ECONOMETRICS - FINAL EXAM
May 16, 2025 – 18:00

First name:	**Last name:**
ID:	**Instructor:**
Email:	**Group:**

Before starting to complete the exam, fill out ALL the information requested in the fields above and carefully read the instructions on the following page.

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
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Question 10	A	B	C	Blank
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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 on 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 75 minutes 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. We want to study the effect of a garbage incinerator on house prices in North Andover, Massachusetts. A rumor about the construction of a garbage incinerator in North Andover began after 1978. Finally, the new garbage incinerator was in operation in 1981.

A simple regression model is used to analyze if the price of houses located near the incinerator (within three miles) would fall relative to the prices of more distant houses. The study uses data on housing prices in constant dollars (in 1978 dollars) for houses sold in two different years: 1978 (before the rumors of an incinerator construction began) and 1981 (after construction began). In this sense, the model proposed is:

$$RPRICE = \beta_0 + \beta_1 NEARINC \ + U$$

Where RPRICE is the house price real terms. *NEARINC* is a dummy variable that takes value 1 when the house is near to the garbage incinerator (less than 3 miles), and 0 otherwise. An analyst using a random sample of 142 houses in 1981 estimates by OLS the next model shown in TABLE 1:

TABLE 1: OLS estimation, observations 1-142
Dependent variable: rprice

	Coefficient	*Std. error*	*t-ratio*	*p-value*
Const	101308	3093.03	32.75	<0.0001
NEARINC	−30688.3	5827.71	−5.266	<0.0001

The analyst runs the same regression using a random sample of 179 houses in 1978 (before the rumor about the incinerator started) and the results are shown in TABLE 2.

TABLE 2: OLS estimation, observations 1-179
Dependent variable: RPRICE

	Coefficient	*Std. error*	*t-ratio*	*p-value*
Const	82517.2	2653.79	31.09	<0.0001
NEARINC	−18824.4	4744.59	−3.968	<0.0001

Question 1. According to the results in TABLE 1:

[1] The intercept is the average selling price for homes not near the incinerator in 1981.

[2] The intercept is the average selling price for homes not near the incinerator in 1978.

[3] The results of this simple regression model imply that the CAUSE of the lower prices for houses near the garbage incinerator is the presence of the incinerator, given that the coefficient for the variable NEARIC is negative and statistically significant.

[4] These results can be used to calculate the average price of houses near the incinerator in 1981.

Thus,

A. Only [2] and [3] are correct.
B. Only [1] and [4] are correct.
C. Only [1] and [3] are correct.

Question 2. Choose the correct option:

A. The average selling price in 1981 is $70619.
B. In 1981, homes located far from the incinerator site had an average value approximately $30688.3 greater than homes located near the site
C. In 1981, homes located near the incinerator site had an average value approximately $30688.3 greater than homes located far from the site.

Question 3. If the regression model presented in TABLE 1 exhibits heteroskedasticity, then …

A. The OLS estimators are biased.
B. The OLS estimators are not efficient anymore.
C. None of the above.

Question 4. According to the results in TABLE 2, choose the correct option:

A. The garbage incinerator was located in an area where housing prices were already lower than in areas located farther from the incinerator.
B. The garbage incinerator caused a fall in house prices by $18224.
C. If the garbage incinerator had not been built, the house prices would be $82517.

Question 5. According to the results in TABLE 2, the point forecast for the prices of homes located far from the incinerator site in 1978 is:

A. $18224.
B. $64693.2.
C. None of the above.

Question 6. According to the results in TABLES 1 and 2, we can conclude that the prices of homes near the garbage incinerator:

A. Decreased between 1978 and 1981.
B. Based on the available information, it is not possible to determine whether the price increased or decreased in that period.
C. None of the above.

Question 7. Being $\widehat{U}_{i,1}$ and $\widehat{U}_{i,2}$ the OLS residuals from the models in TABLES 1 and 2 (respectively), which of the following is CORRECT:

A. $\sum_{i=1}^{142} NEARINC_i \times \widehat{U}_{\mathrm{i},1} = 0$
B. $\sum_{i=1}^{179} \widehat{U}_{\mathrm{i},2} \neq 0$
C. $\sum_{i=1}^{142} RPRICE_i \times \widehat{U}_{\mathrm{i},2} = 0$

Now, let's consider the following model:

$$\log(RPRICE) = \delta_0 + \delta_1 dist + \delta_2 dist^2 + U$$

Being $\log(RPRICE)$ the natural logarithm of house prices in constant dollars, dis is the distance (in miles) to the garbage incinerator, and $dist^2$, the square of such a distance. Using the random sample of 142 houses in 1981, results for the OLS estimation are shown in TABLE 3:

TABLE 3: OLS estimation, observations 1-142
Dependent variable: log(RPRICE)

	Coefficient	*Std. error*	*t-ratio*	*p-value*
Const	10.6847	0.1725	61.93	<0.0001
Dist	0.0083	0.0018	4.71	<0.0001
$Dist^2$	−0.000015	4.16e-06	−3.76	<0.0001

Question 8. If we want to test whether the effect of distance on the logarithm of house prices is constant, then the null hypothesis is:

A. $H_0: \delta_1 = \delta_2$
B. $H_0: \delta_1 = 2\delta_2$
C. $H_0: \delta_2 = 0$

Question 9. According to the results in TABLE 3, the effect of distance on the logarithm of house prices is:

A. Positive but decreasing with the distance.
B. Constant.
C. Negative for distances equal or greater than 2 miles.

Question 10. If the R^2 of the previous model is equal to 0.46, then:

A. The variance inflation factor (VIF) of the variable *dist* is equal to 1.852.
B. The F-statistic for the global significance test is equal to 59.204.
C. The F-statistic for the joint significance test of δ_1 and δ_2 is equal to the sum of each individual t-statistic computed for the individual significance tests.

Question 11. Given the simple regression model $y = \beta_0 + \beta_1 x_1 + u$, and the multiple regression model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$, select the correct statement from the choices below:

A. The OLS estimate of β_1 from the simple regression model will always be higher than the OLS estimate of β_1 from the multiple regression model.
B. If $Cov(x_1, x_2) \neq 0$ and $\beta_2 = 0$, then the variance of the OLS estimator of β_1 is the same in both models.
C. None of the above.

Question 12. If, in a hypothesis test, the null hypothesis (H_0) is rejected at the 5% significance level, but cannot be rejected at the 1% significance level, then...

A. The corresponding p-value could be equal to 0.03.
B. H_0 cannot be rejected at the 10% significance level.
C. The corresponding p-value could be equal to 0.08.

Question 13. The value of the F-statistic for testing any linear constraints (restriction) in a regression model:

A. It is calculated using a formula that involves the Sum of Squared Residuals (SSR) from the restricted model and the Sum of Squared Residuals (SSR) from the unrestricted model.
B. It could be negative.
C. It will never be equal to zero.

Question 14. If the lower and upper bounds of the 95% confidence interval for a regression parameter are 2 and 5, respectively, then**...**

A. The parameter is statistically significant at 5%.
B. The point estimate of the parameter is 4.
C. The probability that the parameter is equal to 3.5 is 95%.

Question 15. Which of the following is specifically related to the functional form of a regression model?

A. RESET test.
B. Breusch-Godfrey test.

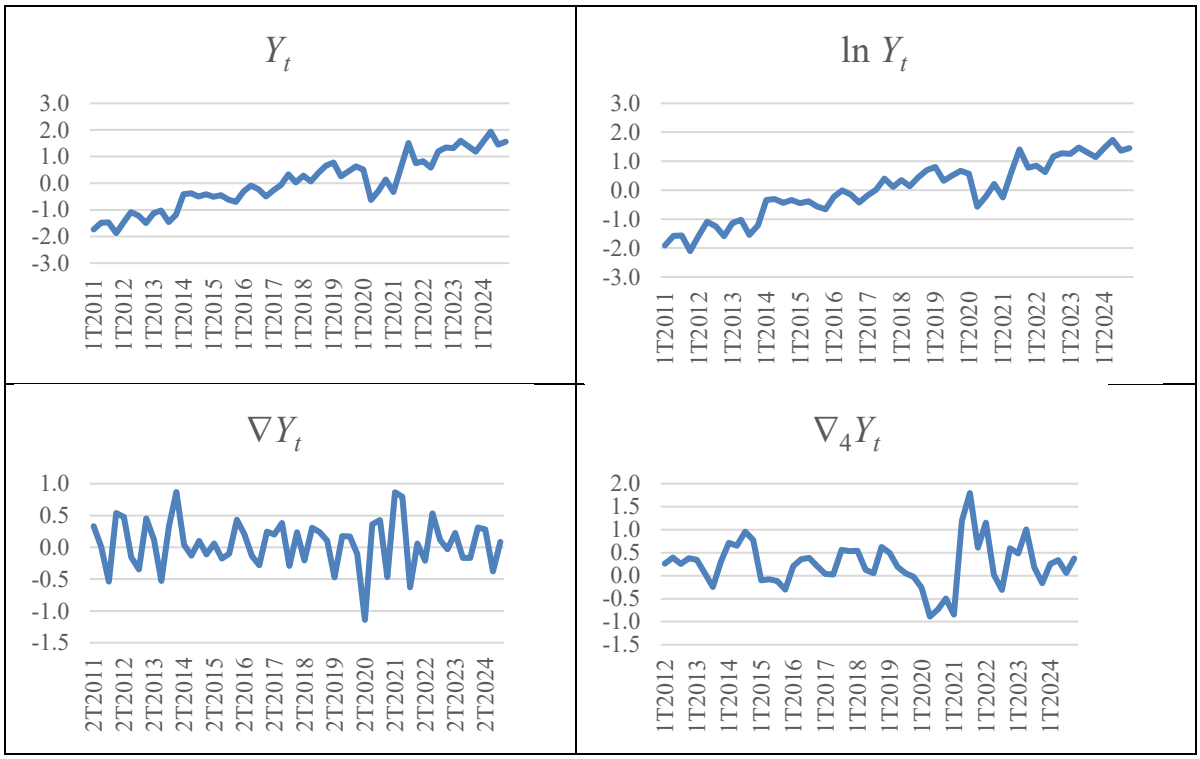
C. White test.

Question 16. Consider a regression model estimated by OLS. Which of the following statements about an influential observation is correct?

A. It is not always characterized by a large residual.
B. It can affect the OLS estimates of the model parameters, but not the individual significant test of the parameters.
C. It is always characterized by an outlier (an unusual observation of the dependent variable).

Questions 17 to 20 refer to the following statement: Let the time series Y_t represent the quarterly number of workers in the sports sector in Spain from 2011 to 2024. Figure 1 shows different transformations of Y_t: $\ln(Y_t)$ is the natural logarithm of Y_t; ∇Y_t is the first difference of Y_t; and $\nabla_4 Y_t$ is the seasonal difference of Y_t. All these transformed variables are standardized.

FIGURE 1



Question 17. According to FIGURE 1:

A. Ln (Y_t) is mean-stationary.
B. $\nabla_4 Y_t$ is clearly stationary.
C. $\nabla_4 Y_t$ is equal to $Y_t - Y_{t-4}$.

Additionally, a researcher considers the time series X that represents the quarterly contributions (money paid by workers, employers, and often the self-employed) to the Spanish Social Security System from 2011 to 2024, in real terms (X is also standardized). TABLES 4 and 5 show the results obtained from the OLS estimations of two different models:

TABLE 4: OLS, observations 2011:1-2024:4 (T = 56)
Dependent variable: Y_t

	Coefficient	*Std. error*	*t-ratio*	*p-value*
Const	0.000000	0.0699652	4.228e-014	1.0000
X_t	0.854902	0.0705984	12.11	0.0000

Mean dependent var.	0.000000	S.D. dependent var.	1.000000
R-squared	0.730857	Adjusted R-squared	0.725873
F(1, 54)	146.6366	P-value (F)	5.11e-17
Rho	0.691657	Durbin-Watson	0.517299

Breusch-Pagan test: Test statistic = 0.731366, $P[\chi^2(1) > 0.731366] = 0.392441$
Breusch-Godfrey test: Test statistic = 26.300353, $P[\chi^2(1) > 26.3004] = 0.0000$

TABLE 5: OLS, observations 2011:2-2024:4 (T = 55)
Dependent variable: ∇Y_t

	Coefficient	*Std. error*	*t-ratio*	*p-value*
Const	0.0289683	0.0525530	0.5512	0.5838
∇X_t	0.540712	0.254139	2.128	0.0380

Mean dependent var.	0.059855	S.D. dependent var.	0.386617
R-squared	0.078690	Adjusted R-squared	0.061307
F(1, 54)	4.526788	P-value (F)	0.038038
Rho	−0.190337	Durbin-Watson	2.373043

Breusch-Pagan test: Test statistic = 0.736919, $P[\chi^2(1) > 0.736919] = 0.390650$
Breusch-Godfrey test: Test statistic = 2.028637, $P[\chi^2(1) > 2.02864] = 0.154$

Question 18: According to the results in TABLE 4:

A. The estimated model should be dismissed, as the estimated constant term is zero and thus lacks theoretical meaning.
B. The researcher can rule out autocorrelation issues in the estimated model residuals.
C. The researcher can rule out heteroskedasticity issues in the estimated model residuals.

Question 19. According to the results in TABLE 5:

A. The researcher should have estimated the model using the Generalized Least Squares (GLS).
B. The estimated model residuals do not show autocorrelation of order 1.
C. None of the above.

Question 20. Choose the correct option:

A. If the time series X is non-stationary, and the residuals from the model estimated in TABLE 4 are stationary, then the time series X and Y can be considered cointegrated.
B. The time series X and Y are not cointegrated in any case, because the residuals of the estimated model in TABLE 4 show autocorrelation of order 1.
C. The results in TABLE 5 provide no information about the characteristics of the estimated model residuals.

CALCULATIONS

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