240A Winter 2022: Computing Assignment III

DUE: 6pm on 2/17. Upload to Canvas an RMD file and either a PDF or html file.

Your compiled file should contain slides that you will present during discussion (if your group is chosen).

One selected group will present problem 1 and the other will present problem 2

1. Explain convergence to your students

You are teaching an introductory econometrics class, and a student asks a question:

- You said the OLS estimator converges to a constant, and then you said it converges to a normal distribution. How can both happen simultaneously?

Use simulations and graphs to answer this question. In the process, you will have to demonstrate the properties of consistency and asymptotic normality.

2. Augustin-Louis Cauchy

You will study (un)biasedness and convergence of the OLS estimator for one case where the LLN and CLT hold and another case where they do not.

Use the data generating process $y_i = 0.9 + 0.5x_i + e_i$, where $x_i \sim N(0, 1)$. Consider two different error distributions:

- $e_i \sim iidN(0, 1)$
- $e_i \sim iidCauchy(0, 1)$

For the OLS slope coefficient,

1. make a table showing, for various sample sizes, the mean and standard deviation across samples.
2. produce a graph(s) showing the sampling distribution for various sample sizes.
3. explain the contents of your table and graphs based on the asymptotic theory seen in class.