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

May 26, 2015 – 12:00

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 AND THIRTY MINUTES TO ANSWER THIS TEST

Question 1. After estimating by OLS a multiple regression model, the resulting residuals:

A) Add up to zero if a constant term was included in the model.

B) Are orthogonal to the model regressors only if a constant term was included in the model.

C) Have constant variances and null covariances whenever the model errors have these properties.

Question 2. In the regression model $Y_t = \beta_0 + \beta_1 X_t + U_t$, t=1,2, …, n where $\bar{Y} = 0$, the OLS estimator of β_1 is:

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

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

C) $\hat{\beta}_1 = \bar{Y} = 0$

Question 3. The statistical significance of a parameter in a regression model refers to:

A) The conclusion of testing the null hypothesis that the parameter is equal to zero, against the alternative that it is non-zero.

B) The probability that the OLS estimate of this parameter is equal to zero.

C) The interpretation of the sign (positive or negative) of this parameter.

Question 4. When the matrix X in the model $Y = X\beta + U$ displays a high degree of collinearity:

A) The OLS estimate of β is unbiased.

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

C) The OLS estimate of β is NOT efficient.

Question 5. Consider the model $Y_t = \beta_0 + \beta_1 X_t + U_t$. We have three observations for the dependent variable Y, which are 2, 4 and 8. After estimating the model by OLS, we know that $\sum_{i=1}^{3} \hat{Y}_i^2 = 80$. Therefore, the (unadjusted) determination coefficient, R^2, is:

A) 0.7857

B) 0.8757

C) 1.0000

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 the standard hypotheses of the General Linear Model. If F^* stands for the value of the *F*-statistic to test the global significance of all the slopes in the model, then the marginal significance (*p-value*) associated with this test is:

A) $\Pr[F(3,27) \geq F^*]$

B) $\Pr[F(2,27) \geq F^*]$

C) $1 - \Pr[F(3,27) \geq F^*]$

Question 7. Consider the model $Y_i = \beta_1 + \beta_2 X_i + U_i$ ($i = 1, 2, ..., 20$), which OLS residuals are denoted by $\hat{u}_i$ ($i = 1, 2, ..., 20$). Assume that the OLS estimation of the regression (with constant term) of $\hat{U}_i^2$ as a function of X_i and X_i^2 ($i = 1, 2, ..., 20$) yields a R^2 value of 0.35. If $\Pr[\chi^2(2) \leq 4.61] = 0.90$ and $\Pr[\chi^2(2) \leq 5.99] = 0.95$, the null that the model errors (U_i) are homoscedastic:

A) Must be rejected with a 5% significance, but not with a 10%

B) Must be rejected both, with a 5% and a 10% significance.

C) Must be rejected with a 10% significance, but not with a 5%

Question 8. The test used in the previous question is known as:

A) Structural change test.

B) Breusch-Godfrey test.

C) White test.

Questions 9 to 12 refer to the following case. We have a sample including: (a) the scores of 10 students (in the standard 0-10 scale) in the final examination of statistics (*rfinal*), and in (b) the midterm exam of the same subject (*rmid*). Table 1 provides some statistics for both variables and Table 2 shows OLS estimation results of the simple linear model relating *rfinal* (endogenous) with *rmid* (exogenous). Last, Table 3 provides some results of the OLS estimation of a model relating variable "difference" (defined as the difference between *rfinal* and *rmid*) with a constant term.

Table 1: Sample statistics for *rfinal* and *rmid*

	Average	Median	Standard deviation
rfinal	5.5000	5.5000	3.0277
rmid	5.5000	5.5000	3.0277

Table 2:

Model 1: OLS, using observations 1-10

Dependent variable: *rfinal*

	Coefficient	*Std. error*	*T-ratio*	*P-value*
Const	0.866667	1.09994	0.7879	0.45345
Rmid	0.842424	---------	--------	---------

Mean dependent var	5.500000	S.D. dependent var	-----------
Sum squared resid	23.95152	S.E. of regression	1.730300
R-squared	0.709679	Adjusted R-squared	0.673388
F(1, 8)	17.01646	P-value(F)	0.003321

Table 3:

Model 2: OLS, using observations 1-10

Dependent variable: *difference*

	Coefficient	*Std. error*	*Estadístico t*	*P-value*
Const	-------	0.537484	------	1.00000

Mean dependent var	0.000000	S.D. dependent var	1.699673
Sum squared resid	26.00000	S.E. of regression	1.699673
R-squared	-----------	Adjusted R-squared	-----------

Question 9. According to the information provided by Tables 1 and 2, the sample correlation coefficient between *rfinal* and *rmid* is:

A) 0.866667

B) 0.842424

C) Positive, but we do not have enough information to compute it.

Question 10. According to the information provided by Table 2, the value of the t statistic which tests the individual significance of the parameter associated to *rmid* (use all the available decimals in your calculations):

A) Is 4.12510 and the variable rmid is individually significant at 5% and 10% significance levels.

B) Is 1.73030 and the variable *rmid* is individually significant at a 10% significance level, but not at a 5%.

C) We do not have enough information to compute this t statistic.

Question 11: The OLS estimate of the constant and the R^2 corresponding to the model in Table 3

A) …are both equal to zero.

B) …are both equal to one.

C) …cannot be computed with the information in Table 3.

Question 12. According to the information in Tables 2 and 3, and knowing that $\Pr[F(1,8) \geq 0.68421] = 0.43212$, the test for the null that the coefficient of *rmid* is equal to one, against the alternative that it is different from one (use all the available decimals in your calculations):

A) Must be rejected both, with a 5% and a 10% significance.

B) Must be rejected with a 10% significance, but not with a 5%

C) Cannot be rejected with a 5% significance.

Questions 13 to 16 refer to the following case. We fitted a regression model relating the log-price of 546 homess (l_price) as a function of: 1) *lotsize*, the size of the lot in square meters, 2) *bedrooms*, number of bedrooms, 3) *bathrms*, number of bathrooms, 4) *recroom*, dummy variable which value is 1 if the home has a games room and zero otherwise, 5) *aircon*, dummy variable which value is 1 if the home has air conditioning and zero otherwise, 6) *prefarea*, dummy variable which value is 1 if the home is located in an upscale neighborhood and zero otherwise, and 7) *garagepl*, number of parking lots. Table 4 shows the OLS results for this model.

Table 4:

Model: OLS, using observations 1-546

Dependent variable: l_price

	Coefficient	*Std. error*	*T-ratio*	*P-value*
const	10.1586	0.0464674	218.6185	<0.00001
lotsize	5.25425e-05	5.17511e-06	10.1529	<0.00001
bedrooms	0.0689575	0.0147725	4.6680	<0.00001
bathrms	0.204855	0.0220184	9.3038	<0.00001
recroom	0.114989	0.0269212	4.2713	0.00002
airco	0.205614	0.0225499	9.1182	<0.00001
prefarea	0.156268	0.0245518	6.3648	<0.00001
garagepl	0.0572742	0.0125616	4.5595	<0.00001

Mean dependent var	11.05896	S.D. dependent var	0.371985
Sum squared resid	----------	S.E. of regression	0.233669

R-squared	0.610473	Adjusted R-squared	0.605405
F(7, 538)	120.4519	P-value(F)	7.6e-106

Question 13: According to the information in Table 4, the sum of squared residuals for this model is (use all the available decimals in your calculations):

A) 23.36690

B) 23.09111

C) 29.37545

Question 14: According to the information in Table 4, choose the CORRECT statement (you can round your calculations up to two decimals):

A) An increase of two bathrooms increases the expected price by 20.49% approx.

B) An increase of one room decreases the expected price by 6.90% approx.

C) An additional parking lot increases the expected price by 5.73% approx.

Question 15: According to the results in Table 4, the expected difference between the price of a home with air conditioning in comparison with the price of another one which does not, being equal the other characteristics, is approximately:

A) 20.5614% and is significant both, with a 5% and 10% significance.

B) 0.205614 monetary units and is significant both, with a 5% and 10% significance.

C) 20.5614% and is significant with a 10% significance, but not with a 5%

Question 16: Knowing that: (a) the covariance between the OLS coefficient associated to *bathrms* and the OLS coefficient associated to *airco* is zero, and (b) $\Pr[F(1,538) \geq 3.8588] = 0.05$, the null that both parameters are equal, against the alternative that they are not equal (use all the available decimals in your calculations):

A) Cannot be rejected with a 5% significance

B) Must be rejected with a 5% significance

C) We do not have enough information to test this hypothesis.

Question 17. Choose which of the following statements are TRUE and FALSE:

1. An influential observation always has a large residual.

2. The OLS residual plots and histogram are valid instruments to detect outliers.

3. Heteroscedasticity and autocorrelation are frequent problems when modeling cross-section and time series data, respectively.
4. A monthly time series with seasonality can be mean-stationary.
5. The transformations inducing stability in the level and dispersion of a time series are, respectively, differencing and log-transform.

A) True: 2, 3 and 4. False: 1 and 5

B) True: 2, 4 and 5. False: 1 and 3

C) True: 2, 3 and 5. False: 1 and 4

Questions 18 to 20 refer to the following statement. **Figure 1** displays the quarterly series of (log) real consumption, denoted by c, and (log) real income, denoted by y, from 1960 1[st] quarter to 2009 4[th] quarter. **Figure 2** displays the first-order difference of both series, that is, $d\_c = \nabla c_t \equiv c_t - c_{t-1}$ and $d\_y = \nabla y_t \equiv y_t - y_{t-1}$.

Figure 1:

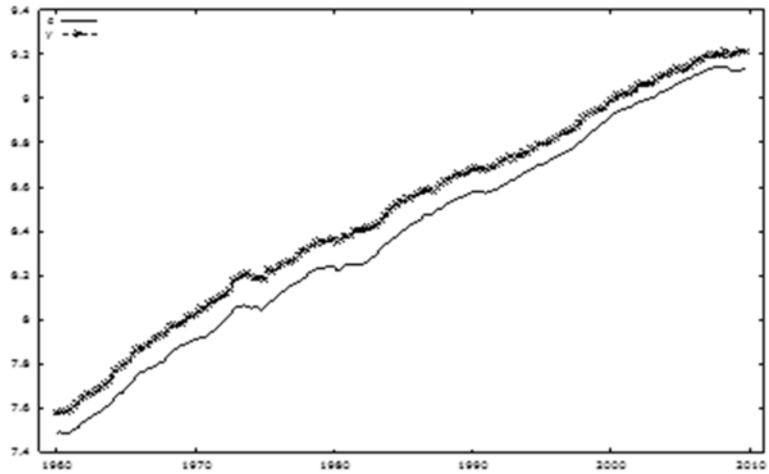

Figure 2:

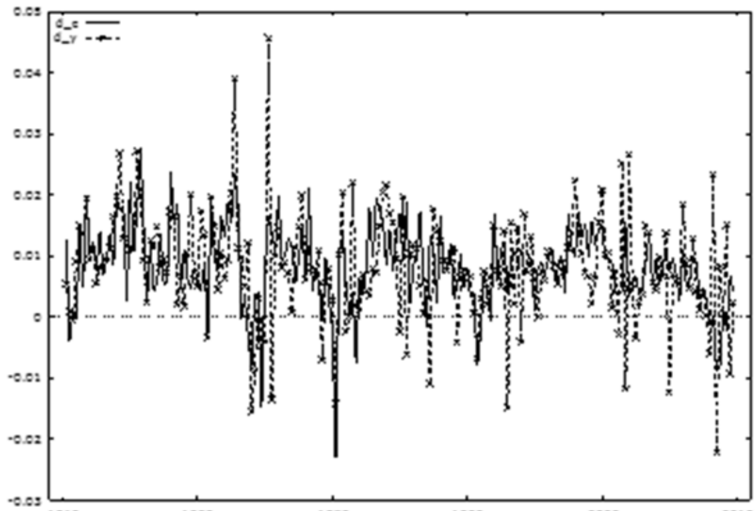

Table 5 displays the results of the OLS estimation of a linear regression relating (log) consumption with (log) income. Last, **Table 6** summarizes the OLS results for a regression relating the variables in first-order differences, that is, d_c as a function of d_y

Table 5

Model: OLS, using observations 1960:1-2009:4 (T = 200)

Dependent variable: c

	Coefficient	*Std. error*	*T-ratio*	*P-value*
const	-0.404163	0.0250534	-16.1320	<0.00001
y	1.03529	0.00294698	351.3050	<0.00001

Mean dependent var	8.383637	S.D. dependent var	0.490502
R-squared	0.998398	Adjusted R-squared	0.998390
Rho	0.889723	Durbin-Watson	0.202570

Table 6

Model : OLS, using observations 1960:2-2009:4 (T = 199)

Dependent variable: d_c

	Coefficient	*Std. error*	*T-ratio*	*P-value*	
const	0.00554085	0.000601578	9.2105	<0.00001	***
d_y	0.339905	0.0494111	6.8791	<0.00001	***

Mean dependent var	0.008330	S.D. dependent var	0.006965
R-squared	0.193688	Adjusted R-squared	0.189595
Rho	0.053566	Durbin-Watson	1.888731

Question 18. According to Figures 1 and 2:

A) The variable c is stationary in the mean but the variable y is not.

B) The quarterly log rates of consumption and income are stationary in the mean.

C) The variable y is stationary in the mean but the variable c is not.

Question 19. The value of the Breusch-Godfrey statistic, to test the null of no autocorrelation in the errors of the model in Table 5, against the alternative that there is a first-order autocorrelation, is equal to 747.37 with a p-value = 0.00000. The value of this statistic to test the same hypothesis on the errors of the model in Table 6 is equal to 0.633, with a p-value = 0.427. Accordingly:

A) The null cannot be rejected with a 5% significance in any of these models.

B) The null can be rejected in both models with a 5% significance.

C) If we set the significance level at 5%, the null would be rejected for the model in Table 5 and not rejected for the model in Table 6.

Question 20. Choose which of the following statements are TRUE and which are FALSE:

1. The model in Table 5 should be preferred to the model in Table 6 because the R^2 is much larger in the former.
2. The OLS estimator for the parameters in Table 5 is biased and inefficient.
3. According to the model in Table 6, if the quarterly variation rate of income increases by 1 percent point, the quarterly variation rate of consumption would increase by 0.34 percentage points approximately.
4. The average quarterly variation rate of consumption is 0.83% in the sample employed.

A) True: 1 and 2. False: 3 and 4

B) True: 3 and 4. False: 1 and 2

C) True: 1 and 3. False: 2 and 4

OPERACIONES

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