

Form S-6: Hypothetical Events for Sensitivity and Uncertainty Analysis

Specifications

The sensitivity and uncertainty analyses use the following input variables:

- CP = central pressure (in millibars)
- R_{max} = radius of maximum winds (in statute miles)
- VT = translational velocity (forward speed in miles per hour)
- N = parameter that determines the shape of the wind field inside the eye
- FFP = far field pressure (in millibars)
- Alpha = filling rate that determines the behavior of CP after landfall

CF is not used as the RMS wind field model produces surface winds directly. The values of CP, R_{max} , VT and FFP are taken from the file FormS6Input09.xls, provided by the FCHLPM. The values of N and Alpha corresponding to the prescribed quantiles are supplied in worksheet "Sen Anal all Variables" of the included file RMS09FormS6Input09.xls, and the corresponding columns appropriately renamed. The values of CP and FFP are used as direct model inputs.

Loss Cost

1. Aggregated loss costs for each input vector and each specified hurricane category over the 682 land-based vertices have been provided on a CD in an ASCII file and a PDF file, both named "RMS09ExpectedLossCost."

These expected loss costs as percentages of total exposure are displayed as cumulative empirical distribution functions in Figure 1.

2. The mean loss cost over all 100 input vectors for each specified hurricane category, at each of the 682 land-based vertices, have been provided on CD in an ASCII file and a PDF file, both named "RMS09LossCostContour."

The mean loss cost for each hurricane category is displayed as a contour plot in Figures 2–4.

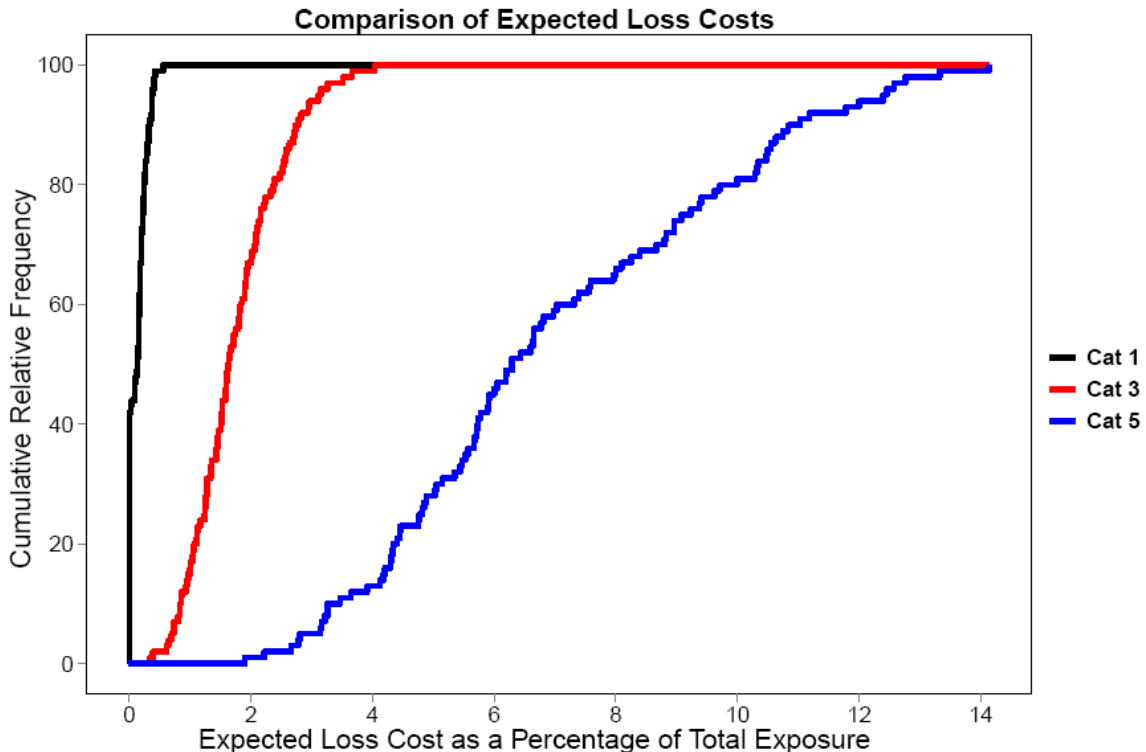


Figure 1: Comparison of CDFs of Lost Costs for all Hurricane Categories

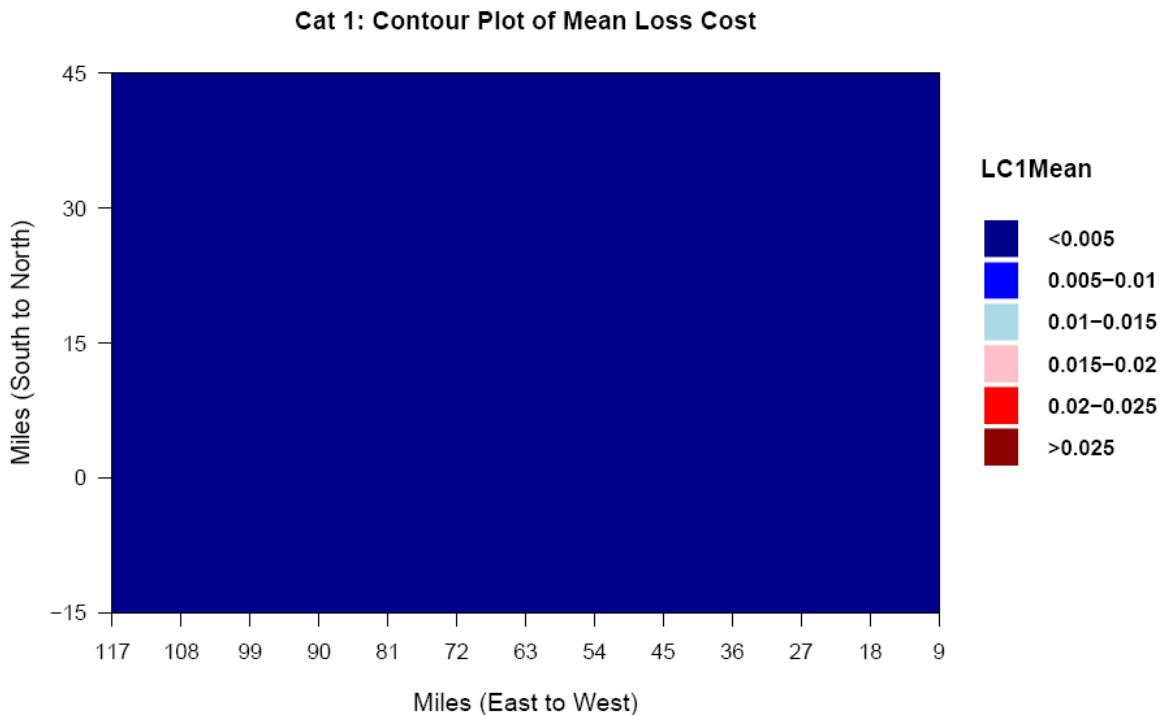


Figure 2: Contour Plot of Loss Cost for a Category 1 Hurricane

Cat 3: Contour Plot of Mean Loss Cost

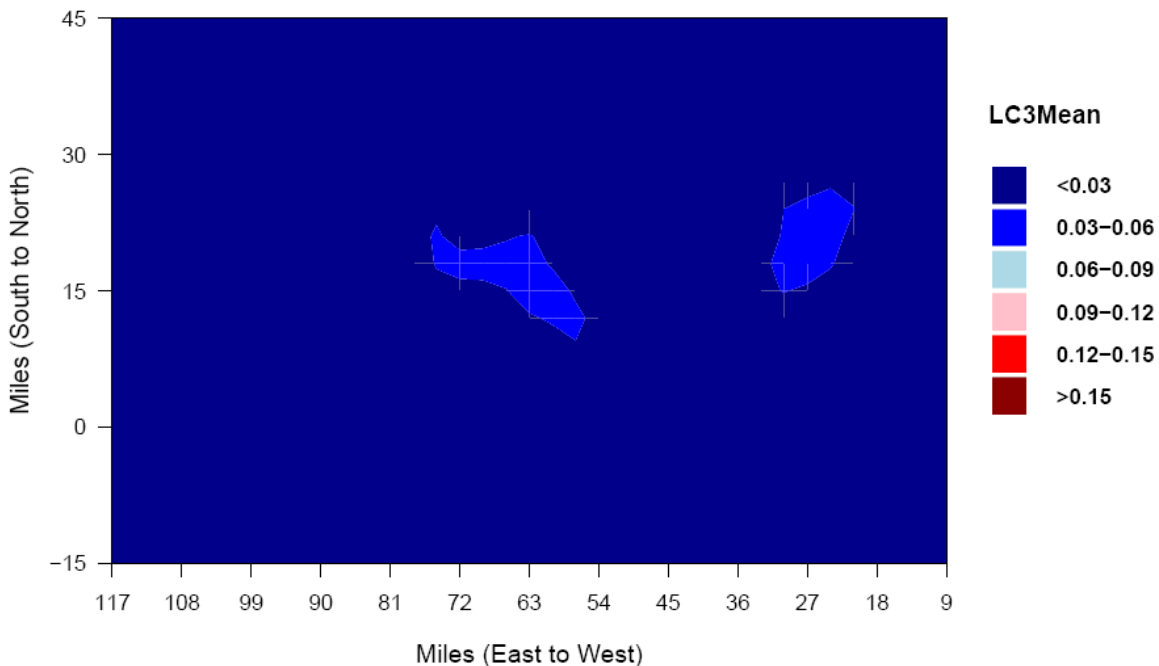


Figure 3: Contour Plot of Loss Cost for a Category 3 Hurricane

Cat 5: Contour Plot of Mean Loss Cost

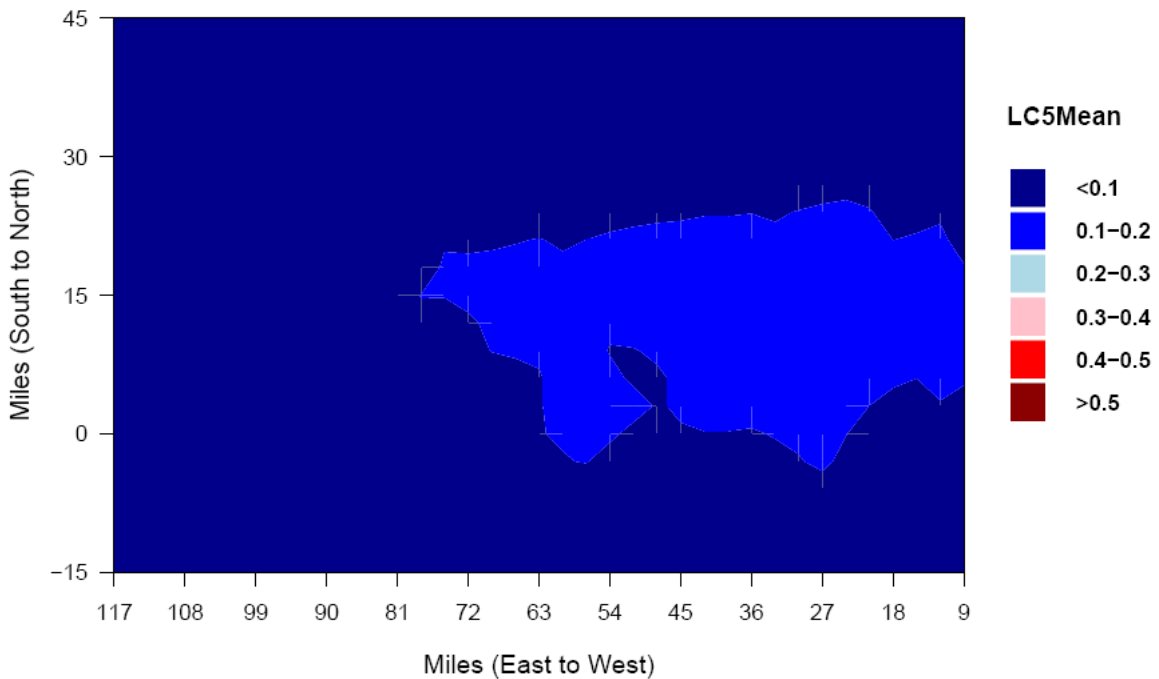


Figure 4: Contour Plot of Loss Cost for a Category 5 Hurricane

Uncertainty and Sensitivity Analysis for Loss Cost

Sensitivity

The standardized regression coefficients (SRCs) for each of the specified input variables are summarized below.

Table 1: Standardized Regression Coefficients

| Category | CP | R _{max} | VT | N | FFP | Alpha |
|----------|---------|------------------|--------|--------|--------|--------|
| 1 | -0.4946 | 0.1721 | 0.0484 | 0.0238 | 0.7454 | 0.1600 |
| 3 | -0.5053 | 0.3926 | 0.0503 | 0.0246 | 0.5784 | 0.3020 |
| 5 | -0.3721 | 0.6283 | 0.1433 | 0.0383 | 0.4025 | 0.3609 |

Figure 5 is a graphical representation of these SRCs for all six input variables for each category of hurricane.

This figure shows that FFP and CP have the most influence on the magnitude of the loss cost for a Category 1 hurricane. The relationship is positive for FFP and negative for CP. The next most influential variables are R_{max} and Alpha, which exhibit a very similar (positive) relationship with the loss cost. VT and N have little influence.

The Category 3 results in Figure 5 show the same ordering in SRCs with respect to Category 1, but now R_{max} has a noticeably larger influence than Alpha.

For Category 5 hurricanes, Figure 5 shows that R_{max} has the largest influence on the magnitude of the loss cost. Next are FFP, CP and Alpha, with SRCs that are very similar to each other in magnitude. VT and N continue to have the least influence on the loss cost.

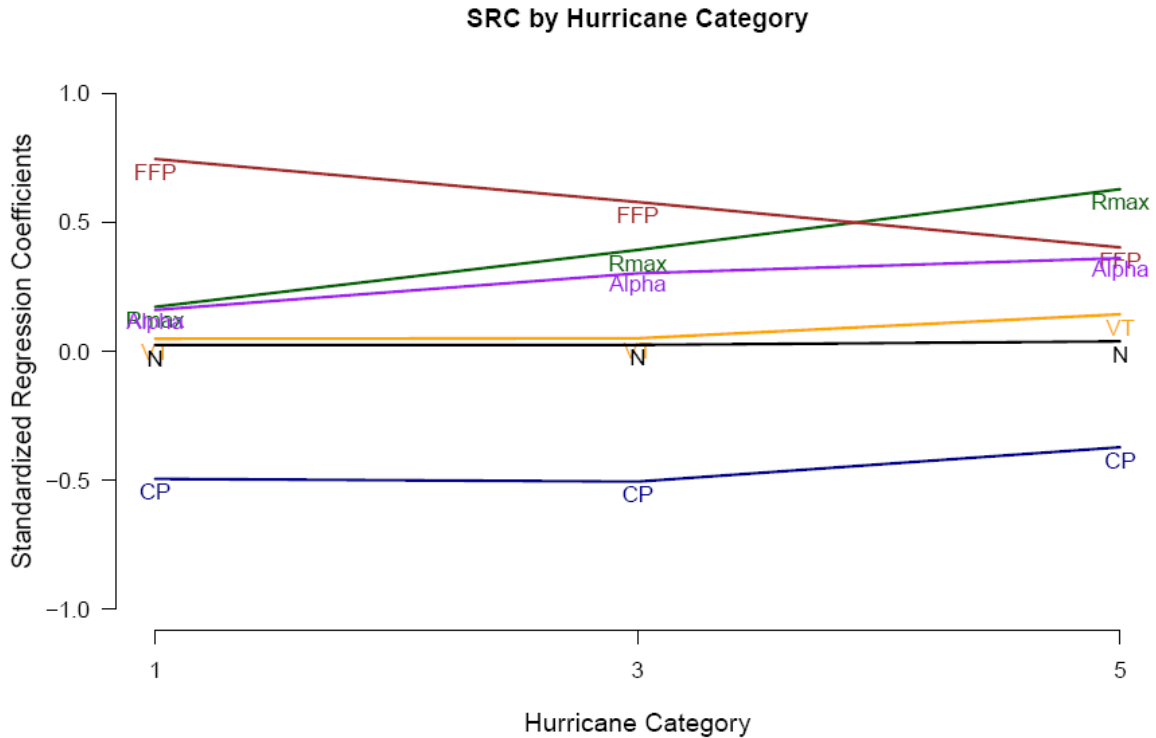


Figure 5: SRCs for Expected Loss Cost for all Input Variables for all Hurricane Categories

Uncertainty

The expected percentage reductions (EPRs) for each input variable are summarized below.

Table 2: Expected Percentage Reductions

| Category | CP | R _{max} | VT | N | FFP | Alpha |
|----------|-------|------------------|------|------|-------|-------|
| 1 | 52.8% | 3.1% | 0.7% | 0.7% | 71.3% | 4.1% |
| 3 | 25.9% | 21.3% | 3.0% | 2.5% | 48.2% | 12.2% |
| 5 | 21.4% | 48.8% | 7.2% | 5.3% | 21.0% | 22.8% |

Figure 6 is a graphical representation of these EPRs for all six input variables for each category of hurricane.

This figure shows that for Category 1 hurricanes the largest contributors to the uncertainty are FFP and CP. Alpha and R_{max} follow after a large gap. VT and N make very little contribution to the uncertainty in loss cost.

For Category 3 hurricanes, Figure 6 shows a similar ordering, with FFP and CP as the largest contributors. However, the gap between the first two contributors and the next two (R_{max} and Alpha) is greatly reduced. R_{max} is now in third place, followed by Alpha. VT and N continue to make the least contribution.

The Category 5 EPRs in Figure 6 show R_{max} as the largest contributor to the uncertainty in loss cost. The next largest contributions correspond to Alpha, CP and FFP, with very similar EPRs. VT and N continue to make the least contribution to uncertainty.

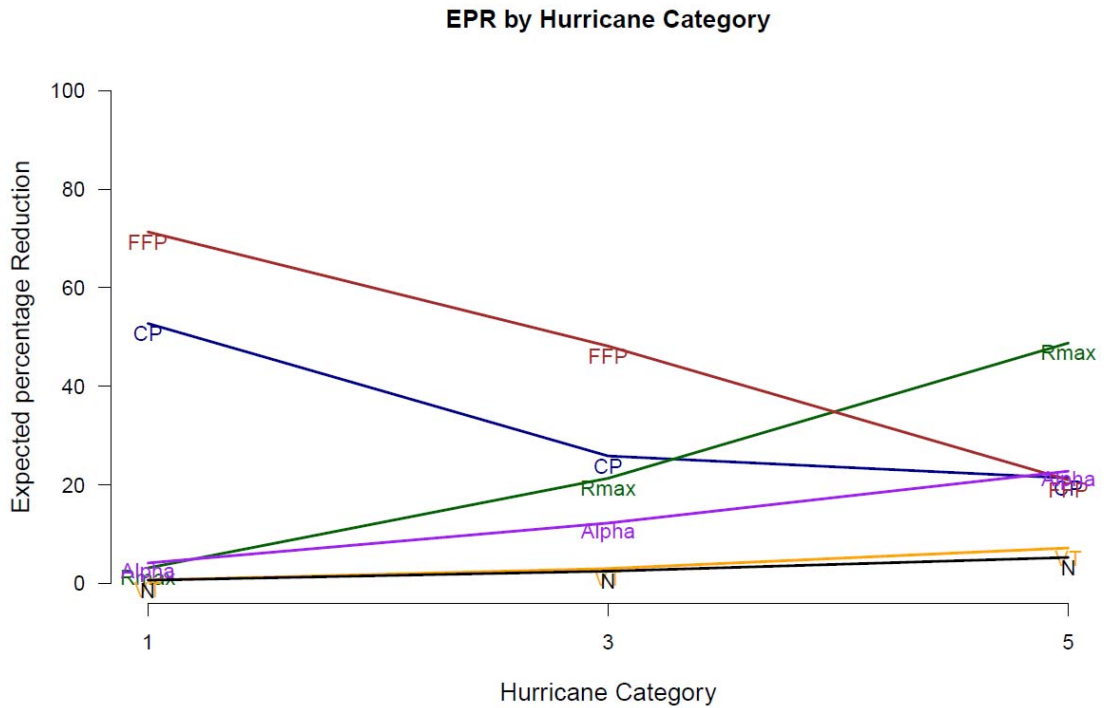


Figure 6: EPRs for Expected Loss Cost for all Input Variables for all Hurricane Categories