ECONOMETRICS - FINAL EXAM, 3rd YEAR (GECO & GADE)

June 25, 2015 – 15:30

First family name:	**Second family Name:**
Name:	**ECO/ADE:**
DNI/ID:	**Instructor:**
Mobile:	**E-mail:**

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

The exam includes 20 questions.

Choose your answer to each question by checking one and only one box per question in the template that you will find in the first page. If you want to leave any question unanswered, check the "Blank" option. This template 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.

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 TO ANSWER THIS TEST

Question 1. If the number of degrees of freedom ($n-k$) in the model $Y_t = \beta_0 + \beta_1 X_t + U_t$, t=1,2, …, n, is zero, then:

A) The matrix $\boldsymbol{X}$ has k columns which depend linearly of the others

B) The OLS estimates for β_0 and β_1 are not unique

C) The residual variance estimator is not defined

Question 2. In the model $Y_t = \beta_0 + \beta_1 X_t + U_t$, t=1,2, …, n where $\bar{X} = 0$, the OLS estimators of β_0 and β_1 are:

A) $\hat{\beta}_1 = \dfrac{\sum Y_t X_t}{\sum X_t^2 - n\bar{X}^2}$ and $\hat{\beta}_0 = 0$

B) $\hat{\beta}_1 = \dfrac{\sum Y_t X_t}{\sum X_t^2}$ and $\hat{\beta}_0 = \bar{Y}$

C) $\hat{\beta}_1 = \dfrac{\sum Y_t X_t}{\sum Y_t^2}$ and $\hat{\beta}_0 = \bar{Y}$

Question 3. In the general model $\boldsymbol{Y} = \boldsymbol{X\beta} + \boldsymbol{U}$, the hypotheses $E[\boldsymbol{U}] = \boldsymbol{0}$ and $E[\boldsymbol{UU}^T] = \sigma^2 \boldsymbol{I}$, imply that:

A) The OLS residuals are homoscedastic

B) The model errors are homoscedastic

C) The model errors are autocorrelated

Question 4. When the matrix $\boldsymbol{X}$ in the model $\boldsymbol{Y} = \boldsymbol{X\beta} + \boldsymbol{U}$ displays exact collinearity, then:

A) The OLS estimator of $\boldsymbol{\beta}$ is unique

B) The covariance matrix of the OLS estimator of $\boldsymbol{\beta}$ cannot be computed because $\left|\boldsymbol{X}^T \boldsymbol{X}\right| = \boldsymbol{0}$

C) The covariance matrix of the OLS estimator of $\boldsymbol{\beta}$ is null

Question 5. In the model $Y_t = \beta_0 + \beta_1 X_t + U_t$ we have three observations of $\boldsymbol{Y}$, which are 2, 4 and 8. After estimating the model by OLS we know that $\sum_{i=1}^{3} \hat{Y}_i^2 = 80$. Then, the sum of squared residuals is:

A) 8

B) 4

C) 2

Question 6. Consider the model $y_i = \beta_1 + \beta_2 x_i + \beta_3 z_i + u_i$ ($i = 1, 2, ..., 30$) which complies with all standard assumptions. If *JB* stands for the sample value of the normality test for the OLS residuals, then the marginal significance (*p-value*) of this test is:

A) $\Pr[\chi^2(2) \geq JB]$

B) $\Pr[\chi^2(30) \geq JB]$

C) $1 - \Pr[\chi^2(2) \geq JB]$

Question 7. In the model $Y_t = \beta_0 + \beta_1 X_t + U_t$, the marginal significance (*p-value*) of the null $\beta_1 = 0$ against the alternative $\beta_1 \neq 0$ is 0.102 Then we can conclude that:

A) The probability that $\beta_1 = 0$ is 10.2%

B) In a 0-100 scale, the evidence in favor of the null is 89.8

C) In a 0-100 scale, the evidence in favor of the null is 10.2

Question 8. Under all the standard assumptions about the model $\boldsymbol{Y} = \boldsymbol{X\beta} + \boldsymbol{U}$, the Gauss-Markov theorem implies that:

A) The OLS estimator for the error variance is unbiased

B) The OLS estimator has minimum variance among the class of linear unbiased estimators of $\boldsymbol{\beta}$

C) The OLS estimator has minimum mean among the class of linear unbiased estimators of $\boldsymbol{\beta}$

Questions 9 to 11 refer to the following case. A researcher wants to build a linear model of employement as a function of real wages using 100 quarterly observations of y_t (the neperian log of the quarterly number of employed people) and x_t (the neperian log of the real wage in each quarter). He thinks that the elasticity of employement with respect to real wage may change in different quarters and, because of this, he defines 4 quarterly dummy variables denoted q_{t1}, q_{t2}, q_{t3} and q_{t4}, so $q_{ti} = 1$ if the observation *t* corresponds to quarter *i* (*i* =1, 2, 3, 4) and $q_{ti} = 0$ otherwise. On this basis, he considers two models:

$$y_t = \beta_0 + \beta_1 q_{t1} x_t + \beta_2 q_{t2} x_t + \beta_3 q_{t3} x_t + \beta_4 q_{t4} x_t + \beta_5 x_t + u_t \qquad [A]$$

$$y_t = \alpha_0 + \alpha_1 q_{t1} x_t + \alpha_2 q_{t2} x_t + \alpha_3 q_{t3} x_t + \alpha_4 x_t + v_t \qquad [B]$$

Question 9. About models [A] and [B]:

A) Model [B] is not well specified because it omits a relevant quarterly variable

B) Both models can be estimated by OLS

C) Model [A] cannot be estimated by OLS because it has exact collinearity

Question 10. In model [B], the null that the relationship between employment and real wage is the same in the four quarters can be written as:

A) $\alpha_1 = \alpha_2 = \alpha_3$

B) $\alpha_1 = \alpha_2 = \alpha_3 = 0$

C) $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$

Question 11. . In model [B], the null that the elasticity of employment with respect to real wage in the 3rd quarter is the same as that in the 4th quarter can be written as:

A) $\alpha_3 = 0$

B) $\alpha_4 = 0$

C) $\alpha_3 + \alpha_4 = 0$

Questions 12 to 16 refer to the following case. A regression model relates the (log) annual wage of 50 workers (denoted by *l_ salary*) with the following explanatory variables: *gpa*: Grade Point Average (in a 1-4 scale); *metrics*: dummy variable which value is 1 if the worker took an Econometrics course, and 0 otherwise, and *female*: a dummy variable which value is 1 if the worker is female and 0 otherwise. Table 1 summarizes the main estimation results.

Table 1

Model: OLS, using observations 1-50
Dependent variable: *l_salary*

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	10.1143	0.0361476	279.8064	<0.00001
gpa	0.0553222	0.0118125	4.6834	0.00003
metrics	-----------	0.0152609	10.5878	<0.00001
female	-0.00648859	0.0139065	-0.4666	0.64300

Sum squared resid	0.105695	S.E. of regression	0.047935
R-squared	0.728219	Adjusted R-squared	0.710495
F(3, 46)	----------	P-value(F)	4.59e-13
Log-likelihood	83.03358	Akaike criterion	-158.0672
Schwarz criterion	-150.4191	Hannan-Quinn	-155.1547

Question 12. According to the results in Table 1:

A) Taking an Econometrics course has a positive and statistically significant effect (at the 5% significance level) on the annual wage.

B) Taking an Econometrics course has a positive but not statistically significant effect (at the 5% significance level) on the annual wage.

C) Taking an Econometrics course has a negative and statistically significant effect (at the 5% significance level) on the annual wage.

Question 13. According to the results in Table 1 the expected difference between the wages of two individuals, one of whom took an Econometrics course and another one who did not, being identical the other factors, is (Note: use all the available decimals in your calculations).

A) 16.158%

B) 0.16158 dollars/year

C) 0.16158%

Question 14. According to the results in Table 1 the test for global significance of all the slopes implies that (Note: use all the available decimals in your calculations):

A) The null cannot be rejected at a 5% significance level because the value of the corresponding F-statistic is 4.109

B) The null must be rejected at a 1% significance level because the value of the corresponding F-statistic is 41.085

C) The null must be rejected at a 10% significance level because the value of the corresponding F-statistic is 33.498

Question 15. According to the results in Table 1 the estimated wage (in log) of a male individual who did not take the Econometrics course and has a GPA of 2 points is (Note: use all the available decimals in your calculations):

A) 10.225

B) 20.344

C) 10.114

Question 16. We have estimated by OLS a model alternative to that in Table 1, where we suppressed the variable female. If the Akaike and Schwarz Information criteria in this model are -159.831 and -154.095, respectively, then:

A) According to Akaike's criterion the model in Table 1 should be preferred to the new model, where the variable *female* is omitted

B) According to Schwartz's criterion the model in Table 1 should be preferred to the new model, where the variable *female* is omitted

C) According to both, Akaike's and Schwartz's criteria, the new model (where the variable *female* is omitted) should be preferred to the model in Table 1

Question 17. The model $Y_i = \beta_0 + \beta_1 X_i + U_i$ is such that $\text{var}(U_i) = \sigma^2 \frac{1}{Z_i^2}$. In which of the following models the errors V_i are homoscedastic?

A) $\frac{Y_i}{Z_i} = \beta_0 \cdot \frac{1}{Z_i} + \beta_1 \cdot \frac{X_i}{Z_i} + V_i$

B) $Y_i \cdot Z_i = \beta_0 \cdot Z_i + \beta_1 \cdot Z_i \cdot X_i + V_i$

C) None of the above

Question 18. The model $Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + U_i$ has been fitted by OLS to a sample of 63 individuals. The econometrician suspects that the observations corresponding to the first 6 individuals in the sample could be influential, so he computed the Cook statistic for each one of them.

Individual	Cook Statistic (D_i)
1	1.48
2	2.27
3	1.09
4	2.50
5	4.65
6	2.98

Knowing that $Prob[F(3,60) \geq 2.76] = 0.05$, we can conclude that:

A) The observations corresponding to individuals 2, 5 and 6 are influential on the OLS estimates

B) The observations corresponding to individuals 4, 5 and 6 are influential on the OLS estimates

C) The observations corresponding to individuals 5 and 6 are influential on the OLS estimates

Questions 19 and 20 refer to the following case. Figures F1, F2 and F3 represent the evolution of the following series: Figure F1: monthly average temperature measured in Parque del Retiro, from January 1988 to December 2000 (denoted as TEMP). Figure F2: percent Unemployment Rate in the USA, from 1976 1st quarter to 1990 4th quarter (denoted as UNEMP) and Figure F3: Monthly return rate of IBM shares, from January 1998 to December 2008 (denoted as IBM).

Figure F1: TEMP

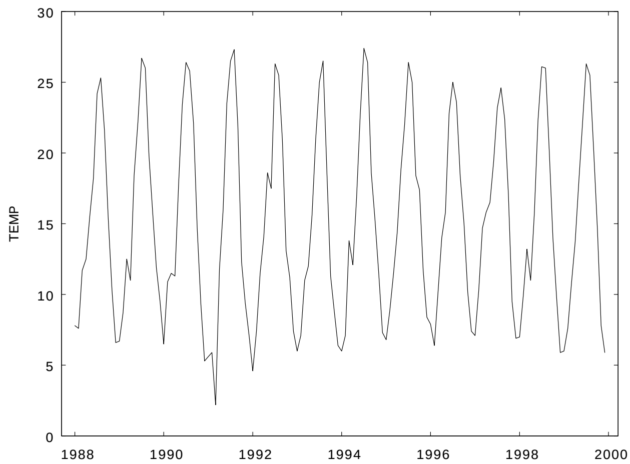


Figure F2: UNEMP

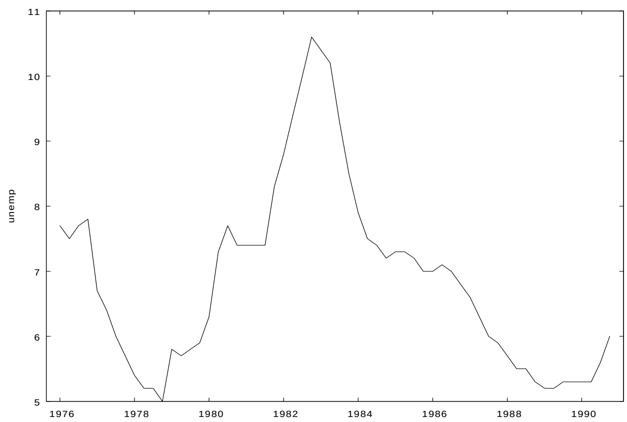
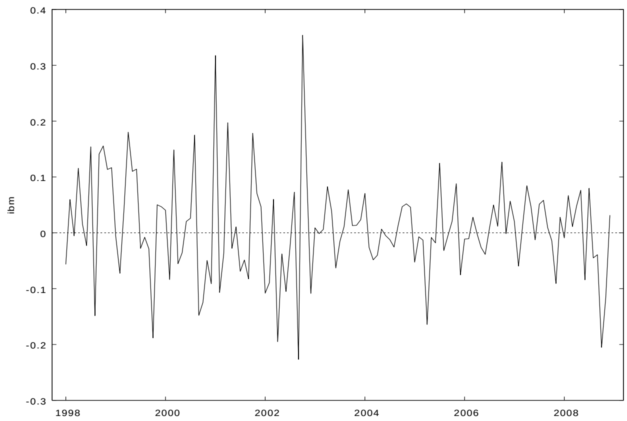


Figure F3: IBM



Question 19. According to figures F1, F2 and F3:

A) The variables TEMP, UNEMP and IBM are nonstationary in the mean

B) The variables TEMP, UNEMP and IBM are stationary in the mean

C) The variable IBM is stationary in the mean, but TEMP is not

Question 20. According to figures F1, F2 and F3:

A) The variable TEMP is seasonal and stationary in the mean

B) The variable TEMP is seasonal and nonstationary in the mean

C) The variable TEMP is stationary both, in the mean and in the variance

OPERACIONES

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