Econometrics - Module I
2016 - 06 - 10

Name: _____

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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. A "CAN'T SAY" answer with no motivations will be considered wrong.

   (a) If $\mathbf{x}$ is a $n \times 1$ nonzero vector, then $A = \mathbf{x}'\mathbf{x}$ is invertible only if $n < 2$.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (b) If $\mathbf{x}$ is a $n \times 1$ nonzero vector, then $A = \mathbf{x}\mathbf{x}'$ is invertible only if $n < 2$.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (c) If the support of a random variable X is the closed interval $[-3, 3]$, then $E(X) = 0$.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (d) In the linear model $y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2$, where x_i is a non-negative continuous variable, the impact of x_i on y_i is positive if $\beta_1 > 0$ and $\beta_2 > 0$.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (e) Rejection of the Godfrey test implies homoskedasticity of the model.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

2. Consider the following dynamic model

$$y_t = \alpha y_{t-1} + \beta_0 x_t + \varepsilon_t$$

Prove analytically (on a separate sheet) that if $0 < \alpha < 1$ and $\beta_0 > 0$

(a) All dynamic multipliers δ_k must be positive;

(b) $\lim_{k\to\infty} \delta_k = 0$;

(c) the long-run multiplier is positive.

3. Imagine you have the following model of electricity consumption in a city:

$$y_t = \beta_0 + \beta_1 x_t + \beta_2 x_t^2 + e_t,$$

in which y_t is total consumption in a given day t and x_t is the average temperature on that day, in °C. Suppose the results from OLS estimation are

$$\hat{\beta} = \begin{bmatrix} 16000 \\ -1.85 \\ 0.05 \end{bmatrix} \qquad V\left(\hat{\beta}\right) = \begin{bmatrix} 70 & 0.2 & -0.08 \\ 0.2 & 0.16 & -0.01 \\ -0.08 & -0.01 & 0.0025 \end{bmatrix}$$

Now

(a) Test the hypothesis $\beta_1 = 0$

$H_0 : \beta_1 = 0$ Test = _____ Test type = _____
Decision: CAN'T REJECT ◯ REJECT ◯

(b) Test the hypothesis $\beta_2 = 0$

$H_0 : \beta_2 = 0$ Test = _____ Test type = _____
Decision: CAN'T REJECT ◯ REJECT ◯

(c) Test the joint hypothesis $[\beta_1, \beta_2] = [0, 0]$

$H_0 : \beta_1 = 0, \beta_2 = 0$ Test = _____ Test type = _____
Decision: CAN'T REJECT ◯ REJECT ◯

(d) Test the hypothesis $\beta_1 + 40 \cdot \beta_2 = 0$

$H_0 : \beta_1 + 40 \cdot \beta_2 = 0$ Test = _____ Test type = _____
Decision: CAN'T REJECT ◯ REJECT ◯

(e) Suppose someone argued that electricity consumption is lowest at 20 °C. Do your estimates reject this claim?

4. 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. A "CAN'T SAY" answer with no motivations will be considered wrong.

   (a) Consider the model $y_i = x_i\beta + \varepsilon_i$, for $i = 1, \ldots, n$. Then $\hat{\beta}_{OLS}$ represents the causal effect of x on y.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (b) The Hausman test, used to compare the OLS and the IV estimator, is not valid if instruments are not exogenous.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (c) In estimating linear panel data models, the strong exogeneity assumption on the time-varying error term is a necessary condition for the consistency of the first-difference estimator $\hat{\beta}_{FD}$.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯