11. (2.5 points)

The following formula is used by the National Council of Compensation Insurance (NCCI) to calculate workers compensation experience modifications under its Experience Rating Plan:

$$M = \frac{A_p + WA_e + (1-W)E_e + B}{E + B}$$

where $W = \frac{E-B}{E+K}$ and B and K vary by size of risk.

a. (0.5 point)

Explain the assumptions behind the theory that B and K should be constant for all risk sizes.

b. (0.5 point)

Critique the theory that B and K should be constant for all risk sizes.

Suppose a new experience rating plan is proposed such that B and K are constant for all risk sizes.

c. (1 point)

Fully explain a valid method that can be used to assess the performance of the proposed plan as compared to the current NCCI plan.

(0.5 point)

Assess the impact of implementing the newly proposed experience rating plan in a competitive market.

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EXAM 8 FALL 2014 SAMPLE ANSWERS AND EXAMINER'S REPORT

QUESTION 11

TOTAL POINT VALUE: 2.5 points **LEARNING OBJECTIVE: B4**

SAMPLE ANSWERS

Part a: 0.5 point

Sample 1

According to the law of large numbers, large risks should be more stable than small risks. Keeping these numbers constant gives much more credibility to large risks than small risks.

Sample 2

If B&K are constant, their variances of losses should decrease proportional to the inverse in risk size, leading to self-rating for large risks.

Part b: 0.5 point

Sample 1

Empirical data shows that the variance of loss ratios did not decrease that quickly as size of risk increases.

Sample 2

It has actually been shown that the variance of large insureds does not decrease as fast as one would expect, so B&K should not be constant because this gives large risks too much credibility. There are certain circumstances that affect small and large insureds the same regardless of size.

Sample 3

WC loss experience does not follow the law of large numbers due to the long tailed nature of the business. Also, large insureds have more loss ratio variance due to diverse operations and exposures.

Part c: 1 point

Sample 1

Quintile test. For each plan, group by risk size. For each risk size, sort risks by mod.

Group into 5 groups. Calculate the standard loss rations and manual loss ratios for each quintile group. Calculate the test statistic for each plan: variance (standard loss ratio)/variance (manual loss ratio). The plan with the lower test statistic performs better.

Sample 2

I would apply an efficiency test. I would sort by determining the current mod and the proposed mod for each risk. Then I would sort the modes into quintile groups (in increasing order of mods) for both current and proposed. I would then calculate the sample variance of the manual loss ratios and standard loss ratios for both plans. Then find the test statistic equal to variance (SP LR)/variance (MP LR) for current and proposed. I would confirm that the proposed plan performs better if the test statistic is smaller than the test stat in the current plan.

Part d (not labeled correctly on exam): 0.5 point

Sample 1

It will assign smaller credibility to small risks and assign too much credibility to large risks. Small risk with credit mod will become preferred business because their premium is higher because of low credibility. Because of that, in a competitive market, rates will go down for those preferred risks (demand stays the same while offer increases will push down prices). The same will happen to large risk with debit mod (they will pay too much, offer increases while demand stays equal, and rates decrease).

Sample 2

If B&K are constant, not enough credit will be given to small risks and too much will be given to large risks. Small accounts with a credit mod and large accounts with a debit mod will become preferred business, and companies will adjust their pricing accordingly.

EXAMINER'S REPORT

General Commentary

On the exam, there was an error in the formula for W in the stem of the question. This was unintended, and the equation should have been:

$$W = \frac{E + B}{E + K}$$

EXAM 8 FALL 2014 SAMPLE ANSWERS AND EXAMINER'S REPORT

Candidates responded in two different ways. Some responded as the question was written and some responded as the question was intended. Both responses were acceptable and could receive full credit.

Part a

To receive full credit, candidates should demonstrate two key points:

1. How variance of loss relates to size of risk
   - The theory is based on the law of large numbers
   - The Variance of the loss ratio is inversely proportional to the size of the insured.
2. How variance ties to credibility/stability by risk size
   - Large Risks approach full credibility / Self-Rating
   - Large Risks are more stable
   - The largest risks are more credible/predictable

Common errors made by candidates included:

- Confusing constant B & K with constant credibility
- Asserting the general constraints behind any credibility standard (such as $0<Z<1$)
- Focusing on the effect of B&K constant (cred grows) without describing why

Part b

Candidates were expected to make at least two of three key points:

1. How should B & K behave?
   - B & K should increase with size of risk
   - No risk should be fully self-rated
2. What support is there for the B & K not being constant?
   - NCCI studies showed variance for larger risks did not decline as fast as predicted.
   - Historical experience does not support the theory.
3. Why might B & K not be constant?
   - Some sources of variation do not decrease with size (changing conditions, parameter risk)
   - As risks get larger, they are more likely to have diverse operations (heterogeneity)

Common errors made by candidates included:

- Explaining B&K "should vary" (which the question states is currently done) without also why and/or what that would imply
- B&K stabilize loss experience, so larger risks need a proportionally bigger B&K

EXAM 8 FALL 2014 SAMPLE ANSWERS AND EXAMINER'S REPORT

Part c

Candidates were expected to discuss a quintiles test in order to receive full credit. However, alternative solutions were accepted as well and could receive full credit.

For example, the Gillam paper compares the quintile test with the efficiency test which does not require grouping by mods. So where the candidate explained they were using the efficiency approach, we accepted this in place of the mod. Other methods were also accepted and could receive full credit if the candidate could explain how the method was appropriate.

Common errors made by candidates included:

- Looking at new plan statistics without comparing to current NCCI plan
- Improperly setting up metric, inverting the ratios, or miscalculating the variances

Part d

Almost half the candidates did not follow Venter's assumption that the NCCI plan would apply to all companies equally. Instead many tried to estimate the impact of just one company filing the plan while its competitor did not. Both approaches were deemed acceptable.

Candidates were expected to comment on the specific risks impacted by the change and how the market will react. The following items could be provided to receive credit:

1. Which specific risks would be impacted by the change?
    - Large risks with debit mods will become preferred
    - Small risks with debit mods will be avoided
    - Insurers will target large risks with poor experience

2. How will the competitive market ultimately react – depended on candidate assumption
    - [If the NCCI implements the bad plan] supply & demand will adjust rates back into balance
    - [if a particular company implements a bad plan] creates adverse selection
    - [if company's new plan performs better] – we may be able to gain competitive advantage by improved risk selection

Common errors made by candidates included:

- Asserting new plan would overcharge all large risks
- Asserting new plan would overcharge all risk with bad experience
- Saying market will target certain risks, but not noting this will rebalance the plan
- Asserting the market will rebalance only the overall adequacy/off balance