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

May 17, 2016 – 15:30

First family name:	**Second family Name:**
Name:	**GECO/GADE:**
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.

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 FIFTEEN MINUTES TO ANSWER THIS TEST

Question 1. In the standard linear regression model, a test for the joint significance of several parameters:

A) Does not allow any of the parameters considered in the null hypothesis to be nonzero.

B) Cannot be done using an F statistic computed on the basis of certain sums of squared residuals.

C) Has a marginal significance level (p-value) which can always be computed using a Student t distribution.

Question 2. In the standard linear regression model, absence of exact (or "perfect") collinearity requires:

A) That the values of the dependent variable are not an exact linear combination of the values of the explanatory variables.

B) The explanatory variables values to be linearly independent.

C) The sample covariance between each pair of explanatory variables to be nonzero.

Question 3. Consider the multiple regression model $\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{U}$, with $E[\mathbf{U}] = \mathbf{0}$ and $\text{Var}[\mathbf{U}] = \sigma^2\,\boldsymbol{\Omega}$ with $\boldsymbol{\Omega} \neq \mathbf{I}$. Which of the following statements is **FALSE**?

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

B) The covariance matrix of the OLS estimator of $\boldsymbol{\beta}$ IS $\sigma^2(\mathbf{X}'\mathbf{X})^{-1}$

C) The covariance matrix of OLS estimator of $\boldsymbol{\beta}$ IS NOT $\sigma^2(\mathbf{X}'\mathbf{X})^{-1}$

Question 4. A set of 20 annual observations on the Spanish Gross Domestic Product, from 1981 to 2000, is:

A) A heteroscedastic stochastic process.

B) An annual time series.

C) A seasonal stochastic process.

Question 5. Choose which of the following multiple regression model assumptions is necessary to assure the unbiasedness of OLS parameters:

A) The errors are not autocorrelated.

B) The errors are homoscedastic.

C) The expected value of the errors is zero.

Questions 6 to 9 correspond to the following statement: The Table "Model 1" displays the estimation results for a model of annual fuel consumption (in millions of 1995 dollars) from 1960 to 1995, which relates the log gas consumption [**LOG(G)**] with: **Pg**, an index of gas prices, **Y**, disposable *per capita* income (in thousands of dollars), **Pnc**, price index of new cars, **Puc**, price index of used cars, and **Ppt**, cost index of public transport.

Model 1: OLS, using the observations 1960-1995 (T = 36)

Dependent variable: LOG(G)

	Coefficient	*Std. Error.*	*t-Statistic*	*p-value*
Constant	3.71415	0.0631232	58.8398	<0.00001
Pg	-0.0305398	0.0110512	-2.7635	0.00968
Y	0.000221807	6.82898e-06	32.4803	<0.00001
Pnc	----------	0.0790663	-1.6052	0.11892
Puc	-0.0275409	0.0254615	-1.0817	0.28802
Ppt	-0.00791789	0.0199616	-0.3967	0.69443

Mean of dep. var.	5.392989	S.D. of dep. var.	0.248779
R-squared	0.989930	Adjusted R-squared	0.988252
F(5, 30)	----------	P-value (F)	<0.000001
Log-likelihood	82.27570	Akaike criterion	-152.5514
Schwarz criterion	-143.0503	Hannan-Quinn	-149.2353

Question 6: According to the results in Model 1:

A) All the estimated parameters, except for the constant term, can be interpreted as elasticities and are individually significant at 1%

B) All the estimated parameters, except for the constant term, can be interpreted as semi-elasticities and are individually significant at 10%

C) Given the information available, it is possible to compute the residual standard deviation.

Question 7: According to the results in Model 1, the joint hypothesis that the coefficients of **Pnc**, **Puc** and **Ppt** are zero (use all available decimals in calculations):

A) Can be tested with an F statistic, which value is 7.357

B) Can be tested with an F statistic, but we do not have enough information to compute its value.

C) Can be tested with a statistic which, if the null hypothesis is true, follows an F distribution with 5 degrees of freedom in the numerator and 30 degrees of freedom in the denominator.

Question 8. According to the results in Model 1 (use all available decimals in the calculations):

A) If the price index of new cars, **Pnc**, decreases by 1 point, gas consumption (**G**) is expected to decrease by 12.69% approx.

B) If the price index of new cars, **Pnc**, increases by 1 point, gas consumption (**G**) is expected to decrease by 0.1269% approx.

C) If the price index of new cars, **Pnc**, decreases by 1 point, gas consumption (**G**) is expected to increase by 12.69% approx.

Question 9. In order to detect a collinearity problem, we computed the variance inflation factors (VIF) for all regressors included in Model 1.

Variance inflation factors (VIF)

Pg	9.211
Y	7.164
Pnc	120.782
Puc	62.029
Ppt	66.096

where $VIF_j = 1/(1-R_j^2)$, where R_j^2 denotes the determination coefficient from regressing the j-*th* regressor on all the other independent variables. According to this information:

A) The variables with the higher collinearity are the price indices **Pnc**, **Puc** and **Ppt**.

B) The variables with the lower collinearity are the price indices **Pnc**, **Puc** and **Ppt**.

C) There cannot be a high degree of collinearity because all the coefficients in Model 1 (except the constant) are jointly significant even at a 1% significance level.

Question 10. Consider the regression model $Y_i = \beta_1 + \beta_2 X_{i2} + \beta_3 X_{i3} + U_i$, where: (a) the matrix $\boldsymbol{X}^T\boldsymbol{X}$ is diagonal with the values 100, 280 and 460 in its main diagonal, and (b) the sample mean of Y_i is 5. Under these conditions, the point forecast for Y_i corresponding to $X_{i2} = X_{i3} = 0$:

A) Is equal to 5

B) Cannot be computed with the available information.

C) Is equal to 1

Questions 11 to 15 refer to the following statement: The sales of a fashion clothing company (SALES) depend on an index of customer purchasing power (ICAPC) and an indicator of confidence in the company products (ICONF). Also, it is thought that sales may be seasonal, which means that the relationship between SALES, ICAPC and ICONF may change in different quarters. Tables 1, 2 and 3 summarize the main results of three models estimated by OLS, where Y=LOG(SALES), X1=LOG(ICAPC), X2=LOG(ICONF) and D2, D3 and D4 are 0-1 quarterly dummy variables, which value is 1 in the corresponding quarters (second, third and fourth, respectively) and 0 otherwise. Use all the decimals in Tables 1,2 and 3 in your calculations.

Question 11. According to the results in Table 1, the estimated constant term is equal to:

A) 17.764886 for the first quarter.

B) 12.75170 for the second quarter.

C) -4.658054 for the fourth quarter.

Question 12. According to the results in Table 1, the estimated sales elasticity

A) With respect to ICONF is 0.933291 for the first quarter.

B) With respect to ICAPC is -1.626575 for the second quarter.

C) With respect to ICONF is -0.930195 for the second quarter.

Question 13. According to the results in Table 2, the expected difference between the log of sales in the fourth quarter and the log sales in the first quarter, considering the same values of ICAPC and ICONF in both quarters:

A) Is 0.618763 but is not significant even at 10%

B) Is 0.618763 and is significant even at 1%

C) Is -6.139694 but is not significant at 1%

Question 14. According to the results in Tables 1 and 2, the F statistic to test the joint hypothesis that: (a) the elasticity of sales with respect to ICAPC is the same in all quarters, and (b) the elasticity of sales with respect to ICONF is the same in all quarters:

A) Is equal to 0.869

B) Is equal to 1.032

C) Cannot be computed with the available information.

Question 15. According to the results in Tables 2 and 3, the F statistic to test the null that the log of sales has no seasonality, i.e. it does not depend on the corresponding quarter:

A) Is equal to 48.925

B) Cannot be computed with the available information.

C) Is equal to 68.925

Table 1				
Dependent variable: Y				
Sample: 1986:1 to 1992:4 (observations included: 28)				
Variable	Coefficient	Std. Error	t-Statistic	p-value
Constante	-13.20387	5.833571	-2.263429	0.0379
D2	12.75170	12.06633	1.056800	0.3063
D3	9.671240	8.959647	1.079422	0.2964
D4	8.545816	7.282290	1.173507	0.2578
X1	2.711783	0.841984	3.220704	0.0053
D2*X1	-1.626575	1.445855	-1.124992	0.2772
D3*X1	-1.973991	1.196396	-1.649948	0.1184
D4*X1	-1.325049	1.069982	-1.238385	0.2334
X2	0.933291	0.445010	2.097239	0.0522
D2*X2	-0.930195	1.100651	-0.845132	0.4105
D3*X2	-0.072413	0.754949	-0.095918	0.9248
D4*X2	-0.345821	0.561278	-0.616132	0.5465
Sum of squared residuals = 0.143700				

Table 2				
Dependent variable: Y				
Sample: 1986:1 to 1992:4 (observations included: 28)				
Variable	Coefficient	Std. Error	t-Statistic	p-value
Constante	-6.139694	2.870911	-2.138587	0.0438
D2	0.193198	0.051066	3.783329	0.0010
D3	0.313589	0.051166	6.128849	0.0000
D4	0.618763	0.052318	11.82706	0.0000
X1	1.488666	0.393303	3.785039	0.0010
X2	0.660192	0.240432	2.745860	0.0118

Sum of squared residuals = 0.199337, R-squared = 0.875514				
Table 3				
Dependent variable: Y				
Sample: 1986:1 to 1992:4 (observations included: 28)				
Variable	Coefficient	Std. Error	t-Statistic	p-value
Constante	1.175230	7.073808	0.166138	0.8694
X1	0.774249	0.986040	0.785210	0.4397
X2	-0.022716	0.587800	-0.038646	
R-squared = 0.044989				

Questions 16 and 17 refer to the following statement. The four standardized plots in Figure 1 represent the transformations indicated at the bottom of each one. All of them are computed from 251 monthly observations of the Spanish Industrial Production Index (IPI), from January 1975 to November 1995.

Question 16. If $\nabla \ln IPI_t = \ln IPI_t - \ln IPI_{t-1}$ and $\nabla_{12} \ln IPI_t = \ln IPI_t - \ln IPI_{t-12}$, where ln stands for the natural logarithm:

A) $\nabla \ln IPI_t$ is the ANNUAL log growth rate of *IPI*.

B) $\nabla_{12} \ln IPI_t$ is the ANNUAL log growth rate of *IPI*.

C) $\nabla\nabla_{12} \ln IPI_t$ is the MONTHLY log growth rate of *IPI*.

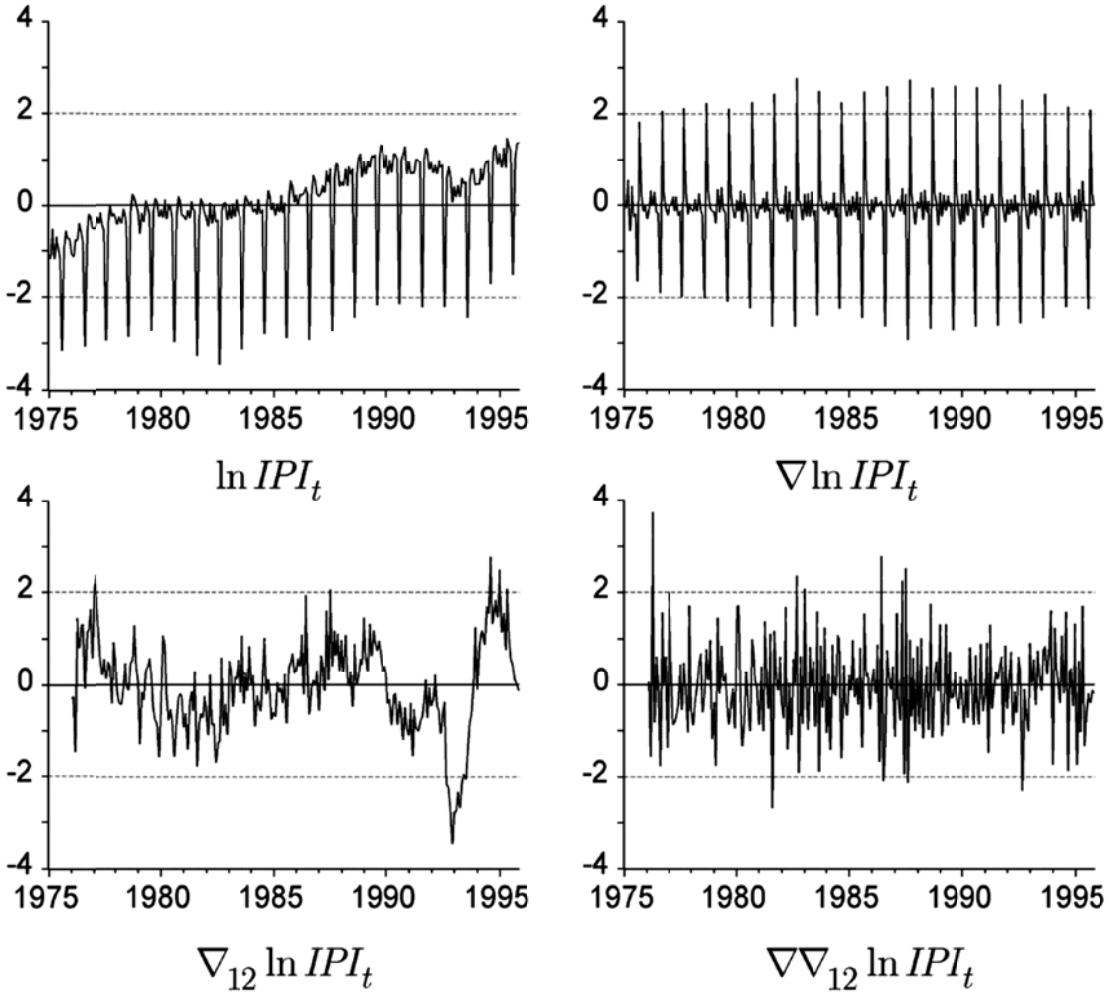
Question 17. According to the patterns in Figure 1:

A) $\nabla \ln IPI_t$ is stationary despite its seasonality.

B) $\nabla\nabla_{12} \ln IPI_t$ is not stationary because it fluctuates widely around its average.

C) $\nabla_{12} \ln IPI_t$ is not stationary, nor seasonal.

Figure 1



Question 18. If the errors $\mathbf{U}$ in the model $\mathbf{Y} = \mathbf{X\beta} + \mathbf{U}$ are autocorrelated, the variance-covariance matrix of the OLS estimator:

A) Can be adequately estimated using White's estimator.

B) Can be adequately estimated using Newey-West's estimator.

C) Can be adequately estimated using the expression $\hat{\sigma}^2(\mathbf{X}^T\mathbf{X})^{-1}$, where $\hat{\sigma}^2$ stands for the usual unbiased estimator of the error variance σ^2.

Question 19. Consider the consumption model $C_i = \beta_1 + \beta_2 RTA_i + \beta_3 S_i + U_i$, where C_i stands for the consumption of the i-*th* individual, RTA_i is the gross disposable income of the i-*th* individual, and S_i is a dummy variable taking the value 1 if the i-*th* individual is male, and 0 otherwise. The Tables "Model A" and "Model B" summarize the main OLS estimation results of two variations of the initial model.

Model A Dependent variable: C_i		
	Coefficient	Std. Error
Constant	25.18	2.60
RTA_i	1.61	0.005
S_i	-1.43	0.060
R-squared = 0.80		

Model B Dependent variable: $\frac{C_i}{RTA_i}$		
	Coefficient	Std. Error
Constant	1.61	0.005
$\frac{1}{RTA_i}$	21.89	2.10
$\frac{S_i}{RTA_i}$	-1.42	0.055
R-squared = 0.86		

Given this information, which of the following statements is **FALSE**?

A) Regardless the properties of the error term, Model B should be preferred to Model A, since its goodness of fit is better.

B) If the error term is such that $\text{var}(U_i) = \sigma^2 RTA_i^2$, Model B should be preferred to Model A.

C) If the error term is such that $\text{var}(U_i) = \sigma^2 RTA_i^2$, the coefficient associated with the gross disposable income in Model A corresponds to the constant term in Model B.

Question 20. Choose which of the following statements is **TRUE**?

A) To detect influential data in a regression model estimated by OLS it is enough to analyze the corresponding residual plot.

B) In a regression model one should always remove from the sample the influential data, since its presence worsens the model R-squared statistic.

C) The presence of a few influential values in a sample may alter significantly some OLS estimation results.

CALCULATIONS

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