RMS® Catastrophe Analysis Training Program
Uncertainty Measures Exercise #3

ANSWER KEY

Part 1

Europe windstorm analyses were performed for five portfolios comprising risks in five separate countries. The spreadsheet *Exercise 3 Uncertainty Measures.xls* contains the summary gross losses and statistics for these analyses as well as for grouped pairs of the portfolio analysis results.

1) Calculate the correlation coefficient between the Belgium and Germany portfolios. Enter the value in the table provided on the spreadsheet.

Answer: *Correlation coefficients between each of the portfolios are shown in the table below:*

	Belgium	***Germany***	***France***	***UK***	***Netherlands***
Belgium	*1.00*	***0.62***	*0.35*	*0.37*	*0.71*
Germany	---	*1.00*	*0.23*	*0.24*	*0.68*
France	---	---	*1*	*0.25*	*0.18*
UK	---	---	---	*1*	*0.37*
Netherlands	---	---	---	---	*1.00*

2) Provide possible explanations for the results that you see.

Answer: *Geographic proximity is a significant determinant as to how correlated windstorm portfolios are. Thus, the correlation coefficient between the Netherlands and Belgium is very high where the locations in each are closer together. On the other hand, locations in the U.K. and Germany are not in close proximity, and this is reflected in the lower correlation coefficient. In addition, the predominant direction of Europe windstorm travel is from the west to the east, so countries aligned to more likely be impacted by the same storm are going to be more highly correlated.*

Part 2

Spreadsheet *Exercise 2 Uncertainty Measures.xls* contains summary statistics and losses from the portfolio analysis results used in Exercise 2 in the *Treaty Losses* tab. Use the information in this spreadsheet to perform the following calculations and answer the questions.

1) Calculate the correlation coefficient for the pre cat net loss between the California and Pacific NW portfolios.

   Answer: *$= (\sigma^2_{CA\&PNW} - \sigma^2_{CA} - \sigma^2_{PNW}) / (2 * \sigma_{CA} * \sigma_{PNW}) = 13.9\%$*

2) Compare results from the above California and Pacific NW portfolio calculations with the results from Part 1 (European windstorm portfolios). Why is there a difference?

   Answer: *The net loss pre cat correlation coefficient is significantly less than that for the Europe windstorm portfolios based on gross losses. Differences in the correlation of locations are due to:*

   1) *Differences in the regional extent of single events have a significant influence on the differences in the correlation coefficients between the two peril regions. In general, single U.S. west coast earthquakes do not impact as large of a region (and thus fewer locations) as a single Europe windstorm. Thus the correlation between the Western U.S. earthquake portfolios would be less.*

   2) *The population centers with the highest exposure between the Pacific NW and California are several hundred kilometers apart, compared to exposures between some of the countries in Europe.*