EPFL
ENAC TRANSP-OR
Prof. M. Bierlaire

Mathematical Modeling of Behavior
Fall 2016

Project Description

1 Aim and Content

The objective of this assignment is to develop a discrete choice model for analyzing the *mode* choice behavior of people living in low density areas of Switzerland. The description of the case study and the explanation of the data is provided in the `optima_attitudes_v2.pdf` file. The dataset can be found in the `optimaDataset.dat` file. The results should be documented in a report. Each group must submit one report by November 29 at noon. *All members of the group should contribute equally in the analysis and writing of the report.*

As always the main goal is to specify and estimate the "best" model you can, by testing different specifications of the utility functions and different types of model (e.g. logit and nested logit), and use it to :

1. forecast the changes in demand in response to (i) an increase in car cost by 10 % (imitating an increase in fuel taxes) and (ii) a decrease in public transport cost by 10 % (imitating a provision of subsidies). Note that as many people do not pay (owning travelcards, seasonal tickets etc.) the aggregate cost elasticity is lower than expected. Bearing this in mind, after computing the cost elasticity for the whole population, try to identify subgroups with higher or lower cost elasticities in order to analyze the forecast. Use the mode shares of the original scenario to compare with the ones obtained after the changes in demand. Which of the two policies would you suggest to the authorities who are aiming at decreasing the share of car?

2. determine which would be the optimal price –in terms of variations with respect to the current price– to maximize the revenue of the public transportation company. Are the results what you expected? Justify your answer.

2 Intermediate Tasks

For each of the following tasks, explain the motivation of your solution, interpret the results, and draw conclusions. Your modeling decisions shall be justified using statistical tests. You are not limited to these tasks. More and deeper analysis is encouraged.

1. Try to include alternative specific parameters.

2. Try to interact socioeconomic variables with the ASC and the attributes.

3. Try to include at least one appropriate non-linear specification for one of the variables.

4. Test a nested logit model and make sure to discuss the assumptions that you are testing and interpret the nesting coefficients.

5. Compute the average value-of-time for car and public transport and discuss if the obtained values are reasonable or not, and why.

6. Make sure to comment and interpret the best model obtained in details. You shall use formal tests.

3 Technical Information

- For this assignment, you will work with the group that you have been assigned to according to the instructions of the teaching assistants.
- You will find the material you need for this assignment on the course webpage.
- Please put the following files into a single `.zip` file named `Group_XX.zip`[1]:
  - your report as a **.pdf** file,
  - your model as a **.py** file,
  - your results as a **.html** file,
  - your analysis as an **excel** file

  and send it by email to `anna.fernandezantolin@epfl.ch` by November 29, 2016.
- The report must be in English and maximum 4 one-sided pages long.
- Split the work of modeling and writing equally among the group members.
- All the concepts needed to answer the assigned problem are covered during the lectures and/ or tutorial sessions.
- You may address your questions to the teaching assistants during the lab sessions or send an email.

Bonne travail!

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[1] Where XX is your group number.