Computer Lab III

Summary

Today

- Administrative stuff (rules, groups, number of pages, ...)
- Summary of what you've learnt so far
  - Types of variables (generic, specific, socioeconomic)
  - Tests (likelihood ratio test, t-test)
- Help: dealing with missing data
- You'll work on lab 2 and your report

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Administrative stuff

- Report is **compulsatory**:
  - No report, no final exam!
- **Deadline** to submit the report: Friday, October 7, 2011, at noon
- Submit by email to Aurélie, Jingmin and Antonin:
  - .html file (from BIOGEME)
  - .pdf (or Word) document containing a description of the model specification with its underlying hypotheses
- One page is perfect, 2 pages is OK.
- Data set: Airline Itinerary Choice (Boeing)
- Groups of 2 or 3 persons:
  please subscribe on the sheet of paper

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Data set: Airline Itinerary Choice (Boeing)

- Data set and models available on the website:
  - 3 models (generic, specific, with socioeconomics)
  - 1 data file (boeing.dat)
  - 1 description about the models provided (.pdf)
- Description of the data and variables available on the website:
  - General description
  - List of variables

Types of explanatory variables

- In linear formulation of utility function, βs are called coefficients or parameters. Different kinds:

  - Alternative specific constants (ASC)

  - Generic
    - Appearing in all utility functions with equal coefficients
    - Assume all choice makers have the same marginal utility between the alternatives

  - Alternative specific
    - Different coefficients between utility functions
    - Capture the marginal utility specific to an alternative

  - Alternative-specific socioeconomic
    - Reflect differences in preference as functions of characteristics of the decision-maker.

Tests

Goal: test alternative specifications of the explanatory variables in the utility functions

- t-test
- Likelihood ratio test

Tests: t-test

- Goal: test whether a particular parameter in the model differs from some known constant, often zero

- Valid only asymptotically (since we work with nonlinear models)

- t-test > 1.96 means significant parameter (95% confidence interval)

Tests: Likelihood ratio test

- Goal: compare different specifications (i.e., models)

- Restricted model (e.g., some βs $= 0$) (null hypothesis) vs unrestricted model

- Number of degrees of freedom: difference between the number of estimated coefficients in the restricted and unrestricted models.

- χ^2 test with this number of freedom:
  $$-2(\mathcal{L}(\hat{\beta}_{unrestricted}) - (\hat{\beta}_{restricted}))$$

Interpretation

- Is the coefficient significant?

- Sign

  - Coefficients are expected to have a behavioral meaning: a negative coefficient means lower utility when the variable is high, and higher utility when the variable is low, e.g. travel time, cost.

  - The other way around: same interpretation

Dealing with missing data

- Section `[Exclude]` tells BIOGEME not to consider some observations.

- **Example** of `binary_generic_boeing.mod`
  - `[Exclude] ArrivalTimeHours_1 == -1 || BestAlternative_3`
  - Excludes missing data (-1) for variable ArrivalTimeHours_1
  - Excludes alternative BestAlternative_3 (1 Stop with 2 different airlines)

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Dealing with missing data

- **Example**: if want to use gender variable (q17_gender)
- **Solution 1**
  - Exclude missing data (-1 and 99) from **whole data set**
  - `[Exclude] ArrivalTimeHours_1 == -1 || BestAlternative_3 || q17_gender == 99 || q17_gender == -1`

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Dealing with missing data

- **Example**: if want to use gender variable (q17_gender)
- **Solution 2** **(BETTER)**
  - Measure taste heterogeneity between men and women by introducing a term for missing data in utility
  - `[Exclude]` section identical
    - `[Exclude] ArrivalTimeHours_1 == -1 ||`
      `BestAlternative_3`
  - In section `[Expressions]` define:
  - `MissingGender = ((q17_Gender == -1) +`
    `(q17_Gender == 99)) > 0`
  - In section `[Utilities]` specify:
  - `+ Male_Opt2 * Male + MDGender *`
    `MissingGender`

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Your goals for the report

1. Write your own model with new variables

2. Test it

3. Back to 1. until you have the best model ever

4. Write a one-page report

5. Send the PDF (or Word) document + HTML result file before the deadline

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