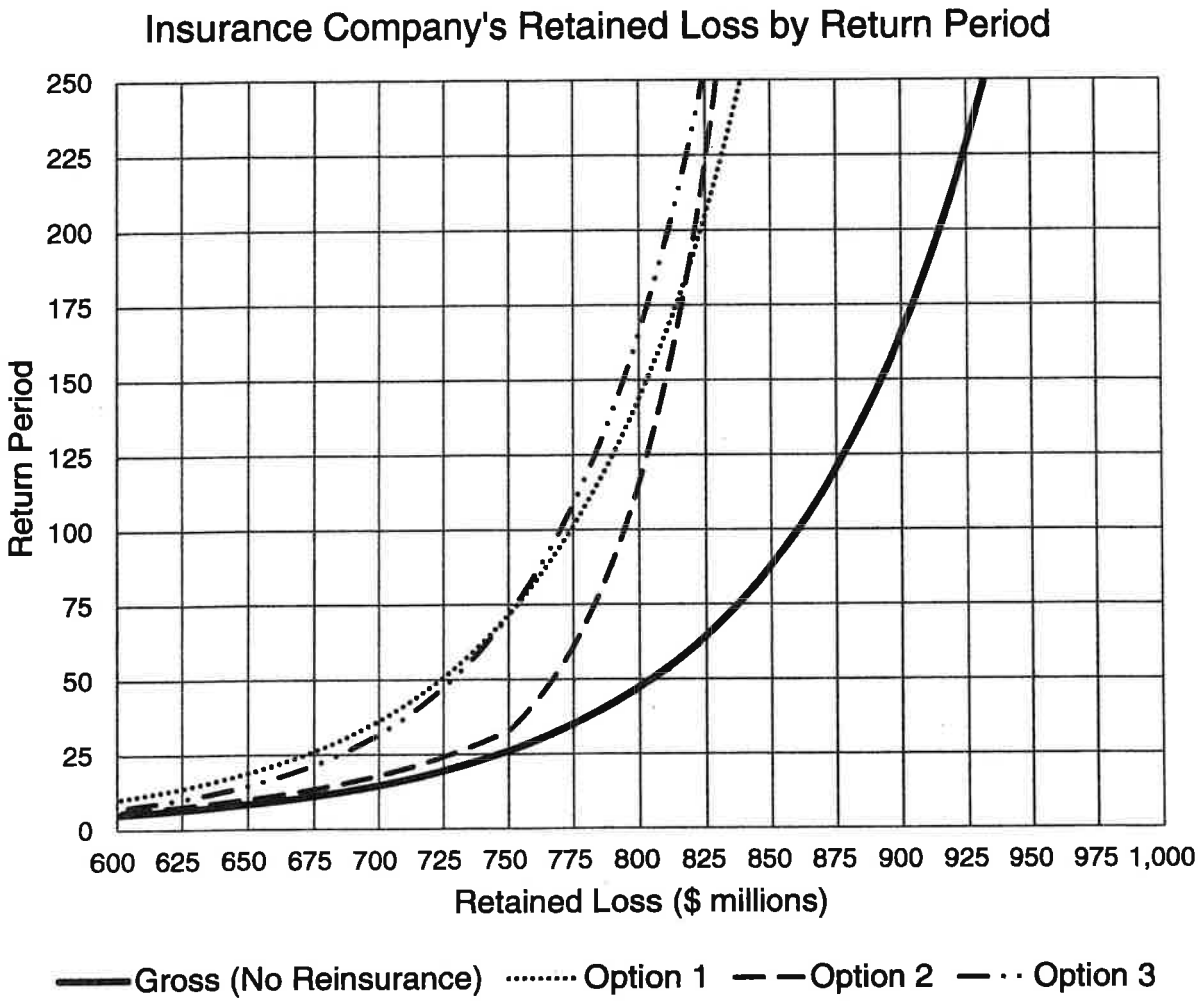
19. (1.75 points)

An insurance company is deciding between three reinsurance treaty options from the same reinsurance company based on the following output from a catastrophe model:



Insurance Company	Gross (No Reinsurance)	Option 1	Option 2	Option 3
Retained AAL	$500 million	$450 million	$486 million	$488 million
Coefficient of Variation of Retained Loss	25%	25%	24%	22%
Coefficient of Variation of Ceded Loss	n/a	25%	76%	169%

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a. (0.5 point)

Calculate the probability that the insurance company retains more than $750 million of loss on a gross basis.

b. (0.75 point)

One of the options represents a Quota Share reinsurance treaty. Justify which of the three options it is, and state the Quota Share percentage.

c. (0.5 point)

Describe a reason why the reinsurance premium for Option 3 may be higher compared to Option 1.

QUESTION 19

TOTAL POINT VALUE: 1.75 | **LEARNING OBJECTIVE(S): C**

SAMPLE ANSWERS

Part a: 0.5 point

Sample 1

By the graph, >= 750M loss has return period >= 25 years
1/25 = 4%

Sample 2

1/25 = 4%

Sample 3

Pr[Ret > 750M] on a Gross basis

- ⇨ Return period = 1-in-25 years
- ⇨ PR[Ret>750M] = 4%

Part b: 0.75 point

Sample 1

Option 1 is the Quota Share treaty
In a Quota Share treaty, losses are shared in the same proportion across all risks, there fore
CV(Gross) = CV(Retained) = CV(Ceded)
QS Percentage is 10%

Sample 2

Option 1 is the Quota Share treaty – it has the same CV on gross and retained loss.
At 1-in-25 year, QS % = 1 – 675/750 = 10%

Sample 3

The quota share option is option 1
The shape of retained loss by return period is identical just reduced by 10% so the QS% is 10%

Part c: 0.5 point

Sample 1

- The coefficient of variation is much higher for the ceded portion of losses for option 3 (CV = 169%) compared to that of Option 1 (CV = 25%)
- This means that there is a lot more uncertainty in the amounts that the reinsurance treaty will cover. This requires a higher risk load for the reinsurance premiums

Sample 2

- Option 3 picks up the volatile part in the tail, compare to Quota Share option 1
- Reinsurer needs more capital to support losses that are riskier/more volatile. The profit margin will be higher.

Sample 3

- Option 3 may have a higher risk load since there could be more volatility in the ceded loss, especially since CoV in ceded loss is 169%

EXAMINER'S REPORT

Candidates were expected to demonstrate understanding of various reinsurance options by using the graph and data table provided. Candidates were expected to read a return period off the graph, understand how to use the information to both pick which option was a quota share and calculate the quota share percentage, and then analyze which option was likely to be costliest.

Part a

Candidates were expected to know how to read return period from the graph and calculate the probability that the insurance company retains losses above a certain point.

Common mistakes included:

- Not identifying a return period from the graph
- Incorrectly calculating the probability from the return period.

Part b

Candidates were expected to identify the quota share treaty from the graph and calculate the quota share percentage.

Most candidates were able to identify which option was the quota share treaty, but many of them did not state the quota share percentage. If candidates listed data points from the curve and used that to show the AAL or ceded % are identical for option 1, credit was given.

Common mistakes included:

- Not providing the quota share percentage
- Stating that Option 2 is the quota share because the sum of ceded and retained CV equals 1
- Stating that Option 3 is the quota share because the shape of retained loss is the same as gross loss.

Part c

Candidates were expected to justify why the reinsurance premium may be higher for one treaty compared to another.

Common mistakes include:

- Not providing justification on why volatility/tail risk coverage would lead to higher reinsurance premiums
- Claiming that Option 3 is more expensive because it has higher AAL.