POLS6382 Quantitative Methods III: Maximum Likelihood Estimation

University of Houston
October 22, 2025

Homework Assignment 4

Instructions

- Answer the following questions and submit your answers and R code in one document. Your document should be prepared using LaTeX or R-Markdown.
- Submit your report using the submission link on Canvas.
- Homework Assignment 4 is due on Friday (October 31), by noon.
- We will review Homework Assignment 4 during class on November 5.

1. Analyzing 2022 Midterm Election Data

In this exercise, you will use the 2022 Cooperative Election Data to analyze the determinants of turnout in the 2022 midterm election.

- 1a. Download the 2022 CES data from the following website: https://cces.gov.harvard.edu/. Use the post-election wave data to extract variables needed for this exercise.
- 1b. Data Preparation: Selecting the variable that measures vote turnout and registration. Then select a few variables that you think are reasonable explanatory variables for voting and registration, e.g., respondent's party ID, age, gender, race, education, or policy preferences on important issues, etc. Recode the voting and registration variables into dichotomous variables. Preparing data for all the explanatory variables by recoding them as needed.
- 1c. Estimate a standard logit model to predict the probability of voting and report the findings.
- 1d. Estimating a two-step Heckman selection model, whereby the voting variable is the dependent variable of the outcome equation, and the registration variable is the dependent variable of the selection equation. Report what you find.
- 1e. Compare your model results between the two specifications: Standard logit and the Heckman selection model. Discuss what differences (if any) you observe across the two specifications. Discuss which one is the better approach to model the probability of turnout.

2. Analyzing Count Data

For this exercise, use the data on U.S. Presidential Vetoes found in the file `vetos.Rdata`.

In the U.S. government, the Presidents can veto legislation passed by Congress. This prevents the bill from becoming law unless two-thirds of the House and Senate vote to "override" the veto. If two-thirds of both houses agree, the bill becomes law despite the President's objections. Otherwise, the bill dies. The literature on vetoes is moderately extensive. Two articles with models similar to the data used here are Jong R. Lee, 1975, "Presidential Vetos from Washington to Nixon", *Journal of Politics* 37:522-546 and Gary W. Copeland, 1983, "When Congress and the President Collide: Why Presidents Veto Legislation," *Journal of Politics* 45: 696-710. Both of these papers suggest that important influences on the number of vetoes cast include the size of the president's the electoral majority, the congressional or gubernatorial experience of the President, scope of government (measured by the number of bills passed), majority control or lack of control of Congress, and the year of presidential term, especially if the president is up for reelection. Some models also include the party of the president. The dataset you have contains most of these variables, plus some additional ones which may or may not be valuable.

For this exercise, rather than study the total number of vetos, I want you to specify and estimate a model of the number of vetos that are overridden by Congress. There are theoretical advantages of this focus, since the override is the final move in a presidential-congressional game; it is less subject to strategic considerations than are the earlier moves, which lead to the vetos themselves. (This statement ignores the possible sequential game being played across bills.) This number of overrides (`nover`) is an event count that may follow the Poisson or some other distribution.

Here are all the variables included in the dataset and the descriptive statistics:

```
. desc
Contains data
  obs:            26
 vars:            32
 size:         3,432 (93.5% of memory free)
-------------------------------------------------------------------------------
   1. congress  float  %9.0g                 Congress Number
   2. year      float  %9.0g                 Year of first session
   3. nveto     float  %9.0g                 Number of Vetos Cast
   4. npocket   float  %9.0g                 Number of Pocket Vetos Cast
   5. nover     float  %9.0g                 Number of Vetos Overridden
   6. pres      str4   %9s                   Presidential Initials--Character
   7. popvote   float  %9.0g                 Percent Popular Vote for
                                               President,last election
   8. housedem  float  %9.0g                 Number of Dems in House
   9. houserep  float  %9.0g                 Number of Reps in House
  10. sendem    float  %9.0g                 Number of Dems in Senate
  11. senrep    float  %9.0g                 Number of Reps in Senate
  12. janpop    float  %9.0g                 Presidential Approval, January
                                               of First Session
  13. junepop   float  %9.0g                 Presidential Approval, June of
                                               First Session
  14. congexpr  float  %9.0g                 Pres. has Congressional
                                               Experience
```

```
 15. govexpr   float  %9.0g                 Pres. has Gubernatorial
                                             Experience
 16. nlaws     float  %9.0g                 Number laws enacted by Congress
 17. reelect   float  %9.0g                 Pres up for reelection
 18. elecdem   float  %9.0g                 Num Dem Electoral Vote
 19. elecrep   float  %9.0g                 Num Rep Electoral Vote
 20. prespty   float  %9.0g                 Party of President
 21. hdempct   float  %9.0g                 House Percent Dem
 22. sdempct   float  %9.0g                 Senate Percent Dem
 23. hmajor    float  %9.0g                 House Majority Dem=1,Rep=0
 24. smajor    float  %9.0g                 Senate Majority Dem=1,Rep=0
 25. preshmaj  float  %9.0g                 Pres Pty Has House Majority
 26. pressmaj  float  %9.0g                 Pres Pty Has Senate Majority
 27. edempct   float  %9.0g                 Electoral College Pct Dem
 28. presepct  float  %9.0g                 Pres Electoral College Percent
 29. congmaj   float  %9.0g                 Pres Pty Has Majority in Both
                                             Houses
 30. popchng   float  %9.0g                 June-Jan Popularity Change
 31. hmargin   float  %9.0g                 Pres Pty Margin in House
 32. smargin   float  %9.0g                 Pres Pty Margin in Senate
-------------------------------------------------------------------------------
```

- 2a. Specify and estimate a Poisson model of veto overrides. Include whatever you wish, and consider more than one alternative specification. Choose your final specification.
- 2b. Discuss the statistical findings briefly.
- 2c. Choose proper methods to interpret your results substantively.
- 2d. Testing for overdispersion and then reestimating the model using the negative binomial model. How do the results differ, if at all?
- 2e. Have fun!

3. Your Term Paper Project

- 3a. Finish data preparation. Skip this if you have completed data collection.
- 3b. Revise your descriptive analysis if needed. Skip this step if you have done this in HW3.
- 3c. Revise and finalize your main statistical model.
- 3d. Prepare three presentation slides to include your most interesting findings so far. Submit your slides as a separate file on Canvas.