Name: _____

Matricola: _____ email: _____

ECONOMETRICS - 09-06-2017 - 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) If a matrix is symmetric, then it's invertible.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (b) If a matrix is invertible, then it's symmetric.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (c) In the dynamic model $y_t = \alpha y_{t-4} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t$, the 57th dynamic multiplier δ_{57} equals 0.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (d) In the dynamic model $y_t = \alpha y_{t-4} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t$, the long-run multiplier $c = \sum_{i=0}^{\infty} \delta_i$ equals 0.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (e) In a linear model, when an estimated coefficient is not significant, the associated regressor has no effect on the dependent variable.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

2. Consider the model $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$, where both y_i and x_i are dummy variables. Let n be the sample size, and

$$p_y = \frac{1}{n}\sum_{i=1}^{n} y_i \quad p_x = \frac{1}{n}\sum_{i=1}^{n} x_i \quad c = \frac{1}{n}\sum_{i=1}^{n} x_i y_i.$$

(a) Write the matrix $X'X$ as a function of n and p_x.

$$X'X = \begin{bmatrix} & \\ & \end{bmatrix}$$

(b) Write the vector $\hat{\beta}$ as a function of p_x, p_y and c.

$$\hat{\beta} = \begin{bmatrix} \\ \\ \end{bmatrix}$$

(c) Write the scalar $\hat{\sigma}^2$ as a function of n, p_x, p_y and c.

$$\hat{\sigma}^2 =$$

(d) What happens if $c = p_x \cdot p_y$? What is your statistical intuition for the result?

(e) Suppose that $n = 100$, $p_x = 0.57$, $p_y = 0.8$ and $c = 0.54$. Test the hypothesis $H_0 : \beta_1 = 0$

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

3. Consider the estimates shown in Table 3; the sample contains 132 migrants in Germany who sent money to their origin country in in the year 2012.

Model 1: OLS, Dependent variable: rem ($n = 132$)

	Coefficient	Std. Error	t-ratio	p-value
const	-0.1878	2.1178	-0.0887	0.9295
s	-0.6047	0.2362	-2.5603	0.0116
y	0.7408	0.2136	3.4684	0.0007
e	-0.2769	0.2113	-1.3103	0.1924

Mean dependent var	6.778288	S.D. dependent var	1.129648
Sum squared resid	150.2385	S.E. of regression	1.083392
R^2	0.101282	Adjusted R^2	0.080218
$F(3, 128)$	4.808359	P-value(F)	0.003310

White's test: LM = 17.3448, p-value = 0.0267125

The dependent variable rem_i is the natural logarithm of the amount they sent home; the independent variables are as follows:

Variable	**Description**
s_i	log of household size
y_i	log of disposable income
e_i	"employed" dummy

Provide an economic interpretation of the estimates presented in Table 3 in a separate sheet.