# Computer Lab I Introduction to the course lab sessions: Datasets and BIOGEME

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## Outline

- Useful information
- Organization of the lectures
- Organization of the labs
- Case studies and available datasets
- BIOGEME: step-by-step example



## Useful information

- Teaching assistants:
  - Anna Fernandez Antolin
  - Evanthia Kazagli
  - Matthieu de Lapparent
- ② Course webpage: http://transp-or.epfl.ch/courses/dca2015/
- ③ Semester projects: http://transp-or.epfl.ch/studentProjects.php



#### Your participation to the lectures:

 Read the material before the beginning of the course!
Textbook and additional reading material available here: http://transp-or.epfl.ch/courses/dca2015/schedule2015.php



## Organisation of the labs

**Case Studies** 

- Choose a dataset
- Test and interpret the provided example models
- Specify and interpret your own models
- All the material is available on the course webpage http://transp-or.epfl.ch/courses/dca2015/labs.php



## Your participation to the labs

- Exercises with the computer using Biogeme.
- Exercises with pen and paper: some will be solved in the whiteboard.
- During the semester you will have to give in one assignment: 27<sup>th</sup> November.
- It is **compulsory** to give in this assignment in order to be evaluated.



- The exercices and assignements are organized in groups.
- The groups will be determined by the teaching assistants and communicated via email to enrolled participants.
- Work jointly with your group.



## Your participation to the labs

- Use the assigned dataset to develop your own model specification.
- By e-mail, give back your results:
  - Max. 1 double-sided page of assignment in PDF format.
  - Model specification in .mod (text) format.
  - Output file in HTML format.
- 1 assignments during the semester.
- Deadline: 27<sup>th</sup> November.



## Case Studies

- Goal: Study discrete choice models.
- Datasets to apply models in:
  - Netherland mode choice
  - Swissmetro
  - Choice of residential telephone services
  - Boeing
  - Optima



## Case Studies

Problem statement

Can the observed pattern of choice be explained in terms of basic economic variables such as relative prices, income, and underlying individual characteristics (gender, age, etc.)?



### Datasets

Netherlands mode choice

Data on intercity travelers' choices between the transport modes of rail and car.



### Datasets

#### Swissmetro

Data on travelers' choices of transport mode among a proposed underground system (Swissmetro), traditional train, and car.



• Choice of residential telephone services

Data on households' choices of local telephone service.



### Datasets

Boeing

Data on flight options for a particular origin-destination trip.



### Datasets

Optima

Data on transportation mode choice in low-density areas of Switzerland.

More information: http://transport.epfl.ch/optima



## BIOGEME

- Created by Michel Bierlaire.
- State of the art software for estimating models in the field of discrete choice analysis.
- Open source.
- All models presented in this course can be estimated with BIOGEME.
- webpage: http://biogeme.epfl.ch



### BIOGEME

- Two versions are available for Windows and Mac OS X:
  - GUI
  - DOS/ command line
- We recommend the DOS/ command line version.



Today

- Go through the dataset descriptions available on the course web page.
- Step-by-step example with BIOGEME using the Netherlands Mode Choice dataset.



### How to install Biogeme?

- biogeme.exe should be in C:\Program Files\biogeme
- Open a DOS window (from the Start menu, select Run and in the dialog box type cmd and select OK).
- In order to use BIOGEME from any directory on your computer, the above directory has to be in your "path" (environment variable).
- In the DOS window type path=%path%;C:\Program Files\biogeme.
  - This has to be typed every time you open the DOS window.
- To check if the installation has been successful, just type biogeme in the DOS window. A message displaying the version of BIOGEME should then appear.

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## How does BIOGEME work?

- BIOGEME reads:
  - a file containing the model specification model\_file.mod
  - a file containing the data sample\_file.dat
- Both are text documents (.txt)

biogeme model\_file sample\_file.dat

- BIOGEME automatically generates:
  - A file containing the results of the maximum likelihood estimation: model\_file.res
  - The same file in HTML format: model\_file.html



 BIOGEME is invoked in a DOS command window under Windows using the following statement structure:

biogeme model\_file sample\_file.dat

- 2 types of files: .mod & .dat
- The graphical version of Biogeme guibiogeme.exe (also available in C:\Program Files\biogeme) is invoked by a double-click on the executable file.



Some useful commands:

- To select a drive (e.g. C), just type C: at the prompt.
- To connect to a directory (e.g. C:\biogeme), just type cd C:\biogeme
- To see the content of a directory, use Windows Explorer, or type dir
- In order to return to the previous (top) directory, type cd ...



Some useful commands:

- To go into a directory (e.g. biogeme), just type cd biogeme
- To see the content of a directory, type ls
- In order to return to the previous (top) directory, type cd ...
- To know where you are, type pwd (Print Working Directory)



## Example

- Netherlands mode choice
- Choice between rail and car
- 223 observations
- Travel times and travel costs are used as explanatory variables for the model, and the deterministic utility specifications are

$$V_{car} = ASC_{car} + \beta_{cost}cost_{car} + \beta_{time}time_{cal}$$
$$V_{rail} = \beta_{cost}cost_{rail} + \beta_{time}time_{rail}.$$

Model is specified in model\_file.mod



### Example

Extract from the file containing the data sample\_file.dat

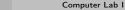
id	choice	rail_cost	rail_time	car_cost	car_time
1	0	40	2.5	5	1.167
2	0	35	2.016	9	1.517
3	0	24	2.017	11.5	1.966
4	0	7.8	1.75	8.333	2
5	0	28	2.034	5	1.267
219	1	35	2.416	6.4	1.283
220	1	30	2.334	2.083	1.667
221	1	35.7	1.834	16.667	2.017
222	1	47	1.833	72	1.533
223	1	30	1.967	30	1.267

- 1 row = 1 observation
- 1 column = 1 variable۲

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### Estimate your first model

- Download the two files from the course webpage to the directory of your choice (e.g. Desktop).
- In the DOS window, move to this directory using the cd command.
- Invoke BIOGEME:

```
biogeme model_file sample_file.dat
```

- Open the HTML file model\_file.html.
- We briefly discuss it.

