ECOM90003: Applied Microeconometric Modelling

Assignment 2

This assignment is based on the paper "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement" by Joshua Angrist and Victor Lavy.

Your submission should include your written responses to all questions, and then an appendix including all requested tables, and finally your Stata code (in a separate .do file, not as part of the main response file). Tables should be numbered sequentially. Please keep your written answers brief and to the point, referring to the tables by table number and column heading where appropriate.

1. [8 marks] Consider the following model relating test scores (as a measure of scholastic achievement) and class size:

$$y_{isc} = \mathbf{X}_s\beta + n_{sc}\alpha + \varepsilon_{isc} \quad (1)$$

where y_i is either the math or reading test score for student *i* in class *c* and school *s*, $\mathbf{X}_s\beta$ is a vector of school characteristics, n_{sc} is the size of class *c* in school *s*, and ε_{isc} is a random error term.

If you have cross-sectional data on all variables in the model, what four assumptions must this model meet for the OLS estimator of α to be an unbiased estimator?

2. [4 marks] What are the potential sources of endogeneity in this regression? [Hint: make sure to consider all potential sources of endogeneity discussed in week 5].

3. [4] Suppose that you have panel data available on all variables in this model, would this be sufficient to solve all potential sources of endogeneity? Why or why not?

4. [4 marks] Now suppose that our variable for class size is measured with error:

$$\widetilde{N}_{sc} = n_{sc} + \nu_{sc} \quad (2)$$

$$\text{cov}\,(n_{sc}, \nu_{sc}) = 0 \quad (3)$$

where $\widetilde{N}_{sc}$ is the mismeasured class size variable we have in our data. Assume that both n_{sc} and $\widetilde{N}_{sc}$ are uncorrelated with ε_{isc} and that n_{sc} is uncorrelated with ν_{sc}. Further, assume that all four assumptions discussed earlier are met. Will the OLS estimator for α be unbiased? Explain your answer, including the expected direction of any bias.

5. [10 marks] The authors of "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement" suggest using Maimonides's Rule as an IV for class size. Explain what is required for this variable to be a valid instrument **in this specific setting**. What arguments and descriptive evidence do the authors present to motivate this instrument? Refer to the relevant figures and tables in the paper and the key points that support the use of this variable as an IV.

6. [8 marks] Using the data provided, replicate Panel A (columns 1-2 and 7-8) of Table 3 and label your replication "Table 1". What do these results tell us about the relevance of the instrument?

7. [12 marks] Replicate Columns 1 to 12 of Table 2 in the paper. Include it in your assignment appendix, labelled as “Table 2”.

8. [8 marks] Replicate Columns 3 - 6 and 9 – 12 in Panel A of Table 3 in the paper. Include it in your assignment appendix, labelled as “Table 3”.

9. [6 marks] Interpret the coefficient estimates from your replication of Table 3 (question 8). What is this type of regression called? Do they tell us anything meaningful about our outcome of interest? If not, what is the next necessary step to making them meaningful?

10. [8 marks] Replicate Columns 1-3 and 7-9 of Table 4 in the paper. Include it in your assignment appendix, labelled as “Table 4”.

11. [10 marks] Interpret the coefficient estimates (including magnitude and significance) from your replication of Table 2 (question 7) and Table 4 (question 10). Comparing the OLS and IV estimates, describe the bias in the naive equations.