ECONOMETRICS - FINAL EXAM, 3rd YEAR (GECO)

July, 9th, 2021 – 9.00

First family name:	**Second family name:**
Name:	**ID:**
Mobile:	**Email:**

Question 1	A	B	C	Blank
Question 2	A	B	C	Blank
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Question 11	A	B	C	Blank
Question 12	A	B	C	Blank
Question 13	A	B	C	Blank
Question 14	A	B	C	Blank
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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 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

Questions 1 to 7 refer to the following statement: Using data from 16 flower shops in 2020, the following model has been estimated using OLS:

$$\ln\_Y = \beta_1 + \beta_2 \ln\_X_2 + \beta_3 \ln\_X_3 + \beta_4 \ln\_X_4 + U$$

Where $\boldsymbol{Y}$ is the dozens of roses sold, $\boldsymbol{X_2}$ is the price of a dozen of roses, $\boldsymbol{X_3}$, is the price of a dozen of carnations and $\boldsymbol{X_4}$. is the average weekly household disposable income. Table 1 summarizes the main estimation results and Table 2 displays the variance-covariance matrix for the OLS parameter estimates (ln_ denotes the log-transformation).

Tabla 1

OLS, using observations 1-16
Dependent variable: ln_Y

	coefficient	std. error	t-ratio	p-value
const	--------	-------	------	0.2214
ln_X2	−1.85624	-------	------	0.0002
ln_X3	-1.45408	-------	------	0.0259
ln_X4	0.559553	0.921079	------	------

Mean dependent var	8.902209	S.D. dependent var	0.306877
Sum squared resid	0.371154	S.E. of regression	0.175868
R-squared	0.737255	Adjusted R-squared	0.671568
F(3, 12)	11.22387	P-value(F)	0.000849
Log-likelihood	7.406800	Akaike criterion	−6.813600
Schwarz criterion	−3.723245	Hannan-Quinn	−6.655348
rho	−0.013701	Durbin-Watson	2.004954

Tabla 2

	const	ln_X2	ln_X3	ln_X4
const	23.7617	0.754904	-1.17979	-4.45769
ln_X2		0.118185	-0.109847	-0.144823
ln_X3			0.327654	0.173297
ln_X4				0.848387

Question 1. According to the information in Table 1, the estimated variance of the model errors is (use in your calculations all the decimals shown in the tables):

A) 0.03093

B) 0.02320

C) 0.37115

Question 2. According to the information in Tables 1 and 2, if the price of a dozen of carnations increases by 1%, *ceteris paribus* (round the results to two decimals):

A) The quantity of roses sold would decrease by approximately 1.45%, although this effect is not statistically significant at the 5% level of significance.

B) The quantity of roses sold would decrease by approximately 1.45% and this effect is statistically significant at the 5% level of significance

C) The quantity of roses sold would increase by approximately 1.45 dozens and this effect is statistically significant at the 5% level of significance

Question 3. According to the information in Tables 1 and 2, the null hypothesis of joint significance of the slopes, that is, every parameter but the intercept (use in your calculations all the decimals shown in the tables and round the results to three decimals):

A) Should be carried out using a F with 4 degrees of freedom in the numerator and 16 in the denominator.

B) Is rejected at the 1% level of significance and the value for the F-statistic is equal to 13.341.

C) Is rejected at the 1% level of significance and the value for the F-statistic is equal to 11.224.

Question 4. According to the information in Tables 1 and 2, the intercept of the estimated model (use in your calculations all the decimals shown in the tables):

A) Is equal to 6.288

B) Cannot be known with the information from Table 1

C) Is equal to 0.221

Question 5. If you estimate again the model:

$\ln\_Y = \beta_1 + \beta_2 \ln\_X_2 + \beta_3 \ln\_X_3 + \beta_4 \ln\_X_4 + U$ using OLS and the same sample but heteroscedasticity-robust standard errors (using White's formula), then:

A) $\hat{\beta}_2 = -1.85624$

B) $\hat{\beta}_2 > -1.85624$

C) $\hat{\beta}_2 < -1.85624$

Question 6. According to the information in Tables 1 and 2, and knowing that: $\Pr[t(12) \leq 2.18] = 0.975$ and that $\Pr[t(12) \leq 1.78] = 0.95$, the hypothesis that average weekly household disposable income does not affect, *ceteris paribus*, the quantity of roses sold (use in your calculations all the decimals shown in the tables):

A) Is not rejected at the 5% or 10% level of significance and the value of the t-statistic is equal to 0.5596

B) Is not rejected at the 5% or 10% level of significance and the value of the t-statistic is equal to 0.6075

C) Is rejected at the 10% level of significance but not at the 5% level of significance

Question 7. According to the information in Tables 1 and 2, and knowing that $\Pr[t(12) \leq 1.78] = 0.95$, the confidence interval at the 90% level for the slope parameter associated to $\ln\_X_2$ is (use in your calculations all the decimals shown in the tables):

A) [-2.468, -1.244]

B) [-3.636, -0.076]

C) [-2.200, -1.512]

Question 8. With a sample of 945 individuals, you estimate the following incorrect model using OLS: $Y_i = \beta_0 + \beta_1 X_{i1} + U_i$. Then you have data for a new relevant variable (X_{i2}), and you estimate the new model: $Y_i = \alpha_0 + \alpha_1 X_{i1} + \alpha_2 X_{i2} + V_i$, choose the right answer:

A) $\sum_i \hat{U}_i = x_{i2}$

B) $\sum_i \hat{V}_i = 0$

C) None of the above

Question 9. In a simple regression model $Y_t = \beta_0 + \beta_1 X_t + U_t$, t=1,2, …, n, where $\overline{X} = 0$, the OLS estimations for β_0 and β_1 are equal to:

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

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

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

Question 10. In a regression model $Y_t = \beta_0 + \beta_1 X_t + U_t$, you have three observations for the dependent variable Y, that are equal to 2, 6 and 10. After the OLS estimation you know that $\sum_{i=1}^{3} \hat{Y}_i^2 = 124$. Then:

A) The Sum of Squared Residuals (SSR) is equal to 4

B) The R^2 is equal to 0.5

C) The Total Sum of Squares (SST) is equal to 140

Question 11. When the matrix X in a linear regression model shows a high degree of collinearity:

A) The OLS estimator for β is not unique

B) One possible solution to the collinearity problem could be to considerably increase the sample size

C) It is quite common that the slopes of the model are individually significant but not jointly significant.

Questions 12 to 16 refer to the following statement: With the aim of analysing the linear dependence of employment against real wages, a researcher gathers data from 100 semi-annual observations on y_t (log of the number of employees each semester) and x_t (log of the real wage each semester). The researcher defines two semi-annual dummy variables (s_{t1} and s_{t2}), with $s_{ti} = 1$ if the observation t belong to semester i (i =1, 2) and $s_{ti} = 0$ otherwise. These variables are defined with the aim to analyse if the number of employees is similar in the two semesters. The following two models are specified:

:

$$y_t = \beta_0 + \beta_1 s_{t1} + \beta_2 s_{t2} + \beta_3 x_t + u_t \qquad [A]$$

$$y_t = \alpha_0 + \alpha_1 s_{t1} + \alpha_2 x_t + v_t \qquad [B]$$

Question 12. Regarding models [A] and [B]:

A) Model [B] is incorrectly specified because it omits a relevant semi-annual variable

B) Both models can be estimated using OLS

C) Model [A] cannot be estimated using OLS because it shows a problem of exact collinearity

Question 13. If the researcher wants to use model [B] to test the hypothesis that the employment is, *ceteris paribus*, the same in both semesters:

A) The hypothesis to be tested is $\alpha_0 = \alpha_1$

B) The hypothesis to be tested is $\alpha_1 = 0$

C) The hypothesis to be tested is $\alpha_1 = \alpha_2 = 0$

Question 14. The researcher now wants to test the hypothesis that the elasticity of the employment against real wage is equal in both semesters, so that the following model is estimated:

$$y_t = \gamma_0 + \gamma_1 s_{t1} + \gamma_2 x_t + \gamma_3 s_{t1} x_t + v_t \qquad \text{[C]}$$

A) The hypothesis to be tested is $\gamma_1 = \gamma_3$

B) The hypothesis to be tested is $\gamma_1 + \gamma_3 = 0$

C) The hypothesis to be tested is $\gamma_3 = 0$

Question 15. Regarding the parameter γ_2 in the model [C]:

A) It should be interpreted as the elasticity of employment against real wage in both the first and the second semesters

B) It should be interpreted as the elasticity of employment against real wage in the first semester only

C) It should be interpreted as the elasticity of employment against real wage in the second semester only

Question 16. According to the model [C], the expected value of y in the second semester is equal to:

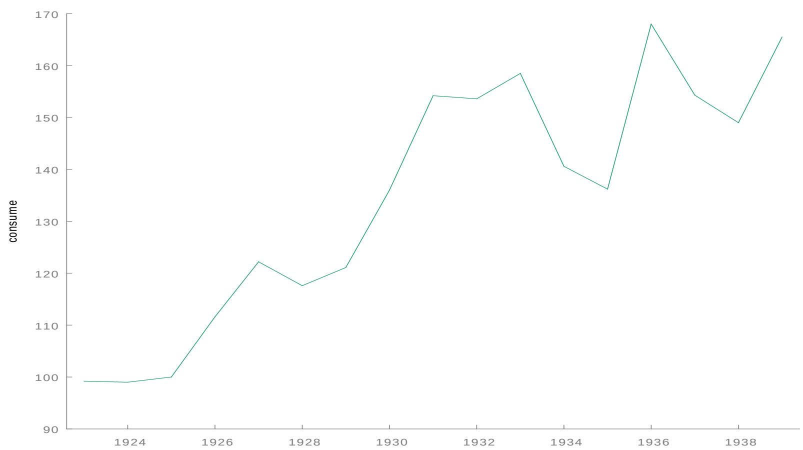
A) $\gamma_0 + \gamma_2 x_t$

B) $\gamma_0 + \gamma_1 + (\gamma_2 + \gamma_3) x_t$

C) $\gamma_0 + \gamma_1$

Questions 17 to 19 refer to the following statement. C*onsume* is annual per capita consumption of textile products in the Netherlands between 1923 and 1939 and *Relprice* is the relative price of textile products in the same period. **Figure 1** shows the evolution of *consume*.

Figure 1. *Consume*



Question 17. According to the Figure 1

A) The series *consume* shows seasonality.

B) The series *consume* is mean-stationary

C) None of the above.

Table 1 shows the results for the OLS estimation of the regression with *consume* as the dependent variable and *relprice* as the independent variable:

Table 1

Modelo 1: OLS, using observations 1923-1939 (T = 17)

Dependent variable: Consume

	coefficient	std. error	t-ratio	p-value
const	235.49000	9.07910	25.94	7.09e-014
Relprice	−1.32331	0.116330	−11.38	8.94e-09

Mean dependent var	134.5059	S.D. dependent var	23.57733
Sum squared resid	923.9089	S.E. of regression	7.848180
R-squared	0.896123	Adjusted R-squared	0.889198
F(1, 14)	-------	P-value(F)	8.94e-09
Log-likelihood	−58.08286	Akaike criterion	120.1657
Schwarz criterion	121.8321	Hannan-Quinn	120.3314
rho	0.385541	Durbin-Watson	1.190710

Question 18. According to the Table 1

A) We can be sure that the relationship between *consume* and *relprice* is spurious, because there is no logical connection between the two series.

B) If the two series were cointegrated, the OLS residuals from this regression would be stationary

C) The F statistic to calculate the joint significance of the slopes in this model would be equal to 0.896123.

Question 19: **Tabla 2** shows the results for the OLS estimation of the regression with *d_ consume* as the dependent variable and *d_ relprice* as the independent variable; *d_ consume* is the first difference of *consume* and *d_ relprice* is the first difference of *relprice*

Table 2

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Modelo 3: MCO, using observations 1924-1939 (T = 16)
Dependent variable: d_consume
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	coefficient	std. error	t-ratio	p-value
const	−0.237323	2.32821	−0.1019	0.9203
d_relprice	−1.76567	0.395162	------	0.0005

Mean dependent var	4.143750	S.D. dependent var	12.71036
Sum squared resid	998.8559	S.E. of regression	8.446706
R-squared	0.587812	Adjusted R-squared	0.558370
F(1, 14)	19.96505	P-value(F)	0.000531
Log-likelihood	−55.77519	Akaike criterion	115.5504
Schwarz criterion	117.0956	Hannan-Quinn	115.6295
rho	−0.054996	Durbin-Watson	1.666822

Question 19. According to the results in Tables 1 and 2:

A) The value of t-ratio for the slope in Table 2 is equal to 19.965

B) The model in Table 2 is preferable because its adjusted R-squared is lower than the adjusted R-squared from the model in Table 1

C) None of the above

Question 20. Consider a monthly time series Y_t and choose the right answer:

A) The series $LOG(Y_t)$ should be interpreted as monthly relative growth of the series.

B) The series DYt, with $DY_t = Y_t - Y_{t-1}$ should be interpreted as absolute monthly growth of the series.

C) The series $DLOG(Y_t)$, with $DLOG(Y_t) = LOG(Y_t) - LOG(Y_{t-1})$, should be interpreted as an indicator of the acceleration of the relative growth rate of the variable.

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Correct		Incorrect		Blank		Final Grade	