ECONOMETRICS - FINAL EXAM
MAY 26, 2022 – 12:00

First name:	**Last Name:**
DNI/ID:	**Mobile:**
E-mail:	**Instructor:**

Question 1	**A**	**B**	**C**	**Blank**
Question 2	**A**	**B**	**C**	**Blank**
Question 3	**A**	**B**	**C**	**Blank**
Question 4	**A**	**B**	**C**	**Blank**
Question 5	**A**	**B**	**C**	**Blank**
Question 6	**A**	**B**	**C**	**Blank**
Question 7	**A**	**B**	**C**	**Blank**
Question 8	**A**	**B**	**C**	**Blank**
Question 9	**A**	**B**	**C**	**Blank**
Question 10	**A**	**B**	**C**	**Blank**
Question 11	**A**	**B**	**C**	**Blank**
Question 12	**A**	**B**	**C**	**Blank**
Question 13	**A**	**B**	**C**	**Blank**
Question 14	**A**	**B**	**C**	**Blank**
Question 15	**A**	**B**	**C**	**Blank**
Question 16	**A**	**B**	**C**	**Blank**
Question 17	**A**	**B**	**C**	**Blank**
Question 18	**A**	**B**	**C**	**Blank**
Question 19	**A**	**B**	**C**	**Blank**
Question 20	**A**	**B**	**C**	**Blank**

Correct	**Incorrect**	**Blank**	**Final grade**

INSTRUCTIONS

This exam includes 20 multiple choice questions.

Your answers must be marked on the answer sheet that you will find in the first page. If you want to leave any question unanswered, choose the "Blank" option. This answer sheet is the only part of this exam that will be graded.

A correct answer adds 2 points to the final grade while an incorrect one subtracts 1 point. A blank answer does not add or subtract. The final grade is the number of points divided by 4.

Make sure that you checked your options, including “Blank”. Do not unclip the sheets. Use the blank space in the following pages to write notes or to do arithmetic calculations.

YOU HAVE ONE HOUR AND 15 MINUTES (75’) TO ANSWER THIS TEST

REMINDER

YOU ARE NOT ALLOWED TO USE DEVICES WITH CONNECTIVITY TO THE INTERNET, INCLUDING MOBILE PHONES, TABLETS, SMARTWATCHES OR MP3/4 PLAYERS

Question 1. According to the OLS algebraic properties:

A) If the constant is removed from the model, the sum of residuals will always be zero.

B) The residuals are orthogonal to the independent variables whether or not an intercept has been included in the model.

C) If the constant is removed from the model, the sum of squared residual (SSR) will always be zero.

Question 2. If the assumptions of the Classical Linear Model are satisfied:

A) The OLS estimator of the parameters has the lowest variance among all linear estimators.

B) The OLS estimator of the parameters has the lowest variance among all linear and unbiased estimators.

C) The OLS estimator of the parameters has the lowest variance among all estimators.

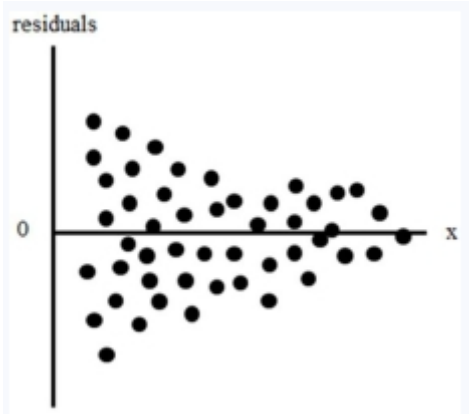
Question 3. PERFECT COLLINEARITY exists when in a regression model, in addition to a constant, you include how many dummy variables to represent a qualitative characteristic with five categories?

A) 4.

B) 5.

C) More than 5.

Question 4. Suppose that you plot the residuals for your sample against the dependent variable and get:



Then you would conclude that the error terms from this model could have …:

A) Heteroscedasticity.

B) Homoscedasticity.

C) Homoscedasticity and multicollinearity.

Question 5. Consider a regression model with constant term and two independent variables that has been estimated using a sample of 18 observations. If R^2=0.9309 and Pr [F(2,15) ≤ 3.68] = 0.95, then the null hypothesis of joint significance of slopes:

A) should be rejected in favour of the alternative at the 5% level of significance, because the corresponding value of the F statistic is 101.04.
B) cannot be rejected in favour of the alternative at the 5% level of significance, because the corresponding value of the F statistic is 3.68.
C) None of the above.

Question 6. An influential observation…

A) Always shows a small and negative OLS residual.
B) If removed from the sample, does not change significantly the estimated parameters using OLS.
C) If removed from the sample, does change significantly the estimated parameters using OLS.

Question 7. The local ice cream shop is interested in knowing the key factors that affect the ice cream consumption. Every day, for all of 2018, they kept track of how much ice cream (Y) they sell (thousands of euros) versus the temperature (ºC) on that day (X). They notice that in summer sales increases drastically. In order to provide concrete evidence that the season factor contributes to the ice cream consumption, they define two new dummy variables, a summer variable, S_t that is equal to 1 for the days of July, August and September and zero otherwise and $W_t = 1 - S_t$. Finally, they estimate three models:

MODELO A $\widehat{Y_t} = 3 + 0.75X_t$

MODELO B $\widehat{Y_t} = 4 + 0.55X_t + 0.65S_t$

MODELO C $\widehat{Y_t} = 4.65 + 0.55X_t - 0.65W_t$

According to this, which of the following statements is TRUE?

A) Model B and C specifications contain the same information, except the interpretation of some of the parameters.

B) According to model B, in summertime, daily sales increase by 4000 euros respect to another day of the year.

C) According to model A, ice cream sales will increase by 3750 euros for every ºC increase in the temperature

Question 8. Consider the model $\hat{Y} = \hat{b}_1 + \hat{b}_2 X_2$ estimated by least squares. If $\bar{Y} = \bar{X}_2$ and $\widehat{\beta_2} = 1$, which of the following statements is TRUE?

A) $\hat{\beta}_1 > 0$.
B) $\hat{\beta}_1 = 0$.
C) $\hat{\beta}_1 < 0$.

Pregunta 9. If $\hat{var}(\hat{\beta}_{slope}) = 0.13125$ and $Pro[t(8) \geq 2.306] = 0.025$, a 95% confidence interval for the slope of the model $\hat{y}_t = 2 - 0.3x_t$ estimated by OLS with a sample of 10 observations is:

A) [-1.135, 0.535]
B) [-0.708, 0.108]
C) [-0.915, 0.315]

Questions 10 to 14 refer to the following statement. Consider the following equation:

$$\text{LO} \quad (price_i) = \beta_0 + \beta_1 size_i + \beta_2 bedrms_i + \beta_3 bathrms_i + \beta_4 recrms_i + \beta_5 aircon_i + \beta_6 Lux_i + \beta_7 garagebays_i + u_i$$

where **price** is the house price measured in thousands of dollars, **size** is the size of the house in feet, **bedrms** is the number of rooms, **bathrms** is the number of bathrooms, **recrms** is a dummy variable with value 1 if the house has a recreation room and 0 if it does not**, aircon** is a dummy variable with value 1 if the house has air conditioning and 0 if it does not, **Lux** is a dummy variable with value 1 if the house is located in a luxury neighbourhood and 0 if it is not and **garagebays** is the number of garage bays. Table P1 shows the OLS estimation of the model. **Note: for computation use all the available decimals in Table P1**

Table P1

Dependent variable: LOG (Price)
Method: Least Squares
Sample: 1-546

	Coefficient	*Std. error*	*t-Statistic*	*P-value*
const	10.1586	0.0464674	218.6185	<0.00001
size	5.25425e-05	5.17511e-06	10.1529	<0.00001
bedrms	0.0689575	0.0147725	4.6680	<0.00001
bathrms	0.204855	0.0220184	9.3038	<0.00001
recrms	0.114989	0.0269212	4.2713	0.00002
aircon	0.205614	0.0225499	9.1182	<0.00001
lux	0.156268	0.0245518	6.3648	<0.00001
garagebays	0.0572742	0.0125616	4.5595	<0.00001

Mean dependent var.	11.05896	S.D. dependent var	0.371985
Sum of squared resid	----------	S.E of regression	0.233669
R-squared	0.610473	Adjusted R-squared	0.605405
F (7, 538)	120.4519	Prob(F-statistic)	7.6e-106

Question 10. (Complete the next statement with the right option) We REJECT the null hypothesis of NO difference between two houses, one located in a luxury neighbourhood and one that is not…

A) at the 5% level of significance but we FAIL to reject it at the 1% level of significance.
B) at the 2% level of significance but we FAIL to reject it at the 1% level of significance.
C) at the 1% level of significance.

Question 11. According to Table P1, holding fixed all other factors, another garage bay is predicted to increase Price by:

A) 0.057 thousands of dollars.
B) 0.057 %.
C) 5.727 %.

Question 12. According to Table P1, the OLS Sum of Squared Residual (SSR) is:

A) 39.375
B) 29.375
C) 89.375

Question 13. If $Pr\ o\ b(|t(538)| \geq 1.9644) = 0.05$ (two-sided 5% critical value is 1.9644) and $Cov(\hat{\beta}_{bathrms}, \hat{\beta}_{recrms}) = 0$, the hypothesis $H_0: \beta_{bathrms} = \beta_{recrms}, H_1: \beta_{bathrms} \neq \beta_{recrms}$ …

A) is rejected at the 5% level of significance.
B) we FAIL to reject it at the at the 5% level of significance.
C) Unfortunately, the regression results in Table P1 do not contain enough information to test such a hypothesis.

Question 14. The "ceteris paribus" estimated difference in price between two houses, one with air conditioning and one without it is approximately…

A) 21 %.
B) 10 %.
C) Unfortunately, the regression results in Table P1 do not contain enough information to obtain such a value.

Question 15. Consider a linear regression model with coefficient standard errors calculated using the usual formulae. Which of the following statements is/are correct regarding the standard error estimator for the **slope coefficient**?

(i) It varies positively with the residual variance
(ii) It varies positively with the spread of X about its mean value
(iii) It varies positively with the spread of Y about its mean value.

A) (ii) and (iii) only.
B) (i) (ii) and (iii).
C) (i) only.

Question 16: We have estimated by OLS the Model [M1] $q_t = \hat{\beta}_0 + \hat{\beta}_1 c_t + \hat{\beta}_2 p_t + \hat{u}_t$, $t = 1, 2, ..., 30$ where q_t denotes the forest surface burned in fires, c_t is the average temperature in July and p_t is the price per metric ton of burned wood. Suppose that a researcher is interested in conducting the White's heteroscedasticity test using the residuals from [M1]. Which would be the most appropriate way to apply this test?

A) $\hat{u}_t = \hat{\alpha}_0 + \hat{\alpha}_1 c_t + \hat{\alpha}_2 p_t + \hat{\alpha}_3 c_t^2 + \hat{\alpha}_4 p_t^2 + \hat{\alpha}_5 p_t c_t + \hat{\varepsilon}_t$ and the White statistic distribution under the null is $\chi^2_{(5)}$.

B) $\hat{u}_t^2 = \hat{\alpha}_0 + \hat{\alpha}_1 c_t + \hat{\alpha}_2 p_t + \hat{\alpha}_3 c_t^2 + \hat{\alpha}_4 p_t^2 + + \hat{\alpha}_5 p_t c_t + \hat{\varepsilon}_t$ and the White statistic is equal to the R^2 of this estimated regression.

C) None of the above.

Question 17: Consider the linear model $Y_i = \beta_1 + \beta_2 X_i + \varepsilon_i \quad (i = 1, 2, ..., N)$, which complies with all the standard hypotheses except that $\text{var}[\varepsilon_i] = E[\varepsilon_i^2] = \sigma^2 X_i^2$. We can compute efficient parameter estimates by applying OLS to the model:

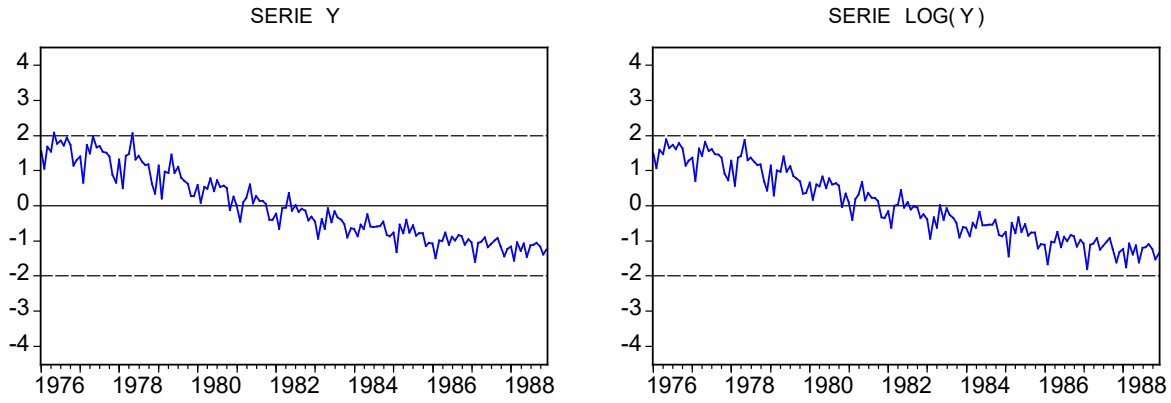
A) $(Y_i / X_i) = \beta_2 + \beta_1 (1 / X_i) + (\varepsilon_i / X_i)$

B) $(Y_i / X_i^2) = \beta_2 + \beta_1 (1 / X_i^2) + (\varepsilon_i / X_i^2)$

C) $Y_i = \beta_1 + \beta_2 X_i + \varepsilon_i$

The two panels in Figure N1 display a time series Y, including 156 monthly observations on the number of births registered in Spain from January 1976 to December 1988, as well as the corresponding natural log LOG(Y).

Figure N1



Question 18. Choose which of the following statements is TRUE:

A) The time series Y is not stationary.

B) The time series LOG(Y) is stationary.

C) The time series Y is stationary.

Question 19. Using data for 120 Spanish companies a researcher has estimated a Cobb-Douglas production function: $Ln(Y_i) = \beta_0 + \beta_1 Ln(L_i) + \beta_2 Ln(K_i) + U_i$, where, for each company, Y is the output, L is the amount of labor employed, K is the capital and Ln is the natural logarithm. If the researcher is interested in determining whether the function exhibits constant returns to scale, $\beta_1 + \beta_2 = 1$, which would be the restricted model for this restriction:

A) $\ln Y_i = \beta_0 + (\beta_1 - \beta_2) \ln K_i + w_i$.

B) $\ln \frac{Y_i}{K_i} = \beta_0 + \beta_2 \ln \frac{K_i}{L_i} + \eta_i$.

C) $\ln \frac{Y_i}{L_i} = \beta_0 + \beta_2 \ln \frac{K_i}{L_i} + v_i$.

Question 20. If two annual variables, CO_2 emission (CO_2) and global surface temperature (T) are **cointegrated, then …**

A) CO_2 and T must both be stationary.
B) CO_2 and T must both be non-stationary.
C) Both series must NOT have any common characteristic (e.g., trends).

CALCULATIONS

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First name:	**Last Name:**
DNI/ID:	**Mobile:**
E-mail:	**Instructor:** J-A. JIMENEZ-MARTIN

Answer Key

Pregunta 1	A	B	C	En blanco
Pregunta 2	A	B	C	En blanco
Pregunta 3	A	B	C	En blanco
Pregunta 4	A	B	C	En blanco
Pregunta 5	A	B	C	En blanco
Pregunta 6	A	B	C	En blanco
Pregunta 7	A	B	C	En blanco
Pregunta 8	A	B	C	En blanco
Pregunta 9	A	B	C	En blanco
Pregunta 10	A	B	C	En blanco
Pregunta 11	A	B	C	En blanco
Pregunta 12	A	B	C	En blanco
Pregunta 13	A	B	C	En blanco
Pregunta 14	A	B	C	En blanco
Pregunta 15	A	B	C	En blanco
Pregunta 16	A	B	C	En blanco
Pregunta 17	A	B	C	En blanco
Pregunta 18	A	B	C	En blanco
Pregunta 19	A	B	C	En blanco
Pregunta 20	A	B	C	En blanco

Correctas		Incorrectas		En blanco		Puntuación	