

# INTRODUCTION to ECONOMETRICS

## Home-work II 2020

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Deadline. **October 2 11h59pm [Paris time]** via email in PDF format and first class after the deadline for the printed version of your work again. Delays will be penalized.

Instructions. I am expecting one PDF file for each student named LAST\_NAME.pdf containing the description of the code, the results obtained and their interpretations. This document should be formatted according to the template available on the course web-page. Not respecting the formatting will affect your grade.

## Problem 1 [OLS - different flavours]

Consider the following population regression model

$$Y_i = \beta_0 + \beta_1 X_i + u_i \quad ,$$

where  $\beta_0 = \sqrt{2}$  and  $\beta_1 = \sqrt{3}$ .

Assume that  $X$  and  $u$  are distributed as Student's  $T$  random variables with  $N-1$  degrees of freedom. Let the sample size be  $N=100$  and draw a random sample from this population.

1. Write the code to compute the OLS estimators using the scalar, matrix and numeric representations discussed in class. For the numeric case use the "optim" R command and explicitly set the relative tolerance (using the "reltol" option) equal to  $1e-06$ .
2. For each of them write the corresponding R function to compute estimates.
3. Write a simple Monte Carlo simulation to study the sampling properties of the  $\hat{\beta}_1^{\text{OLS}}$  in the three cases.
4. What happens when the relative tolerance of the command "optim" is set to 1? Is anything wrong with the OLS estimator?