

## ***Interactive comment on “Willingness-to-pay for a probabilistic flood forecast: a risk-based decision-making game” by L. Arnal et al.***

**Anonymous Referee #2**

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The authors present the evaluation of a flood protection game for users of probabilistic hydrological forecasts. The aim of the game is to spend as little money as necessary for protecting a city from flooding. The participants were divided into 9 groups differing in flood frequency and forecast bias. The nine groups have 9 to 21 members/participant. Due to this limited dataset the evaluation is more of a descriptive kind.

Nonetheless, it gives an insight into possible reasons for taking good or bad decisions. And on factors that influence the willingness to pay for a forecast.

The article is written well. After an introduction the game set up and the objectives are presented clearly. The objectives are addressed with six questions which are first described thoroughly in paragraphs 2.1.1 to 2.1.6. The answers to these questions are presented in the results section 3.1-3.6. It might be more reader friendly to combine

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these sections and take the question-answer pairs one after another.

Specific Comments:

P4L16-19: Did the participants know from the beginning that there are two rounds? → According to P6L7 they didn't.

P4L27: Total number of flood events is kept equal in order to give equal chances to all participants to win.

- This statement doesn't hold. Participants surely did not have equal chances to win the game. This depended on the forecast set type and the river they were given.

- For the aim of the study it is not required that every participant has the same chance to win, but this statement is wrong. → 2.1.1. P5L3

P4L29-30: the number of flood events was different for every river, but not for every round → the Green River has the same number of events in round 1 and 2, whereas it changes for Yellow River and Blue River (which again influences their chances to win).

P6L7: So, at the beginning, the participants didn't know that there were two rounds to play?

P6L26-27: How did the participants that purchased a forecast perceive the quality of the forecasts compared to round 1? Did participants that had biased forecast sets in round 1 notice the better performance of the forecasts in round 2?

Figure 3: - Yellow and Green River → the ticks do not match the x-axis labels! - It would be nice if the plot was arranged according to table 3 - Change “forecasted final purse” to “final purse if following median forecast” - Labels of the “columns” could be changed to “pos. biased”, “unbiased”, “neg. biased” (same could be done for fig. 4)

QA 1 (2.2.1/3.1):

Fig 4: please change order of the bars such that forecast type 1 is first in line.

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Equal chances ...: - the disadvantage for participants with positive bias is smaller if the observed value is above/equals the flood threshold. Thus for the blue river, which experiences three floods in five cases (1st round), the participants with forecast set type 1 are expected to perform better than those with forecast set type 3.

QA2 (2.2.2/3.2): You state that the percentage of negative perceptions of the quality of the forecasts increases with increasing or decreasing forecast bias. This seems to be quite consistent for positively biased forecasts, but how do you explain that the distribution of the ratings from the participants with the most negative bias (0) looks almost the same as from the participants with unbiased forecasts? → Fig.5

QA3 (2.2.3/3.3): At a first glance Figure 6 looks completely fine. However, there were five levels of perceived performances (very bad to very good) the participants could choose from. So the graph should not show perceived performances higher than five or lower than one. You could change the graph to a simple scatterplot and choose the point size proportional to the number of participants that fall onto a specific perceived-actual-performance combination. (Same for Figure 6 b).

QA4 (2.2.4/3.4):

P13L3-4: It would be more straight forward if you just stated the average percentage the participants were willing to spend from the tokens left in their purse.

P13L4-5: ...  $48+32+21=101$  ... round to 20 % for blue river. However, it would be more informative what percentage of river group members purchased a forecast for the second round → 36% of the yellow river group, 41% of green rivers, 23% of blue rivers purchased forecasts for the second round. And also for the forecast set type groups → pos. biased 30%, unbiased 42% and neg. biased 31%.

QA6 (2.2.6/3.6):

P15L18-19: Could you give the average final purse for the two groups "with and without forecast in the second round" separately.

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Table 5: you could do that additionally by forecast set type

Discussion/Conclusion:

P18L9: gambling was considered a reason for not buying a forecast set by other few participants. → according to P14L22 this was just one participant.

P18L12-15: "This further demonstrates that more work is needed not solely to provide guidance on the use of probabilistic information for decision-making, ..."

Comment: It is questionable if the setup of the game is not to some extent counterproductive and doesn't help to improve this. The winners of the games had mostly biased forecasts in the first round and no forecast in the second round ...

If the game should have an educational merit, shouldn't the game then be set up in a way so that people who have no bias in the forecasts of the first round and who purchase a forecast in the second round have better chances to win?

Minor Comments:

P2L3: remove dashes

P3L15: remove "one"

P7L8: his purse

P11L17: ... the lowest percentage of participants not following the median forecast are for the unbiased forecast set type 2.

P13L16: ... (the river that experienced most floods in round 1 and for which players thus ended the first round with on average the lowest amount of tokens left in their purse)

P16L5-6: ... than the "avoided cost" of each river. On average participants paid 1000 tokens more ...

P18L3: ... necessary. Seifert ...

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general: it would be easier for the reader if you used the terms "neg. biased forecast", "unbiased forecast" and "pos. biased forecast" instead of the terms "forecast set type 1-3" in the text, tables and graphs.

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