

Elements of Econometrics, 2023-2024

Class teacher: Ksenia Kasianova.

Class 1: Intro

Problem 1

Is the following correct?

- (a) If X and Y are independent then $\rho_{X,Y} = 0$.
- (b) If $\rho_{X,Y} = 0$, then X and Y are independent.

Problem 2

- (i) Which estimator can be considered a good estimator?

(ii) Suppose the data is generated by a model $y_t = \alpha + \beta x_t + \varepsilon_t$, $t = 1, \dots, n$, satisfying the conditions of classical regression. $\hat{\alpha}, \hat{\beta}$ - estimates of the least squares method. The estimate $\tilde{\beta}$ was obtained using the least squares method under the additional (generally speaking, incorrect) assumption that $\alpha = 0$.

- (a) Find the OLS estimate of $\hat{\beta}$. Under what conditions is it an unbiased estimate of the parameter β ?
- (b) Find the variance of the estimate $\tilde{\beta}$, compare it with the variance of the estimate $\hat{\beta}$.
- (c) Discuss which of the two estimates is better to use.

Problem 3

Let $X = (X_1, \dots, X_n)$ be a random sample from an exponential distribution with distribution density $f(x; \lambda) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$, where $\lambda > 0$.

Use the maximum likelihood method to find an estimate for the unknown parameter λ .

Problem 4

- (a) How p-value is related to observed statistic? to critical value?
- (b) How hypothesis testing is related to confidence interval? Derive confidence interval for mean.
- (c) How type I and type II errors are related?