be expected given the wide scope of the question and the number of calculations involved. There were several common errors candidates made, including:

- Failing to calculate an adjusted *E* (and using $650,000), resulting in an incorrect ELG;
- Using *E* instead of $\hat{E}$ in the denominators of the balance equations;
- Neglecting the balance equations altogether, and assuming entry ratios of 1.2 and .75;
- Incorrectly using *E* and $\hat{E}$ in the calculation of the basic premium.

Partial credit was awarded to candidates who correctly wrote the formula for *b* (but failed to calculate it), but only if they correctly identified each component (including the change and savings, and limited and unlimited expected losses).

Candidates who did not actually perform the Table M lookup due to either time constraints or incorrect balance equations could still receive credit if they adequately described the lookup, including the iterative aspect of it.

If the candidate used 1.04 for the tax multiplier in part a, no further credit was deducted in part b for carrying that error through.

No credit was deducted for candidates who didn't convert the basic premium to dollars, or for candidates who included the converted ELF in their basic premium; even though neither is done in the source material, both are standard industry practices.

EXAM 8 FALL 2014 SAMPLE ANSWERS AND EXAMINER'S REPORT

Part c

This question tested the candidates' understanding of how retro premium is impacted via changes in retro parameters. Furthermore, it tested the candidate's understanding of how retro premium "works" beyond the basic calculations in part b.

Very few candidates received full credit on this subpart. The most common reason was the candidate assuming "retrospective premium" meant "basic premium", which is incorrect. Two meanings of "retrospective premium" were accepted: expected retrospective premium, and actual retrospective premium.

If the candidate assumed that "retrospective premium" meant "expected", then a full credit response was one that recognized that in a balanced plan, the expected retro premium *always* equals the guaranteed cost premium, and thus will not change due to a shift in parameters. An increase in per occurrence limit would lead to a decrease in the ELF, and an increase in both the limited expected loss and insurance charge. These movements would fully offset one another and leave the expected retro premium unchanged.

Many candidates cited the overlap between the ELF and insurance charge as an argument for or against the assertion, but this was not accepted. The ICRLL procedure is designed to correct for the overlap, and thus the overlap issue does not apply.

A candidate who recognized one or more values that would shift, correctly identified the direction(s) of the shift, and provided a clear explanation for why they would shift, received partial credit.

A candidate who recognized two or more values that would shift, *and* identified that the shifts would offset one another, *but* didn't recognize that the offset would be dollar for dollar, also received partial credit.

If the candidate assumed that "retrospective premium" meant "actual", then a full credit response needed to clearly articulate the relationship between the insured's actual losses and their expected losses. Specifically, the candidate needed to demonstrate that the insured would save premium only if their actual losses were lower that what the E and ELF would anticipate.

In this case, partial credit answers recognized the connection between retro premium and losses, but failed to solidly connect these to expected losses.

There was a surprising number of candidates who scored well in Parts a and b but received no credit for Part c. It might be that those candidates were overly focused on memorization and not sufficiently focused on understanding the material in depth.