Manuscript ID: hess-2019-434

RESPONSES TO REVIEWER #2's COMMENTS

We are grateful to Reviewer #2 for his/her insightful review. The provided comments have contributed substantially to improving the paper. According to them, we have made significant efforts to revise the manuscript, with the details explained as follows:

Point #1
COMMENT:
detailed comments in the marked up version

RESPONSE: We are really thankful for the reviewer's carefulness and comments. We have revised all the errors in our manuscript carefully which have been highlighted in the revision

Point #2
COMMENT:
There is something missing here. Please introduce your 'OR' and 'AND' cases to assist the reader. Also, what are the names of T^{OR} and T^{AND}? what do they describe? What is R^d?

RESPONSE: We appreciate the reviewer's comment. We have provided more details about the joint return period in OR and AND as follows:

(i) "OR" case T^{OR}:

$$T^{OR} = \{(x_1, x_2, ..., x_d) \in R^d : x_1 > x_1^* \vee x_2 > x_2^* \vee ... \vee x_d > x_d^*\} = \frac{\mu}{1 - C(F_1(x_1 \mid \gamma_1), ..., F_d(x_d \mid \gamma_d) \mid \theta)} \quad (4)$$

where R^d is a d-dimensional real space; μ denotes the average time between two adjacent events under consideration. The joint RP in OR (denoted as T^{OR}) indicates the occurrence probability of the extreme event with one of its variables x_i's, i = 1, 2, …, d, exceeding the corresponding threshold x_i^*

(ii) "AND" case T^{AND}:

$$T^{AND} = \{(x_1, x_2, ..., x_d) \in R^d : x_1 > x_1^* \wedge x_2 > x_2^* \wedge ... \wedge x_d > x_d^*\} = \frac{\mu}{\hat{C}(\overline{F}_1(x_1 \mid \gamma_1), \overline{F}_2(x_2 \mid \gamma_2), ..., \overline{F}_1(x_d \mid \gamma_d) \mid \theta)} \quad (5)$$

where $\hat{C}$ is the multivariate survival function of the X_i's proposed by Salvadori et al. (2013; 2016), and $\overline{F}_i(x_i \mid \gamma_i) = P(X > x_i) = 1 - F_i(x_i \mid \gamma_i)$. Following Salvadori et al. (2013; 2016), and

the Inclusion-Exclusion principle proposed by Joe (2014), the multivariate survival function $\hat{C}$ can be obtained by:

$$\hat{C}(\mathbf{u}) = \bar{C}(1-\mathbf{u}) \quad (6)$$

and

$$\bar{C}(\mathbf{u}) = 1 - \sum_{i=1}^{d} u_i + \sum_{S \in \mathrm{P}} (-1)^{\#(S)} C_S(u_i : i \in S) \quad (7)$$

where #(*S*) denotes the cardinality of *S*. The joint RP in AND (denoted as T^{AND}) of the extreme event indicates the occurrence probability with all of its variables x_i's, i = 1, 2, …, d, exceeding the corresponding thresholds x_i^*'s

Point #3

COMMENT:

In order to be accurate, Figs 10 to 12 are tables and should be labelled and referred to as such

RESPONSE: We are grateful for the reviewer's comment. Figures 10 – 12 show the contributions of model parameters to uncertainties in risk inferences under different design standards and service time periods. These results seem to be presented in tables. However, Figures 10-12 are in fact heat maps generated by Excel, in which different parameter contributions are highlighted by different colors. Consequently, we labelled them as figures rather than tables.