Name: _____

Matricola: _____ email: _____

ECONOMETRICS - 01-09-2017 - Time: 2 h 30 m

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) A symmetric matrix may not be square.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (b) The matrix $\begin{bmatrix} 0 & -1 \\ 0 & 1 \end{bmatrix}$ is idempotent.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (c) The model $y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 + \varepsilon_i$ is nonlinear.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (d) Suppose that $E(\ln y_i | \ln x_i) = 0.5$. Then, if x_i goes from 100 to 110, y_i would grow (on average) by 5%.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (e) Consider the model $y_t = \beta_0 + \beta_1 x_t + \varepsilon_t$, where $\text{corr}(\varepsilon_t, \varepsilon_{t-1}) \neq 0$; then the OLS estimator of β_1 is inconsistent.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

2. Table 1 contains the OLS estimates for the following model:

$$m_i = \beta_0 + \beta_1 n_i + \beta_2 y_i + \beta_3 \text{ north}_i + \beta_4 \text{ south}_i + \text{error}_i$$

where

Variable	**Description**
m_i	log of foreign residents in province i
n_i	log of total population in province i
y_i	log of value added in province i
north_i	"North" dummy (equals 1 if i is a Northern province)
south_i	"South" dummy (equals 1 if i is a Southern province)

Estimation was run on a cross-section sample of 110 Italian provinces. The idea is to build a model which should describe the number of foreign residents in a province as a function of its size, wealth and geographical location.

Table 1: OLS model

Model: OLS, using observations 1–110 — Dependent variable: m_i

	Coefficient	Std. Error	t-ratio	p-value
const	−0.793098	1.08469	−0.7312	0.4663
n_i	0.405095	0.225002	1.800	0.0747
y_i	0.669945	0.207860	3.223	0.0017
north	−0.100342	0.0835025	−1.202	0.2322
south	−0.678283	0.109511	−6.194	0.0000

Mean dependent var	10.18782	S.D. dependent var	1.040965
Sum squared resid	9.508075	S.E. of regression	0.300920
R^2	0.919500	Adjusted R^2	0.916434
$F(4, 105)$	299.8388	P-value(F)	1.77e–56

(a) Write a short comment on the economic interpretation of the estimates for the coefficients β_1, β_2, β_3 and β_4

(b) add any other comment you consider appropriate

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(c) test the hypothesis $\beta_2 = 1$;

Test type:	_____	Distribution:	_____	Test statistic:	_____
Decision:	REJECT	◯	DON'T REJECT	◯	

(d) Suppose that you wanted to estimate a slightly different version of this same model, that is

$$s_i = \gamma_0 + \gamma_1 n_i + \gamma_2 w_i + \gamma_3 \text{ north}_i + \gamma_4 \text{ south}_i + \text{error}_i$$

where s_i is the log of the fraction of foreign nationals on total population in province i and w_i is the log of value added per capita in province i. It can be proven that the estimates of the γ coefficients can be easily computed from the estimated β coefficients. Write the numerical values of the estimated parameters below:

$\hat{\gamma}_0$ = _____

$\hat{\gamma}_1$ = _____

$\hat{\gamma}_2$ = _____