RMS® CCRA® Training Program
Terrorism Modeling Exercise

Learning Objectives:

The purpose of this exercise is to gain hands-on experience with the interpretation of both scenario and probabilistic terrorism loss results. At the end of the exercise you will have learned how to:

- Interpret terrorism model results, including the key drivers of average annual loss (AAL), and AAL by attack type/region/target type
- Understand differences between the drivers of terrorism loss results vs. the drivers of exposure accumulation

You have been provided with an MS Excel workbook file (Terrorism Modeling Exercise Data.xls) which contains data extracted from terrorism analyses.

Overview

Assume that you are a catastrophe risk analyst for the large commercial division of a primary insurance company. Your company's approach to the management of terrorism risk is based on three measures: (a) exposure concentrations, (b) scenario loss results, and (c) probabilistic loss modeling. Exposure accumulations and probabilistic analyses have been performed and the results have been extracted for your review.

Using the data in the MS Excel file, answer the following questions.

Analysis Results Questions:

1. Management would like to limit gross exposure within 200 meters of an RMS Target building to $200 million and limit exposure within any 200 meter ring to $400 million.
    a. Using worksheet "2. Accumulations RMS_Targets," how many accumulations exceed $200 million, and which portfolio drives these results (e.g. property or workers compensation)?

        # of Accumulations:_____ Predominant Portfolio: _____

    b. Explain how the dollar loss for workers compensation is calculated for an exposure accumulation analysis. How does knowledge of this process affect your view of the results?

c. Management has established criteria around RMS Target buildings, yet you notice there is significant exposure in non-RMS target locations based on the results in worksheet “4. Building Level Accumulations.”

   Compare these results to the accumulations within 200 meters of RMS Target locations (worksheet 2). What observations do you have? How might you incorporate this new information into your risk management strategies?

d. List at least two exposure data issues that could change how you view these results.

   1. _____

   2. _____

2. Management has selected the 2-ton bomb as a benchmark scenario for managing exposure to terrorist attacks. This loss threshold is set to $200 million.

    a. Identify those attacks that would generate gross loss in excess of $200 million to the combined property and workers compensation books, given a successful 2-ton bomb attack has occurred. Fill in the table provided using the results in the "5. GR 2ton Bomb Loss" worksheet.

2-Ton Bomb Attacks Generating > $200 M Gross Loss

City	Target	Event ID	Cond. Probability	WC Gross Loss	Property Gross Loss	Total Gross Loss

b. Identify those targets that have the highest likelihood of attack, given a successful 2-ton bomb attack has occurred. Fill in the table provided using the results in the "5. GR 2ton Bomb Loss" worksheet.

Top 5 Targets by Highest Likelihood of Attack (2-Ton Bomb)

City	Target	Event ID	Cond. Probability	WC Gross Loss	Property Gross Loss	Total Gross Loss

c. What is the benefit of examining loss to those targets that have the highest likelihood of occurrence?

3. Your management does not understand the term "Attack Loss Table" (ALT). Explain the difference between an Event Loss Table (ELT) for natural catastrophe analyses and an ALT for terrorism analyses. Include the definition of terrorism event and terrorism attack likelihood in your answer.

4. Various magnitudes of each attack mode are modeled in order to capture the potential range of losses that the insurance industry could face and to understand each attack mode's likelihood of occurrence.

   Your company has asked you to review losses by attack mode magnitude in order to determine the worst case conventional attack for each attack mode. The following table identifies the maximum loss scenario by attack mode magnitude for a bomb based on the combined property and workers compensation books. The information is from the results in the "6. GR All Bomb Loss" worksheet.

Maximum Loss Scenario by Attack Mode Magnitude for Bombs (Prop + WC)

City	Target	Event ID	Cond. Probability	Attack Mode	WC Gross Loss	Property Gross Loss	Total Gross Loss
Chicago	Chicago CBD (37)	666028	0.00000752	Bomb-10 Ton	$0.0	$581.8	$581.8
Chicago	Chicago CBD (37)	666027	0.0000132	Bomb-5 Ton	$0.0	$465.5	$465.5
Chicago	Newberry Plaza	692753	0.0000441	Bomb-2 Ton	$0.0	$297.9	$297.9
New York	Lefcourt Colonial	675033	0.0000956	Bomb-1 Ton	$37.5	$177.9	$215.4
New York	Lincoln Building	666779	0.000501	Bomb–600 lb	$8.6	$112.9	$121.5

   Management has asked you whether it is more appropriate to select a 5-ton bomb or a 10-ton bomb as the benchmark scenario. Using the information from the previous questions, what recommendation would you make? Include a discussion of the relative likelihood of an attack occurring vs. the potential for loss in your answer.

5. It is helpful to examine average annual loss by various metrics to assess drivers of terrorism risk. Calculate the average annual loss to the Property and Workers Comp books using the data on worksheet "7. GR ALT Conventional." Fill in columns P, Q, and R and provide the totals below.

   Property Average Annual Loss: $_____

   Workers Comp Average Annual Loss: $_____

   Combined Average Annual Loss: $_____

6. Analyzing annual average loss by attack mode magnitude is a useful method to evaluate the drivers of risk to a portfolio. The following table shows the contribution of average annual loss by attack mode magnitude and by portfolio for all conventional attacks. Management has asked you to comment on how the nature of the portfolio impacts the expected loss between a 2-ton and a 5-ton bomb.

Attack Mode Magnitude	WC	Property	Combined
Bomb - 600 lb.	17%	29%	25%
Bomb - 1 Ton	19%	20%	20%
Aircraft Impact	15%	16%	16%
Bomb - 5 Ton	19%	11%	14%
Bomb - 2 Ton	15%	13%	13%
Bomb - 10 Ton	14%	7%	9%
Conflagration	2%	4%	3%
Sabotage - Industrial - Explosion – Large	0%	0%	0%
Sabotage - Industrial - Explosion – Medium	0%	0%	0%
Sabotage - Industrial - Explosion – Small	0%	0%	0%

   a. Compare the expected loss from the 2-ton bomb vs. 5-ton bomb for the property portfolio. What observations do you make? Provide an explanation for the results that you see.

b. Compare the expected loss from the 2-ton bomb vs. 5-ton bomb for the workers compensation portfolio. What observations do you make? Provide an explanation for the results that you see (hint: consider the potential distribution of injuries).

7. The terrorism EP curve takes into consideration both the frequency and severity of events, and is a commonly used metric for managing terrorism risk.

   a. The 250-year return period is used as a common risk management metric for natural catastrophe exposed books of business. For corporate catastrophe treaties that include natural as well as terrorism perils, grouping and managing these portfolios against a common exceedance probability metric is possible. Referring to the worksheet "8. GR EP results", what is the 250-year return period loss for the Property book, the Workers' Comp book and the combined book?

      Property 250-year Loss: $_____

      Workers Comp 250-year Loss: $_____

      Combined 250-year Loss: $_____

   b. Management has asked you to comment on how the 2-ton bomb attack scenario loss, which is currently used as the benchmark scenario, compares to the 250-year return period loss.

c. Discuss the pros and cons of managing to a specific attack mode.

8. Answer the following using the information in spreadsheet “9. PTM ALT“ assuming that an event has occurred,
   a. What is the conditional likelihood that the event will be a 2-ton bomb event? _____
   b. Identify which conventional attack mode is **most likely**? _____

   Note: Conventional attacks are defined as non-CBRN attacks and include bombs, aircraft impact, conflagration and explosion-only industrial sabotage attacks.