Econometrics Test

2012 - 02 - 15

Name: ______________________ Matricola: ______________________

1. Say if the following statements are unambiguously true (TRUE), unambiguously false (FALSE) or impossible to classify the way they are stated (CAN'T SAY). Write the motivations to your answers **only** in the space provided. Answers with no motivations will not be considered.

   (a) The matrix XX' is positive definite.

   TRUE ○ FALSE ○ CAN'T SAY ○

   (b) If X is correlated to Y and Y is correlated to Z, then X must be correlated with Z

   TRUE ○ FALSE ○ CAN'T SAY ○

   (c) If $E(X) = 2$, then $E(\ln(X)) \leq \ln(2)$.

   TRUE ○ FALSE ○ CAN'T SAY ○

   (d) Since an estimator is a random variable, the limit in probability of a consistent estimator is also a random variable.

   TRUE ○ FALSE ○ CAN'T SAY ○

   (e) In an OLS estimate, the t-ratio for a parameter has always the same sign as the parameter.

   TRUE ○ FALSE ○ CAN'T SAY ○

2. Consider the model

$$y_i = \beta_0 + \beta_1 d_i + \varepsilon_i$$

where d_i is a dummy variable.

Show that, *in general*, in a model such that

$$\begin{aligned} \mathbf{y} &= \begin{bmatrix} \mathbf{y}_1 \\ \mathbf{y}_2 \end{bmatrix} \\ \mathbf{X} &= \begin{bmatrix} \boldsymbol{\iota} & 0 \\ \boldsymbol{\iota} & \boldsymbol{\iota} \end{bmatrix}, \end{aligned}$$

the second element of $\hat{\boldsymbol{\beta}}$ is equal to the difference between the average of $\mathbf{y}_2$ and $\mathbf{y}_1$. *[Note: the number of elements of* $\mathbf{y}_1$ *is not necessarily equal to that of* $\mathbf{y}_2$*.]*

3. Consider the following data from a sample with $n = 100$ observations:

$$\begin{array}{ccc} \sum_{i=1}^n y_i = 200 & \sum_{i=1}^n y_i^2 = 1715.2 & \sum_{i=1}^n x_i y_i = 64 \\ \sum_{i=1}^n x_i = 80 & \sum_{i=1}^n x_i^2 = 144; & \end{array}$$

you want to estimate a linear model as follows:

$$y_i = \beta_0 + x_i \beta_1 + \epsilon_i$$

Calculate:

(a) the OLS estimate of (β_0, β_1)

(b) the centred R^2 index

(c) a consistent estimate of $\sigma^2 = V(\epsilon_i)$

(d) a consistent estimate of $V(\hat{\beta}))$

(e) a test for the hypothesis $\beta_1 = 0$