Econometrics Test
2015 - 07 - 15

Name: ______________________________

Matricola: ______________________ email: ______________________

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 is a square matrix, then the matrix $B = \frac{1}{2}(A + A')$ is symmetric.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (b) The distribution function of a discrete random variable is differentiable everywhere.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (c) Asymptotically normal estimators are efficient.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (d) In a linear regression model, $R^2 = 1 \Leftrightarrow \hat{\sigma}^2 = 0$.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (e) If the p-value in a Godfrey test is higher than 10%, we need to use robust standard errors for hypothesis testing.
   TRUE ◯ FALSE ◯ CAN'T SAY ◯

2. You have the following estimates:

$$\hat{\beta} = \begin{bmatrix} 0.75 \\ 1 \\ 1.25 \end{bmatrix} \qquad \hat{V} = \begin{bmatrix} 0.025 & 0.005 & 0.005 \\ 0.005 & 0.075 & -0.0025 \\ 0.005 & -0.0025 & 0.0375 \end{bmatrix}$$

Test the following hypotheses:

(a) $H_0 : \beta_1 = \beta_2$ $W =$ ______________________________
Decision: ACCEPT ◯ REJECT ◯

(b) $H_0 : \beta_2 = \beta_3$ $W =$ ______________________________
Decision: ACCEPT ◯ REJECT ◯

(c) $H_0 : \beta_1 = \beta_3$ $W =$ ______________________________
Decision: ACCEPT ◯ REJECT ◯

Note: if $X \sim \chi^2_1$, then $P(X > 2.71) = 0.1$, $P(X > 3.84) = 0.05$, $P(X > 6.63) = 0.01$.

3. Table 2 contains a model for CO_2 emissions in 158 countries (data from the World Bank, World Development Indicators, 2015 edition).

Variable name	**Description**
p	log of *per capita* CO_2 emissions into the atmosphere
y	log of *per capita* GDP
m	manufacturing index: $\log\left(\frac{w}{1-w}\right)$, where w is the share of GDP from manufacturing

A few descriptive statistics are reported in table 1:

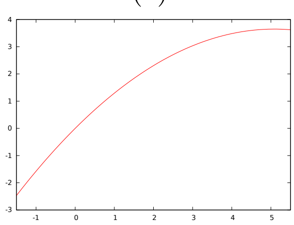
Variable	Mean	Median	Minimum	Maximum
p	7.54014	7.80017	2.91648	10.5756
y	1.81002	1.86471	−1.46040	4.62900
y^2	5.38768	3.47719	0.00000	21.4277
m	−2.15260	−1.99243	−4.59512	−0.241162

Table 1: Descriptive statisitcs

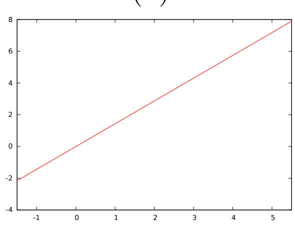
Answer the following questions, making use of the numerical estimates that you find in table 2:

(a) Which one of the following pictures best describes the relationship between p and y?

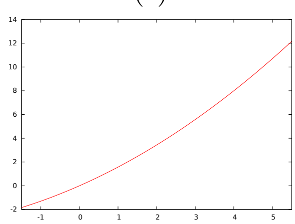
(a)



(b)



(c)



(b) Are the signs and magnitudes of the coefficients on the GDP variables y and y^2 consistent with your economic intuition?

(c) The joint hypothesis $\beta_y = 1$, $\beta_{y^2} = 0$ was tested and gave a p-value of 5.67783e-09. Explain the economic meaning of this result.

(d) Is the sign and magnitude of the coefficient on the m variable consistent with your economic intuition?

(e) Do we have a heteroskedasticity problem in this model? Motivate your answer.

Model 1: OLS, $n = 158$, Dependent variable: p

	Coefficient	Std. Error	t-ratio	p-value
const	6.26451	0.175978	35.5982	0.0000
y	1.43510	0.0856555	16.7544	0.0000
y^2	-0.141133	0.0223260	-6.3215	0.0000
m	0.260872	0.0686186	3.8018	0.0002

Mean dependent var	7.540137	S.D. dependent var	1.571499
Sum squared resid	60.73144	S.E. of regression	0.627981
R^2	0.843366	Adjusted R^2	0.840315
$F(3, 154)$	276.3947	P-value(F)	9.28e–62

White's test for heteroskedasticity – LM = 3.14508, with p-value = 0.924926

Table 2: OLS model for CO_2 emissions