

CSSS/POLS 510 MLE Lab

Lab 9. Count Data

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Housekeeping

- Homework 4 answer key will be uploaded on Chris's website (Lab 9)
 - Grades will be posted next week
- Homework 5 is due December 3 (Wed) 4:30pm
 - Submit a pdf file showing all your code for computation/visualization
 - Comment the part that causes knitting problem
 - Answer key will be uploaded on Chris's website (Lab 9)
 - Grades will be posted during the last week of the quarter
- No lab on December 5 (Office hours only)
- Agenda
 - Review Multinomial Logit
 - Preview Homework 5
 - Modeling count data

Recap

Where are we at right now?

- ① Learn distribution and MLE → HW1 & HW2
- ② Logit model → HW3
- ③ Ordered Probit model → HW4
- ④ Multinomial logit model → HW5

Review: Simulating QoI (Multinomial Logit)

- 1 Estimate: MLE $\hat{\beta}_{(M+1) \times (P+1)}$ and its variance $\hat{V}(\hat{\beta}_{(M+1) \times (P+1)})$
→ `optim()`, `multinom()`
- 2 Simulate estimation uncertainty from a multivariate normal distribution:
Draw $\tilde{\beta} \sim MVN[\hat{\beta}, \hat{V}(\hat{\beta})]$
→ `MASS::mvrnorm()`
- 3 Create hypothetical scenarios of your substantive interest:
Choose values of X: $X_c \rightarrow \text{simcf}::\text{cfmake}(), \text{cfchange}() \dots$

Review: Simulating QoI (Multinomial Logit)

- 4 Calculate expected values:

$$\tilde{\pi}_c = g(X_c, \tilde{\beta})$$

- 5 Compute EVs, First Differences or Relative Risks

$$\text{EV: } \mathbb{E}(y = j | X_{c1}, \tilde{\beta})$$

→ `simcf::mlogitsimev()` ...

$$\text{FD: } \mathbb{E}(y = j | X_{c2}, \tilde{\beta}) - \mathbb{E}(y = j | X_{c1}, \tilde{\beta})$$

→ `simcf::mlogitsimfd()` ...

$$\text{RR: } \frac{\mathbb{E}(y=j | X_{c2}, \tilde{\beta})}{\mathbb{E}(y=j | X_{c1}, \tilde{\beta})}$$

→ `simcf::mlogitsimrr()` ...

Last words

Statistics (and programming) should be intuitive

- If I can't explain the result in a simple manner, I don't understand it
- Statistics is a tool; your research design is first
- You run the model; don't let the model run you

Model results are unintelligible unless...

- You interpret and communicate them in meaningful ways
- *Substantively meaningful* quantities of interest (QoI) and counterfactual scenarios
- Visualization is critical
Avoid WYGWYS (What you get is what you see)

Last words

Computers (and AI) are powerful yet not so smart

- They execute what you instruct them, *literally*
- When mistakes happen, it is usually us who make mistakes (but, sometimes AI makes mistakes too)
- No replacement of sound statistical judgement
- Don't be held hostage to particular code, functions or packages
- "No default, all manual" is a virtue of `simcf` and `tile`
- Run incrementally when you face new loop and function: Reading ability is also critical
- Watch out for typo

Evaluation

What I am responsible of. . .

- Teaching in Lab sessions
- Grading of your homework
- Response to your questions and other communication

What I am Not. . .

- Course contents
- Number and difficulty of problem sets
- How questions in problem sets are structured and phrased
- How answers should be graded

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