**The Shopkeepers dilemma – A game on making decisions under uncertainty**

*Refer to HEPEX games:* [*www.hepex.org*](http://www.hepex.org)

This document provides a brief instruction to setting up and playing the “serious” game first played at the EGU in 2016 on the making of decisions based on uncertain forecast information. The objective of the game is to explore how decisions are made based on the ratio between costs of taking action in response to a flood event, and the expected losses due to a flood event should it occur. In the game, participants are divided into three groups, each representing a different type of shop. There is a shop that sells Ferraris, a grocery store, and a shop that sells gravestones. The difference between these shops is that they have quite different scales of losses should they be flooded, but the cost of taking action is also different. In the game they are presented a sequence of seven flood bulletins, which indicate the probability of flooding (provided as the probability of exceeding two threshold levels). At each stage the participants then need to make a decision on an action to take, which can be one of three; (i) do nothing; (ii) raise temporary defences, or (iii) move inventory to a safe place. These actions are mutually exclusive, meaning that only one action can be taken. After decisions have been made, the outcome of the event is presented. The participants are then asked to tally their costs (for taking action) and losses (should they have been flooded). Note that there is an additional dimension to the game, which is that shops make a profit if they stay open for business. This is only the case if they are not flooded. If the decision made was to move the inventory, then they can obviously also not remain open for business.

**Preparation and materials**

The game can be played in a session at e.g. a conference or with a group of students. A group of more than 40-50 participants make it fun to play. A time-slot of 25-30 minutes is required, although it has been played in a 15 minute session with 120 participants. To prepare:

* Print out the score sheet (*Score\_Sheet\_v5.pdf*). This should be printed on single sided A4 paper, preferably in colour. There are three pages, one each for each of the three types of shop. The total number of pages printed should be at least sufficient for the total number of participants. After printing, divide the pages into each kind of shop.
* Optionally print out the shop owners sheet (*Shop\_Owners\_Sheets.pdf*). This is for information only. It can be used to fold in half into an A5 size, together with the Score Sheet. The text “*The game of making decisions under uncertainty: How sure must one be?*” can then be placed facing upwards on the desk/chair of each participant. The idea is that participants do not know what kind of shop they have until they start.
* Distribute the score sheet (optionally folded into the shop owner sheet) amongst participants. The three shops should be more or less equally distributed, and preferably mixed so that the same shops do not sit next to each other.

**Playing the game**

To start off the game, a presentation has been prepared to explain how it works to the participants (*The game of making decisions under uncertainty\_v4.pptx*). Note that the presentation has several slides that should not be immediately shown to participants!

* Slides 1-15 are used to explain the game. It is important that some time is taken to explain this. Participants need to be clear on the situation, what the flood bulletin looks like and means, and also the decisions that they can take. They also need to know what each decision means to them in terms of costs of taking action, and also the losses should action not be taken. It is also important to mention that there is a loss when flooded. This is due to the damage incurred by flooding (could be considered a direct damage). There is also a loss of profit for not being open for business. This foregone profit can be considered an indirect damage due to flooding. These are, however, separate things and the loss of profit is not included in the damage due to flooding! Note that there are three hidden slides. These include the detailed information for each shop and are not shown, but may be optionally printed and handed out (see *preparation and materials* above).
* Slides 16-31 are the actual game. For each flood event, the bulletin is presented and participants are asked to make their decisions. Only once everybody is ready, then the outcome is presented, which is the next slide. So be very careful not to advance to quickly as that would ruin the event! For Event #1 some additional time is spent to allow participants to familiarise themselves with the scoring. After that we can assume they know what to do.
* The last three slides are an evaluation/wrap-up. The idea is to select a winner based on the REV. Users need to have counted their costs and losses on their score sheers carefully to calculate their final savings. It is also best to just look at the final savings rather than the REV as that is complex thing to calculate. Selecting a winner is not easy, so some categories have been identified to select potential winners. It is likely that the winner will be from the Ferraris shops – as it is easier for them to get value from the forecast. This is unfortunately inherent in the game. One could also think of selecting a winner from each group, though that will take some time. The last slide explains why it is more difficult to get value as a gravestone seller. This shows the cumulative distribution of all possible (2187) decision combinations and the relative value this has to each user. It can be seen that most decisions are of little value to the gravestone sellers (REV < 0, which means it is best to ignore the forecasts and take no action).
* After the game, collect all score sheets so that these can be evaluated.

**Have fun!!**