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| Fall 2023 |

**HOMEWORK EXERCISE 1**

**This exercise is to be submitted to Canvas by 3:30 PM on Tuesday, September 19, 2023. Please submit your answers in an Excel file with the following naming convention:**

**“last\_first\_hw1” (for example, sonnier\_garrett\_hw1)**

**Your submission file should be neatly formatted and contain four tabs, one for questions 1 and 2 and one each for the remaining three questions.**

**This is an individual homework assignment but you may confer with your classmates.**

**In addition to this document there is an Excel workbook (fish preferences.xlsx) containing the data necessary to complete the exercise posted on Canvas. This also serves as a template in which you may complete the assignment.**

**If you feel it necessary you may offer a concise explanation of how you calculated any numbers you are asked to report. You may insert a comment or type directly into your spreadsheet.**

As noted in the popular press government policies on the labeling of food products as “genetically modified” is a controversial topic. Little is understood in terms of consumer behavior with regards to such labels. To help us understand consumer behavior in this space, we have collected choice based conjoint data on consumer preferences. The attributes and levels for the study are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Type** | **Production Method** | **Price per Pound** |
| *Level 1* | Tuna | Wild | $13.99 |
| *Level 2* | Halibut | Farm Raised | $16.99 |
| *Level 3* | Salmon | Farm Raised/Genetically Modified | $19.99 |

A design was used to develop 9 profiles to be evaluated by consumers. Consumers offered a binary yes/no decision to the question of would they buy each profile. A sample of 109 consumers completed the study. Their data are available in the files fish\_preferences.xlsx.

Using these data please complete the following exercises.

1. Specify a binary logit model of consumer choice. For your model, *treat “salmon” as the baseline type and “farm raised/genetically modified” as the baseline production method. Let price enter the utility function linearly in tens of dollars (see class notes from conjoint) and include an intercept term in your model*. Using Excel, build the total log-likelihood function and use solver to find the parameter values that maximize the log-likelihood ***(NOTE: This is a binary logit model similar to the GMAT exercise done in class. The utility of buying is a linear function of an intercept and the attributes of the profiles. The utility of the no buy option is simply zero. The car example we worked in class on Sept 12 is a more complicated multinomial logit model you do not need for this assignment).*** Report your estimated parameters.
2. Using your estimates of the model parameters compute the predicted probabilities for each individual (NOTE: the probabilities will update automatically in your sheet once you find the optimal values for the model coefficients).
3. Compute the derived importance of each attribute. Which attribute is most important?
4. Holding production method constant, what is your estimate of the dollar value of tuna relative to salmon and halibut relative to salmon? Holding type constant what is your estimate of the dollar value of Wild relative to Farm/GMO and Farm relative to Farm/GMO? How do you interpret these results?
5. Part I. Assume the following market with four products and a “None” option.

|  |  |  |  |
| --- | --- | --- | --- |
| **Product** | **Type** | **Method** | **Price** |
| 1 | Tuna | Wild | $19.99 |
| 2 | Halibut | Wild | $18.99 |
| 3 | Salmon | Wild | $15.99 |
| 4 | Salmon | Farm | $13.99 |
| None | --- | --- | --- |

Using the logit rule to compute the share of respondents predicted to choose each option at the given prices (don’t forget the intercept term for Products 1-4 and recall that price is coded in tens of dollars). What happens to the share of Farm Raised Salmon (Product 4) if it becomes Farm Raised and Genetically Modified (still priced at $13.99)?

Part II. Keep Product 4 as Farm/GMO Salmon at $13.99. Holding the price of Product 1, Product 2 and Product 4 constant, predict the product shares when the price of Product 3 (the Wild Salmon) varies from $13.99 to $19.99 in increments of $3.00. Record your answers in Excel in a Table similar to the one below. Use the table to compute **own and cross price elasticities** of the product shares. The elasticities may be computed using the simple arc elasticity formula (i.e. the ratio of the % change in share from $13.99-$19.99 to the % change in price from $13.99 to $19.99 using the midpoint formula to compute the % changes as we did in class). What do you observe regarding the pattern of cross-price elasticities? Is this a sensible pattern of price competition in this market?

**Product Shares as a Function of Product 3 Price**

|  |  |  |  |
| --- | --- | --- | --- |
| **Price of Product 3** | **$13.99** | **$16.99** | **$19.99** |
| *Product 1* |  |  |  |
| *Product 2* |  |  |  |
| *Product 3* |  |  |  |
| *Product 4* |  |  |  |
| *None* |  |  |  |