Hoja de Ejercicios 10
Especificación de Modelos

Estadística-II. INTRODUCCIÓN a la ECONOMETRÍA. UC3M

1. (Exercise 6.3). Using the data in RDCHEM.RAW, the following equation was obtained by OLS:

$$\begin{aligned} \widehat{rdintens} &= 2{,}613 + 0{,}00030\ sales - 0{,}0000000070\ sales^2 \\ &\quad (0{,}429)\ (0{,}00014) \qquad (0{,}0000000037) \\ n &= 32,\ R^2 = 0{,}1484 \end{aligned}$$

   (i) At what point does the marginal effect of *sales* on *rdintens* become negative?

   (ii) Would you keep the quadratic term in the model? Explain.

   (iii) Define *salesbil* as sales measured in billions of dollars: $salesbil = sales/1,000$. Rewrite the estimated equation with *salesbil* and $salesbil^2$ as the independent variables. Be sure to report standard errors and the R-squared. [Hint: Note that $salesbil^2 = sales^2/(1,000)^2$.]

   (iv) For the purpose of reporting the results, which equation do you prefer?

2. (Exercise 6.4). The following model allows the return to education to depend upon the total amount of both parentséducation, called *pareduc*:

$$\log(wage) = \beta_0 + \beta_1\ educ + \beta_2\ educ \cdot pareduc + \beta_3\ exper + \beta_4\ tenure\ + \mu$$

   (i) Show that, in decimal form, the return to another year of education in this model is:

$$\Delta \log(wage)/\Delta educ = \beta_1 + \beta_2\ pareduc$$

   What sign do you expect for β_2? Why?

   (ii) Using the data in WAGE2.RAW, the estimated equation is:

$$\begin{aligned} \widehat{\log(wage)} &= 5{,}65 + 0{,}047\ educ + 0{,}00078\ educ \cdot pareduc + 0{,}019\ exper + 0{,}010\ tenure \\ &\quad (0{,}13)\ (0{,}010) \qquad (0{,}00021) \qquad (0{,}004) \qquad (0{,}003) \\ n &= 722,\ R^2 = 0{,}169 \end{aligned}$$

   (Only 722 observations contain full information on parentséducation.)

   Interpret the coefficient on the interaction term. It might help to choose two specific values for *pareduc*—for example, $pareduc = 32$ if both parents have a college education, or $pareduc = 24$ if both parents have a high school education—and to compare the estimated return to *educ*.

   (iii) When *pareduc* is added as a separate variable to the equation, we get:

$$\begin{aligned} \widehat{\log(wage)} &= 4{,}94 + 0{,}097\ educ + 0{,}033\ pareduc - 0{,}0016\ educ \cdot pareduc + 0{,}020\ exper \\ &\quad (0{,}38)\ (0{,}027) \qquad (0{,}017) \qquad (0{,}0012) \qquad (0{,}004) \\ &\quad +0{,}010\ tenure \\ &\quad (0{,}003) \\ n &= 722,\ R^2 = 0{,}174 \end{aligned}$$

Does the estimated return to education now depend positively on parent education? Test the null hypothesis that the return to education does not depend on parent education.

3. (Exercise 6.10). Consider a model where the return to education depends upon the amount of work experience (and vice versa):

$$\log(wage) = \beta_0 + \beta_1\ educ + \beta_2\ exper + \beta_3\ educ \cdot exper\ + \mu$$

(i) Show that the return to another year of education (in decimal form), holding *exper* fixed, is $\beta_1 + \beta_3\ exper$.

(ii) State the null hypothesis that the return to education does not depend on the level of *exper*. What do you think is the appropriate alternative?

(iii) Use the data in WAGE2.RAW to test the null hypothesis in (ii) against your stated alternative.

(iv) Let θ_1 denote the return to education (in decimal form), when $exper = 10 : \theta = \beta_1 + 10\beta_3$. Obtain $\widehat{\theta}_1$ and a 95 % confidence interval for θ.(Hint: Write $\theta_1 = \beta_1 - 10\beta_3$ and plug this into the equation; then re-arrange. This gives the regression for obtaining the confidence interval for θ_1.)