Examen de Introducción a la Econometría

Universidad Carlos III de Madrid

1^a Convocatoria

Curso 2006/2007

Conteste las preguntas siguientes en cuadernillos separados en 2 horas.
Salvo que se indique lo contrario, los números en paréntesis son los errores estándar.

1. [3 puntos] Let $\log(wage)$ be the logarithm of the monthly wage, *educ* the number of years in education, *abil* the inteligence quotient, IQ, test. Assume that the model

$$\log(wage) = \beta_0 + \beta_1 educ + \beta_2 abil + u$$

satisfies the assumption $E(u|educ, abil) = 0$.

   (a) Interpret β_1. Because there is initially no information on the IQ test in the sample, the following simple regression model is estimated

$$\begin{aligned} \widehat{\log(wage)} &= 5.97 + \underset{(.006)}{0.06}\, educ, \\ n &= 935, \quad \hat{R}^2 = 0.097, SSR = 149.52. \end{aligned}$$

   Explain under what conditions OLS estimation of the parameter associated with *educ* is an unbiased estimator of β_1. Provide a 95% confidence interval for the slope of the estimated model.

   (b) Assume now that the IQ score is available for the observations in the sample and the following estiamtion is obtained,

$$\begin{aligned} \widehat{\log(wage)} &= 5.66 + \underset{(.007)}{0.04}\, educ + \underset{se(\hat{\beta}_2)}{0.0059} abil, \\ n &= 935, \quad \hat{R}^2 = 0.130. \end{aligned}$$

   Test at the 5% significance level that intelligence has no effect on wages.

   (c) Obtain the sample covariance between education and intelligence. In view of the results, interpret the parameter associated with education in both regressions.

2. [4 puntos] The following equation was obtained to explain salaries of CEOs, *salary* :

$$\begin{aligned} \widehat{\log(salary)} &= \underset{(0.294)}{4.362} + \underset{(0.033)}{0.275} \log(sales) + \underset{(0.0039)}{0.0179} roe \\ n &= 209, \quad \hat{R}^2 = 0.282 \end{aligned}$$

where *sales* is annual firm sales, and *roe* is the return on equity (in percent form).

   (a) Interpret the coeffcient of $\log(sales)$ and test whether is significantly positive.

   (b) A new variable, *rosneg*, is included. This variable is a dummy variable which takes value 1 if *ros* (return on stock) is negative and 0 otherwise. The following equation is obtained,

$$\begin{aligned} \widehat{\log(salary)} &= \underset{(0.307)}{4.074} + \underset{(0.035)}{0.314} \log(sales) + \underset{(0.004)}{0.017} roe \\ &\quad + \underset{(1.009)}{2.094} rosneg - \underset{(0.112)}{0.258} \log(sales) * rosneg - \underset{(0.178)}{0.00353} roe * rosneg \\ n &= 209, \quad \hat{R}^2 = 0.315, \end{aligned}$$

   and the variance-covariance matrix for the slope coefficients of $\log(sales)$, *roe*, *rosneg*, $\log(sales)*$ *rosneg*, and $roe * rosneg$, is,

$$\widehat{Var}\begin{pmatrix} \hat{\beta}_{\log(sales)} \\ \hat{\beta}_{roe} \\ \hat{\beta}_{rosneg} \\ \hat{\beta}_{\log(sales)*rosneg} \\ \hat{\beta}_{roe*rosneg} \end{pmatrix} = \begin{pmatrix} 0.001236 & 1.47E-05 & 0.010414 & -0.001236 & -1.47E-05 \\ 1.47E-05 & 1.64E-05 & 0.000410 & -1.47E-05 & -1.64E-05 \\ 0.010414 & 0.000410 & 1.018975 & -0.109247 & -0.003193 \\ -0.001236 & -1.47E-05 & -0.109247 & 0.012544 & -0.000116 \\ -1.47E-05 & -1.64E-05 & -0.003193 & -0.000116 & 0.000318 \end{pmatrix}.$$

   Test whether the model should be different for firms depending on the sign of *ros*.

(c) Test whether for all firms with negative ros, an increase in sales leads to an increase in the salary of the CEO, everything else constant.

(d) Explain how you would test the hypothesis that for a CEO for a firm with negative ros, $\log(sales) = 10$ and $roe = 20$, it is equally interesting in terms of the salary (a) to have a 1% increase in sales, or (b) manage to obtain a positive ros (in both cases everything else constant).

3. [3 puntos] Using data from workers in Bangladesh, the following equations were obtained:

$$\widehat{\log(wage)} = \underset{(0.35)}{1.25} + \underset{(0.03)}{0.15}\,male + \underset{(0.004)}{0.02}\,exper \quad (1)$$

$$\widehat{\log(wage)} = \underset{(0.48)}{1.55} + \underset{(0.05)}{0.10}\,male + \underset{(0.005)}{0.015}\,exper - \underset{(0.002)}{0.005}\,male * exper, \quad (2)$$

where $wage$ is measured in US \$, and the regressors are a dummy for male workers and the work experience in years.

1. (a) According to the results from equation (1), what is the difference between the wage for a male worker with 5 years of experience and a female worker with 10 years of experience?

(b) According to the results from equation (2), what is the difference between the wage for a male worker with 5 years of experience and a female worker with 10 years of experience?

(c) Test whether wage differencials between male and female workers do not depend on experience.

CRITICAL VALUES:

$t_\infty \sim N(0,1)$
$\Pr(t_\infty > 2,576) = 0,005$
$\Pr(t_\infty > 2,326) = 0,01$
$\Pr(t_\infty > 1,960) = 0,025$
$\Pr(t_\infty > 1,645) = 0,05$
$\Pr(t_\infty > 1,282) = 0,10$

$F_{1,\infty} \sim \chi^2_1$	$F_{2,\infty} \sim \chi^2_2/2$	$F_{3,\infty} \sim \chi^2_3/3$
$\Pr(F_{1,\infty} > 6,63) = 0,01$	$\Pr(F_{2,\infty} > 4,61) = 0,01$	$\Pr(F_{3,\infty} > 3,78) = 0,01$
$\Pr(F_{1,\infty} > 3,84) = 0,05$	$\Pr(F_{2,\infty} > 3,00) = 0,05$	$\Pr(F_{3,\infty} > 2,60) = 0,05$
$\Pr(F_{1,\infty} > 2,71) = 0,10$	$\Pr(F_{2,\infty} > 2,31) = 0,10$	$\Pr(F_{3,\infty} > 2,08) = 0,10$

We remind that a Student's t with n degrees of freedom is distributed approximately for n large ($n > 30$) as a $N(0,1)$. A Fisher's F with q degrees of freedom in the numerator and n degrees of freedom in the denominator is distributed approximately when n is large as a χ^2_q/q.