

RMS® CCRA® Training Program Modeling Applications Exercise

ANSWER KEY

Part I: Gusty Insurance Company (45 minutes)

1. You have a meeting scheduled one week from today with the lead underwriters to identify accounts for non-renewal or purchase of facultative reinsurance in order to free up capacity for new business. You decide to do an analysis so that you can identify the top three accounts to non-renew or cede.

- a. List two data quality concerns and how/if they will impact your decision.

Our first step was to create a list of potential data quality issues that may be a concern. To start, we acknowledged that completeness of any of the following would potentially impact our decision:

- *Geocoding resolution: If all or most of the data is at postal code resolution or lower, losses will have higher uncertainty. Knowing where a property is located is important to achieving the most accurate results.*
- *Primary construction characteristics: Having complete information regarding building construction, occupancy, height, and year of construction are also critical to data completeness.*

In addition, data quality concerns regarding the accuracy of any of the following could also impact our decision:

- *Address information: Does the portfolio contain physical address data or mailing address data? Having a complete set of address information that does not tell us anything about the location of the property will yield misleading model results.*
- *Valuation: How recently has the portfolio been reviewed for accuracy of the underlying values? This can cause a major shift in loss estimates if the policy provides replacement cost guarantee and the values are out-of-date.*
- *Premium data: Oftentimes the premium data pulled from a system reflects something other than the subject premium for this type of analysis. For example, if this is a multi-line policy, the premiums may include dollars for workers compensation or liability. This can cause erroneous business decisions if the premium is being used to evaluate the profitability of an account.*

Specifically, once we reviewed the data, our top two concerns are the following:

- *Over half of the values are geocoded to the postal code level or lower resolution.*
- *43% of the values have unknown construction data.*

While obtaining more accurate and complete data is ideal, we may not have time before our decision needs to be made. If this is the case, we would prioritize the accounts that show both of these data quality concerns for the majority of their locations and take this into account in our recommendation.

- b. List two financial metrics that you will use to make your decision and why they are the most important (e.g. ground-up Average Annual Loss).

Sample answer:

The top two metrics that we will use to prioritize these accounts are account contribution to portfolio excess average annual loss (XSAAL), and the ratio of premium to loaded gross AAL for each account.

Given that we are looking to free up capacity within the portfolio, it is important to consider which accounts are highly correlated with the portfolio, and which accounts actually diversify the risk. The XSAAL calculation will highlight those accounts that are driving the portfolio's catastrophe losses beyond the 100-year return period, which is causing our current portfolio constraint. Ranking them based on the size of the contribution to XSAAL causes those accounts with the largest individual impact to float to the top.

Taking the ratio of premium to loaded gross AAL gives us a measure of account profitability on a stand-alone basis. The loading methodology would consider the catastrophe peril pure premium, a risk load based on the standard deviation, and potentially an additional expense load to cover operating costs. Any accounts where this ratio is under 100% should be prioritized as potentially unprofitable in the long term, particularly if they also contribute to key portfolio concentrations.

- c. Which accounts do you recommend for non-renewal or facultative reinsurance and why?

A complete answer should be based on more than one metric in order to consider multiple aspects of the risk.

Sample answer:

We took an approach that combines (1) the ratio of premium to loaded average annual loss defined as gross AAL + $0.25 \times \sigma$, (2) our data quality factor, and (3) the contribution of the top ten accounts (ranked by gross AAL) to the 100-year excess average annual loss for the portfolio.

We started with an analysis of the profitability of the top ten accounts by comparing the pure premium plus our risk load to the account premium. Two of these accounts are profitable from a cat perspective (B17709 & B17188) and therefore fall to the bottom of our list of potentials for non-renewal/reinsurance.

We then checked the data quality on the remaining eight accounts, and found that two accounts have a very poor rating and three have only average rating.

Lastly, we calculated the average annual loss in excess of the 100-year return period (XSAAL) for the top ten accounts that are up for renewal. The overall portfolio risk is very highly concentrated in Florida, specifically Miami-Dade, Broward, and Palm Beach counties. The analysis shows that two accounts (B11494 and B12306) are less correlated with the rest of the book relative to the other eight accounts analyzed, so we may wish to retain these accounts if other factors are equal.

Ultimately we weighted the profitability and the portfolio correlation above the data quality ranking. As a result, we recommend reviewing the following accounts:

B10823 – 31% profitability ratio, poor data quality, and correlated with the severe events in the portfolio

A15597 – 42% profitability ratio and correlated with the severe events in the portfolio

B18849 – 31% profitability ratio and correlated with the severe events in the portfolio

D13429 is very similar to accounts B18849 and A1557, and it should be considered for non-renewal or reinsurance as well (33% profitability and similarly correlated with the portfolio).

2. One responsibility that you have inherited with your new role is to help explain catastrophe risk modeling to those less familiar with it. You are stopped by your head underwriter in the hallway, who confronts you with the following statement: “The Johnson account’s actual claim was 20% higher than the modeled loss for hurricane Joan. Explain to me why I should use this information for pricing accounts – it doesn’t accurately reflect real life!”

- a. Review the Johnson account and provide the top two exposure data issues that may increase the variability between modeled losses and actual losses. Explain your answer.

Differences between actual loss experience and modeled risk are to be expected due to the underlying uncertainty in catastrophe loss models. The uncertainty is lower when looking at a large number of locations, such as a portfolio of accounts; however, it can be significant at the account or location level – oftentimes well beyond 20%. In addition, this can be compounded by any of the following:

- *Incomplete data for modeling, which could include:*
 - *Missing primary characteristics*
 - *Poor geocoding resolution*
 - *Missing data on mitigation features (e.g. storm shutters)*
 - *Missing financial information (e.g. deductibles)*
 - *Only key locations being captured*
- *Inaccurate data*
- *Modeling the account using aggregate data*
- *Obtaining loss results by running something other than the loss footprint (e.g. stochastic event, user defined event)*
- *Exclusion of surge losses from analysis if these losses are covered*
- *Losses from non-modeled sources such as business interruption due to power outages, or inland flooding loss*
- *Exclusion of demand surge from analysis*

In addition to underlying uncertainty in predicting account-level losses, the exposure data reveals the following shortcomings:

- *Unknown construction type*
- *Unknown year of construction*
- *Low-level geocoding resolution (Postal code, City, and County for most locations)*

In addition, while it is not explicit in the data, we questioned if the number of buildings field and the occupancy type field are accurately reflected since they are exactly the same for each location. It is possible that this data was defaulted, which would change the outcome of the loss estimates.

- b. Script a short, one paragraph response to this individual using your answers from (a) to support your argument.

A good response should incorporate commentary on many of the factors outlined in (a) listed above, and should include a discussion regarding the fact that models use averages to estimate losses.

Example script:

"Catastrophe loss models use averages to estimate risk. As a result, loss estimates across a portfolio of locations will exhibit the least amount of uncertainty; by contrast, individual account losses for a single catastrophe event will contain significant variability. This variability may be compounded by incomplete or inaccurate data. Based on my review of the account, I noticed that most of the locations in the Johnson account only have geocode matches of postal code, city, or county-level. In addition, many of the key building characteristics such as construction type and year of construction are missing. All of this will increase uncertainty in your loss estimate. Models capture some of this uncertainty around the mean losses in the standard deviation, which can be used to assist you with your business decisions including pricing. Given all of these factors, the fact that this account's losses are within 20% of modeled losses is both reasonable and expected."

Part II: Cat Re (45 minutes)

1. Since the rollup has just been completed, you are fully aware that your Florida capacity is almost completely used up even though there is room to grow the overall portfolio. However, GIC looks like it may be profitable business. The treaty program is structured as follows:

90% of \$50M xs \$50M (4.75% ROL)

90% of \$35M xs \$100M (2.50% ROL)

90% of \$25M xs \$135M (2.25% ROL)

**ROL = Rate On-Line = Price Charged/Limit*

- a. List three things that will influence your decision to participate on this treaty.

Any of the following could influence the decision to write a new piece of business:

- *Correlation – is this business highly correlated with my existing portfolio or does it diversify my risk?*
- *Does the new business cause the portfolio risk metrics to exceed any management constraints?*
- *Price – can I get adequate premium to cover the expected losses plus expenses?*
- *Exposure/Loss Data – what will the cedant provide to me for data? Will they provide RiskLink EDM/RDM, county aggregate data, other model output, etc. so that I can analyze the business?*
- *Data quality – does the cedant provide me with quality information so that I have confidence in the model loss results?*
- *Relationships – do I have a long-standing relationship with this cedant and understand their business practices or is it a new cedant?*

- b. Price is always a factor – explain how you will develop a technical rate and why you propose this approach.

There are many pricing formulas that can be used to develop a technical rate. Any formula/explanation is acceptable as long as it demonstrates an understanding that a risk load should be considered in addition to the average annual loss to cover expected losses, uncertainty, and volatility in model loss results.

Sample answer:

Our technical rate for this portfolio is the pure premium plus a risk load of 25% of the standard deviation plus expenses. The risk load is higher than our typical 20% because we are nearing our Florida capacity limit. By writing this business, we may need to decline other opportunities in order to keep our metrics within the corporate guidelines, and want to reflect the opportunity cost in the pricing. Since our formula contains both pure premium and standard deviation, it considers not only the expected losses that we will need to cover on average over time from the modeled peril(s), but also the distribution around the losses, which reflects both volatility and uncertainty.

- c. Do you decide to write all or part of this program? If so, which layers and how much of a line do you take? Explain your answer.

Again, there are many answers that are acceptable for this question. The importance is placed on demonstrating solid reasoning for your answer. A good answer should include some discussion around rate adequacy, correlation, capacity limits, and accumulation guidelines.

Sample answer:

We only chose to take a small line (1.5%) on the top layer of this program for the following reasons:

- This \$25M layer is the only layer where our technical premium was lower than the contract terms.*
- We also reviewed the correlation of this portfolio with our own and noticed that 68 of CatRe's top 100 events are also in GIC's top 100 event list. Since we expect that adding this treaty to our current portfolio will continue to increase the correlation of our book instead of diversify it, we are more comfortable writing high layers that have lower probability of activation.*
- At 1.5% of the top layer, the most we would be adding in any key city is \$375,000 (1.5% of \$25M), which does not exceed our New York City accumulation threshold.*