Ec141, Spring 2020

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Problem Set 5

Due: May 8th, 2020

Problem sets are due at 5PM via bCourses. You may work in groups, but each student should turn in their own write-up (including a narrated/commented and executed Jupyter Notebook). Please use markdown boxes within your Jupyter notebook for narrative answers to the questions below. As always, I encourage you to work together with your classmates (you will learn more and enjoy it more). Make use of Zoom and other collaborative, but social distancing compliant, technologies.

Useful reading: Carson (2012), Loomis et al. (1996).

1 Contingent valuation

The file `LoomisForestCVDataset.csv` contains a subset of the dataset used by Loomis et al. (1996). The dataset consists of five columns. The first column lists a bid amount randomly proposed to a respondent to assess their willingness to pay for a fire management program for old growth Pacific Northwest forests. The second column lists the number of respondents saying yes to the project under version one of the survey. The third column lists the number of respondents saying no to the project under version one of the survey. Columns four and five give yes and no responses for the same bid amount but under a different version of the survey.

1. Write a short Python script to transform the given datafile into one respondent per row form. The first column should equal $D = 1$ if the respondent answered yes, $D = 0$ if they answered no. The second column should give the bid amount, A. The third column is $X = 1$ if the response was solicited from version one of the survey and $X = 0$ if it was from version two. Your transformed dataset should have 260 rows and three columns.

2. Assume that willingness-to-pay for the fire management program for a randomly sampled person is:

$$W = \alpha + X'\beta + V,$$

where $V \,|\, X, A \sim \mathcal{N}(0, \sigma^2)$ captures heterogeneity in willingness-to-pay across individuals. Explain how the survey design ensures independence of V and X and A?

3. Assume that individuals respond yes to the proposal if their willingness-to-pay exceeds the bid they were offered. Show that under this assumption that

$$\Pr\left(D = 1 | X, A\right) = \Phi\left(\frac{\alpha}{\sigma} - \frac{1}{\sigma}A + X'\frac{\beta}{\sigma}\right)$$

with $\Phi\left(\cdot\right)$ the CDF of the standard normal distribution.

4. Use probit regression analysis to construct estimates of the composite parameters $\frac{\alpha}{\sigma}$, $-\frac{1}{\sigma}$ and $\frac{\beta}{\sigma}$. From these estimates recover estimates of the fundamental preference parameters α, β and σ. Describe and implement a bootstrap procedure to construct standard error estimates for these parameters. Summarize you results in a table and provide a brief discussion.

5. You are part of an environmental conservation group that is campaigning for a ballot initiative that would fund a fire management program like the one studied by Loomis et al. (1996). The type of initiative you wrote needs to pass with a majority of 67 percent. Your organization wrote the ballot initiative with a proposed tax of $\hat{A}^* - 0.05$ per person, with $\hat{A}^*$ equal to

$$\hat{A}^* = \hat{\alpha} - \hat{\sigma}\Phi^{-1}\left(0.67\right).$$

Here $\hat{\alpha}$ and $\hat{\sigma}$ correspond to your point estimates from question 4 above. Explain the reasoning behind choosing the proposed tax in this way? Construct an estimate of this tax (as well as a standard error using the bootstrap).

6. Read the Carson (2012) and Loomis et al. (1996) papers, then write a short summary of your analysis discussing any strengths and weaknesses. Describe any additional data collection you would undertake if able to do so in order to improve your analysis.

References

Carson, R. T. (2012). Contingent valuation: a practical alternative when prices aren't available. *Journal of Economic Perspectives*, 26(4), 27 – 42.

Loomis, J. B., González-Cabán, A., & Gregory, R. (1996). *A contingent valuation study of the value of reducing fire hazards to old-growth forests in the Pacific Northwest.* Research Paper PSW-RP-229-Web, United States Department of Agriculture: Forest Service.