

Exercises Set 1

Estadística-II. INTRODUCCIÓN a la ECONOMETRÍA. UC3M

- (B.10, Wooldridge (2006)). Suppose that at a large university, college grade point average, GPA , and SAT score, SAT , are related by the conditional expectation $\mathbb{E}(GPA|SAT) = 0,70 + 0,002SAT$.
 - Find the expected GPA when $SAT = 800$. Find $\mathbb{E}(GPA|SAT = 1400)$. Comment on the difference.
 - If the average SAT in the university is 1,100, what is the average GPA ? (*Hint*: $\mathbb{E}[\mathbb{E}(Y|X)] = \mathbb{E}(Y)$).
- (2.1, Wooldridge (2006)). Let $kids$ denote the number of children ever born to a woman, and let $educ$ denote years of education for the woman. A simple model relating fertility to years of education is

$$kids = \beta_0 + \beta_1 educ + u$$

where u is the unobserved error.

- What kinds of factors are contained in u ? Are these likely to be correlated with level of education?
 - Will a simple regression analysis uncover the ceteris paribus effect of education on fertility? Explain.
- (2.2, Wooldridge (2006)). In the simple linear regression model $y = \beta_0 + \beta_1 educ + u$, suppose that $\mathbb{E}(u) \neq 0$. Letting $\alpha_0 = \mathbb{E}(u)$, show that the model can always be rewritten with the same slope, but a new intercept and error, where the new error has a zero expected value..
 - (Ejercicio 2.3, Wooldridge (2006)). The following table contains the ACT (American College Training) scores and the GPA (grade point average) for 8 college students. Grade point average is based on a four-point scale and has been rounded to one digit after the decimal.

Estudiante	GPA	ACT
1	2.8	21
2	3.4	24
3	3.0	26
4	3.5	27
5	3.6	29
6	3.0	25
7	2.7	25
8	3.7	30

- a) Estimate the relationship between GPA and ACT using OLS; that is, obtain the intercept and slope estimates in the equation

$$\hat{GPA} = \hat{\beta}_0 + \hat{\beta}_1 ACT$$

Comment on the direction of the relationship. Does the intercept have a useful interpretation here? Explain. How much higher is the GPA predicted to be, if the ACT score is increased by 5 points?

- b) Compute the fitted values and residuals for each observation and verify that the residuals (approximately) sum to zero.
- c) What is the predicted value of GPA when $ACT = 20$?
- d) How much of the variation in GPA for these 8 students is explained by ACT ? Explain.