EPFL
ENAC TRANSP-OR
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Mathematical Modeling of Behaviur
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Exercises session 8

The topic of this and the following lab session is validation (discussed in the last part of the lecture on statistical tests) and forecasting. We ask you to work on the *Optima* dataset –Mode choice in Switzerland.

Choose the best model that you have specified during the previous lab sessions.

Validation

1. Perform an outlier analysis using Biosim to generate the probabilities, and Excel for the analysis. Try to find possible causes for low probabilities and, if possible, modify the model specification in order to improve the model.

2. Compare predicted vs. observed shares for different market segments.

Forecasting

1. Choose a scenario you want to test. For example, test the effect of a change in the cost of alternatives across different market shares.

2. For each scenario, forecast the shares for the different market segments and compare with the original scenario.

3. Compute elasticities and explain the relationship between the change in variable (e.g. cost) and the market share (elastic, inelastic relationship).

We refer to the BIOGEME tutorial page 67, for instructions on using Biosim: `http://biogeme.epfl.ch/v18/tutorialv18.pdf`.

Short tutorial to perform forecasting analysis using Biosim and Excel

1. Estimate the base model:

   Use one of the models you developed. Choose a model that you are confident with –a model that is complex enough to mimic the behavior of travelers in Switzerland.

2. Produce the choice probabilities using Biosim:

   The estimation you performed with Biogeme at step 1 generates a file *yourModel.res*. Rename it *yourModel_res.mod*. Open it and try to understand what it represents.

   Run Biosim on that file using the following command: `biosim myModel_res myData.dat`. It creates a file called *myModel_res.enu*. This file contains the probabilities.

   Open the file *myModel_res.enu* and paste its content on the right of the database my-Data.dat. Now, you have an Excel sheet with the original data and the choice probabilities for each alternative from your model.

3. Use Excel to compute market shares:

   From the Excel sheet, you can compute market shares for each mode by summing the probabilities of each respondent.

   You can also compute market shares using a segmentation, e.g. based on income groups.

4. Effect of increasing price:

   In order to forecast the effect of an increasing price, you can modify the file *myModel_res.mod*. Create a copy of this file, *myModel_res_price.mod*, and modify the [`Expression`] section by defining a new cost or any new scenario you want to test.

   Run biosim on this new file and get *myModel_res_price.enu*.

   Recompute the market shares for this result. Report the difference in market shares related to change in some attributes.

You will find a numerical example on the website of the course based on the Residential telephone services case study.

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