Objectives of the course

1 Linear regression

Summary statistics and random variables :

- Summary statistics : mean, median, quantiles, variance, skewness. Explain in words how these summary statistics are useful and how to compute them (except for the skewness).
- What is the difference between the median and the mean ?
- Being able to interpret a graphic of two random variables that are correlated (positively, negatively or with no correlation).
- What are the needed assumptions for estimating the expectation of a random variable with the sample average ?
- What is the difference between an estimator and an estimate ?
- Being able to explain why the law of large numbers is useful.

Linear regression : mathematical framework

- Knowing the vocabulary used in the linear regression framework : dependent variable, explanatory variable, ...
- Being able to explain the advantages of minimizing the sum of squared residuals with respect to the sum of absolute residuals.
- What is the purpose of the determination coefficient ? How do we interpret it ?
- How the determination coefficient and the correlation coefficient are related ?
- Being able to interpret the coefficients of a linear regression (slide 67).
- Being able to transform a non-linear regression into a regression that can be estimated using the OLS estimator (slide 65).

Linear regression : statistical framework

- Being able to explain each hypothesis of the statistical framework and why they are needed.
- Being able to explain in words and mathematically the meaning of an unbiased estimator, a consistent estimator and an efficient estimator.
- Being able to perform a statistical test if you are given the variance of the OLS estimator.
- Being able to interpret a p-value.
- Being able to interpret a confidence interval.
- Being able to explain what an error of type 1 means.
- Being able to explain in words the central limit theorem (CLT) and to give practical illustrations.
- Being able to explain why CLT helps relax the assumption on the normality of the error terms.