

# PO 7005: Assignment 5

Thomas Chadeaux

NOTE: Always justify your answer. Show R code when relevant. Late submissions will be penalized (5 points per day). Each question is equally weighted.

## 1 Question A (40 points)

Consider the following data:

$$y = 1, 0, 1, 1, 0$$

$$x = 5, 6, 2, 3, 4$$

1. Suppose our model is a logit of the form  $y = \beta_0 + \beta_1 x$ . Write down the likelihood function for the model, using the values above (write it *fully*, including actual numerical values). Use R to *manually* estimate the coefficients  $\beta_0$  and  $\beta_1$ , using MLE (i.e., do not use `glm` or related functions that will just give you the results. You may use loops and/or optimization functions [I recommend `optim()`]). (20 pts)
2. Suppose I now asked you to calculate the coefficients' standard errors, but you have no idea what the formula for it might be. What would you do (20 points)? (Bonus points: do it! Do not worry if you do not get the same results as in the canned version. 5 extra points)

## Question B (60 points – 10 pts each)

WomenEmployment.dta is a sample of 4,711 women in years when employed, not enrolled in school and having completed their education, with wages in excess of \$1/hour but less than \$700/hour.

1. Using standard OLS, estimate the following model:

$$\log(\text{wage}_{it}) = \beta_0 + \beta_1 \text{experience}_{it} + \beta_2 \text{experience}_{it}^2 + \varepsilon_{it},$$

where *ln\_wage* and *tll\_exp* are the variable names for  $\log(\text{wage})$  and experience, respectively.

2. Do you think fixed effects for each individual ('idcode') are justified in this model? Report your results for both models using a publishable table.
3. Now add fixed effects by calculating first differences. Do you obtain different results? Why?
4. Do you think your preferred method to estimate this model should be fixed effects or first differences?
5. Now estimate the same model, but using random effects. Do you think the random effects model should be preferred to the fixed effects model? Justify
6. Using the model you've finally chosen (FE, RE or FD), do you think you can report your results as they are, or do you think the reviewers might raise some objections about your reported results? Explain why, and explain and perform your next step if you think the reviewers won't be happy.