

ESM 245

Homework #3: Stated preferences

Introduction

One consequence of climate change is that it is increasing the variability of weather patterns in many parts of the world. In agriculture, this could manifest as more variable rainfall and potentially more droughts and floods, which can affect agricultural productivity. In the ocean, this could manifest as more variable ocean temperatures, which can affect fishery catches.

Insurance is one approach to helping protect against this kind of variability. For example, in agriculture, farmers often purchase “index insurance”. Index insurance has the following features:

- The farmer pays a small amount of money each year to be part of the program. This is called a “premium”
- The “index” is usually the rainfall that is experienced in a given year. The index is measured in a reliable and repeatable way.
- A payout happens when the index falls below a threshold. For example, if the threshold is 10 inches of rainfall, then if the actual rainfall is 12 inches, there is no payout, but if the actual rainfall is 9 inches, then there is a payout.

The basic idea of index insurance is that it provides a financial payout in years where the farmer earns very low income, due to rainfall. Because payouts depend only on rainfall, and not on any behavior of the farmer, index insurance programs cannot be “gamed” by the farmer (nothing the farmer does can affect their payout).

Index Insurance in Fisheries

Like farmers, fishermen are subject to high variability in returns. While index insurance is common in agriculture, it is not used at all in fisheries. **The Environmental Markets Lab (emLab) here at Bren recently conducted a study to examine the willingness to pay by fishermen for index insurance in fisheries.** In this homework, you will help analyze a simulated dataset from our analysis to help place an economic value on index insurance in fisheries.

Survey

We conducted a survey of fishermen to understand their interest in index insurance and to elicit their willingness to pay for an index insurance product. That research project was designed to answer a slightly different question (about “basis risk”), so **for the purposes of this homework, we are using a simulated dataset that is similar to what was used in the actual study.** The basic idea is to present each respondent with an insurance contract with a premium that was randomized across respondents. Some respondents said “yes” (meaning they would be willing to pay the premium), and others said “no” (meaning they would not pay the premium). Then, we

collected some socioeconomic variables to help us understand why some respondents might be willing to pay more than others. Finally, we ask them some questions to assess how risk-averse they are because risk aversion might affect their willingness to pay for insurance.

Data

Please use the dataset “insurance.csv” (on Canvas). The columns are:

- 1) ID = Respondent identifier (indicated by i below)
- 2) Premium = the premium offered to that respondent. These were randomized across respondents.
- 3) Yes = whether the respondent answered Yes (so Yes=1) or No (so Yes=0).
- 4) Age = age of the respondent
- 5) Years = number of years the respondent has been fishing
- 6) Length = the length of the respondents fishing vessel (in meters)
- 7) Risk = a measure of risk aversion of the respondent (higher than 1 indicates risk averse, lower than 1 indicates risk loving)

Regression analysis

You will be running a linear regression called a linear probability model, as follows:

$$\text{Yes}_i = a_0 + a_1 * \text{Premium}_i + a_2 * \text{Age}_i + a_3 * \text{Years}_i + a_4 * \text{Length}_i + a_5 * \text{Risk}_i + e_i$$

(where e_i is an error term)

Questions

You will use your regression results to help determine the willingness to pay of fishermen for index insurance. Please answer the following questions:

- 1) Load the dataset into R and make a summary table describing the min, mean, and max of each variable.
- 2) Run the regression described above. Make a summary table of the coefficient estimates and the p-values for each of them.
- 3) Write a 1-2 sentence interpretation of the coefficient estimate for a_1 .
- 4) Do the coefficient estimates have the sign you would have expected? Write a brief explanation for each (around 1 sentence for each coefficient estimate).
- 5) Consider a fisher named Susan, who is 35 years old, has been fishing for 8 years, uses a 10m boat, and has a risk score of 1.1. Make a plot with the Premium on the x-axis and the Probability of Susan's purchase on the y-axis. What is Susan's average willingness to pay for index insurance?