

FINANCIAL ECONOMETRICS
SHANGAI JIAO TONG UNIVERSITY SUMMER
SCHOOL 2025-2026
PROBLEM SET - LECTURE 2

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Reference: Stock, J.H. and Watson, M.W., Introduction to Econometrics (4th Edition, Global Edition)

Chapter 4: Linear Regression with One Regressor

Question 1. A regression of average monthly expenditure (AME, measured in euros) on average monthly income (AMI, measured in euros) using a random sample of college-educated full-time workers earning €100 to €1.5 million yields the following:

$$\widehat{AME} = 710.7 + 8.8 \times AMI, \quad R^2 = 0.030, \quad SER = 540.30$$

- (a) Explain what the coefficient values 710.7 and 8.8 mean.
- (b) The standard error of the regression (SER) is 540.30. What are the units of measurement for the SER? (Euros? Or is it unit free?)
- (c) The regression R^2 is 0.030. What are the units of measurement for the R^2 ? (Euros? Or is R^2 unit free?)
- (d) What does the regression predict will be the expenditure of a person with an income of €100? With an income of €200?
- (e) Will the regression give reliable predictions for a person with an income of €2 million? Why or why not?
- (f) Given what you know about the distribution of earnings, do you think it is plausible that the distribution of errors in the regression is normal?

Question 2. A researcher runs an experiment to measure the impact of a short nap on memory. There are 200 participants and they can take a short nap of either 60 minutes or 75 minutes. After waking up, each participant takes a short test for short-term recall. Each participant is randomly assigned one of the nap times, based on the flip of a coin. Let Y_i denote the number of points scored on the test by the i th participant ($0 \leq Y_i \leq 100$), let X_i denote the amount of time for which the participant slept prior to taking the test ($X_i = 60$ or 75), and consider the regression model $Y_i = \beta_0 + \beta_1 X_i + u_i$.

- (a) Explain what the term u_i represents. Why will different participants have different values of u_i ?
- (b) What is $E(u_i|X_i)$? Are the estimated coefficients unbiased?
- (c) What concerns might the researcher have about ensuring compliance among participants?
- (d) The estimated regression is $\hat{Y}_i = 55 + 0.17X_i$.
 - (i) Compute the estimated regression's prediction for the average score of participants who slept for 60 minutes before taking the test. Repeat for 75 minutes and 90 minutes.
 - (ii) Compute the estimated gain in score for a participant who is given an additional 5 minutes to nap.