Hoja de Ejercicios 8
Contrastes sobre conjuntos de parámetros

Estadística-II. INTRODUCCIÓN a la ECONOMETRÍA. UC3M

1. (Ejercicio 4.6, Wooldridge). In Section 4.5, we used as an example testing the rationality of assessments of housing prices. There, we used a log-log model in *price* and *assess* [see equation (4.47)]. Here, we use a level-level formulation.

   (i) In the simple regression model

   $$price = \beta_0 + \beta_1 \; assess + u$$

   the assessment is rational if $\beta_1 = 1$ and $\beta_0 = 0$. The estimated equation is

   $$\begin{aligned} price &= \underset{(16.27)}{-14.47} + \underset{(0.049)}{0.976} \; assess \\ n &= 88, \; SSR = 165644.51, \quad R^2 = 0.820 \end{aligned}$$

   First, test the hypothesis that $H_0 : \beta_0 = 0$ against the two-sided alternative. Then, test $H_0 : \beta_1 = 1$ against the two-sided alternative. What do you conclude?

   (ii) To test the joint hypothesis that $\beta_0 = 0$ and $\beta_1 = 1$, we need the SSR in the restricted model. This amounts to computing $\sum_{i=1}^{n}(price_i - assess_i)^2$, where $n = 88$, since the residuals in the restricted model are just $price_i - assess_i$. (No estimation is needed for the restricted model because both parameters are specified under H_0 .) This turns out to yield $SSR = 209,448.99$. Carry out the F test for the joint hypothesis.

   (iii) Now, test $H_0 : \beta_2 = 0, \beta_3 = 0, \beta_4 = 0$ in the model

   $$price = \beta_0 + \beta_1 \; assess + \beta_2 \; lotsize + \beta_3 \; sqrft + \beta_4 \; bdrms + u$$

   The R-squared from estimating this model using the same 88 houses is .829.

   (iv) If the variance of *price* changes with *assess*, *sqrft*, *lotsize*, or *bdrms*, what can you say about the F test from part (iii)?

2. (Ejercicio 4.7, Wooldridge) . In Example 4.7, we used data on Michigan manufacturing firms to estimate the relationship between the scrap rate and other firm characteristics. We now look at this example more closely and use a larger sample of firms.

   (i) The population model estimated in Example 4.7 can be written as

   $$log(srap) = \beta_0 + \beta_1 \; hrsemp + \beta_2 \; log(sales) + \beta_3 \; log(employ) + u$$

   Using the 43 observations available for 1987, the estimated equation is

   $$\begin{aligned} log(srap) &= \underset{(4.57)}{11.74} - \underset{(0.019)}{0.042} \; hrsemp - \underset{(0.370)}{0.951} \; log(sales) + \underset{(0.360)}{0.992} \; log(employ) \\ n &= 43, \quad R^2 = 0.310 \end{aligned}$$

Compare this equation to that estimated using only 30 firms in the sample.

(ii) Show that the population model can also be written as

$$log(srap) = \beta_0 + \beta_1\ hrsemp + \beta_2\ log(sales/employ) + \theta_3\ log(employ) + u$$

where $\theta_3 = \beta_2 + \beta_3$. [Hint: Recall that $\log(x_2/x_3) = \log(x_2) - \log(x_3)$.].
Interpret the hypothesis H_0: $\theta_3 = 0$.

(iii) When the equation from part (ii) is estimated, we obtain

$$\begin{aligned} log(srap) &= \underset{(4.57)}{11.74} - \underset{(0.019)}{0.042}\ hrsemp - \underset{(0.370)}{0.951}\ log(sales/employ) + \underset{(0.205)}{0.041}\ log(employ) \\ n &= 43, \quad R^2 = 0.310 \end{aligned}$$

Controlling for worker training and for the sales-to-employee ratio, do bigger firms have larger statistically significant scrap rates?

(iv) Test the hypothesis that a 1% increase in sales/employ is associated with a 1% drop in the scrap rate.