ECONOMETRICS - FINAL EXAM

June 19, 2025 – 12:00

Family name:	**First 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
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Question 18	A	B	C	Blank
Question 19	A	B	C	Blank
Question 20	A	B	C	Blank

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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.

EXAM DURATION IS 75 MINUTES

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 5 refer to the following information. A researcher wishes to study the relationship between household annual consumption, households size, as well as the family head education and age by estimating the following model:

$$LCONS = \beta_0 + \beta_1 HSIZE3 + \beta_2 HSIZE4 + \beta_3 HSIZE5P + \beta_4 EDUC + \beta_5 AGE + U$$

where *LCONS* is natural logarithm of annual consumption in euros, *HSIZE3* is a dummy equal to 1 for households composed of three people and 0 otherwise, *HSIZE4* is a dummy equal to 1 for households with four people and 0 otherwise, *HSIZE5P* is a dummy equal to 1 for households with at least five people and 0 otherwise. The reference category is households consisting of one or two members. *EDUC* measures the number of years of education for the household head and AGE measures the households head's age. The researcher, using a random sample of 98 households, estimates by OLS the model and results are shown in TABLE 1:

TABLE 1: OLS regression
Dependent variable: LCONS

	Coefficient	*Standard error*	*T-statistic*	*p-value*
Const	6,74596	0,404402	16,68	<0,0001
HSIZE3	0,298709	0,212263	1,407	0,1627
HSIZE4	0,117173	0,190947	0,6136	0,5410
HSIZE5P	0,205587	0,189196	1,087	0,2800
EDUC	0,0944391	0,0155159	6,087	<0,0001
AGE	0,0232910	0,00736923	3,161	0,0021

Mean of dependent variable	8,905190	Std. dev. of dependent variable	0,602161
Sum of squared residuals	----------	Std. error of regression	0,508166
R-squared	0,324535	Adjusted R-squared	0,287825
F(5, 92)	----------	P-value (F)	7,00e-07

Question 1. The estimates in TABLE 1 show that:

A. An additional year of schooling for the household head increases annual consumption by approximately 9,44%.
B. An additional year of age for the household head increases annual consumption by approximately 0,023%.
C. An additional year of schooling for the household head increases annual consumption by approximately 9,44 euros.

Question 2. The value of the statistic to test global significance of the model parameters is equal to:

A. 8,8405.
B. 6,9733.
C. 78,1546.

Question 3. Knowing that Pr[t(92) ≤ 1,98609] = 0,975 , Pr[t(92) ≤ 1,66159] = 0,95, and $cov(\beta_4, \beta_5) = 0$ the null hypothesis that $\beta_4 = \beta_5$ versus the alternative that $\beta_4 \neq \beta_5$:

A. Is not rejected at 5% significance level.
B. Is rejected at 10% significance level.
C. None of the above.

Question 4. If we look at household size results:

A. The estimated change in household annual consumption for increasing size from 1 or 2 members to 3 (holding everything else constant) is 0,29 euros.
B. Annual consumption for a household with 1 or 2 members is significantly different from consumption for a household with 3 members (holding everything else constant) at 5% significance level.
C. The estimated change in household annual consumption for increasing size from 4 members to 5 (holding everything else constant) is 9,24%.

Question 5. Indicate for which household group the estimated logarithm of annual consumption is the smallest:

A. A three-person household with a 43-year-old head who has 15 years of schooling.
B. A four-person household with a 36-year-old head who has 18 years of schooling.
C. A seven-person household with a 48-year-old head who has 14 years of schooling.

Suppose you also estimate the following model:

$$LCONS = \alpha_0 + \alpha_1 EDUC + \alpha_2 AGE + V$$

Using the same random sample of 98 households, we obtained OLS estimates that are reported in TABLE 2:

TABLE 2: OLS regression using observations 1-98
Dependent variable: LCONS

	Coefficient	*Standard error*	*T-statistic*	*p-value*
Const	6,89535	0,363781	18,95	<0,0001
EDUC	0,0947213	0,0154577	6,128	<0,0001
AGE	0,0237717	0,00717997	3,311	0,0013

Mean of dependent variable	8,905190	Std. dev. of dependent variable	0,602161
Sum of squared residuals	24,42553	Std. error of regression	0,507061
R-squared	0,305539	Adjusted R-squared	0,290919
F(2, 95)	20,89840	P-value (F)	3,01e-08

Question 6. If you want to test the null hypothesis that household size does not affect consumption, such a hypothesis would be formulated as:

A. $H_0: \alpha_1 = \alpha_2 = 0$.
B. $H_0: \beta_1 = \beta_2 = \beta_3 = 0$.
C. None of the above.

Question 7. Knowing that Pr[F(3,92) ≥ 2,70359] = 0,05, the null hypothesis that household size does not affect consumption:

A. Is rejected at 5% significance level.
B. Is not rejected at 5% significance level.
C. Cannot be tested with the information available.

Question 8. If we reestimate the model in TABLE 2, replacing AGE with AGE10 (where AGE10 = AGE/10 - age in tens of years):

A. The parameter for AGE10 is 0,237717.
B. The parameter for AGE10 is 0,00237717.
C. None of the above.

Suppose you also estimate the following model:

$$LCONS = \gamma_0 + \gamma_1 EDUC + \gamma_2 AGE + \gamma_3 EDUC\_AGE + U$$

Where $EDUC\_AGE = EDUC*AGE$. Using the same random sample of 98 households, we obtained OLS estimates that are reported in TABLE 3:

TABLE 3: OLS regression using observations 1-98
Dependent variable: LCONS

	Coefficient	*Standard error*	*T-statistic*	*p-value*
Const	8,96847	1,03902	8,632	<0,0001
EDUC	−0,0815825	0,0843515	−0,9672	0,3359
AGE	−0,0283357	0,0255170	−1,110	0,2696
EDUC_AGE	0,00448134	0,00210907	2,125	0,0362

Question 9. According to estimates in TABLE 3:

A. A one-year increase in the household head's age, decreases annual consumption by approximately 2,83% for any household in the sample.
B. For households whose head has no schooling, a one-year increase in their age decreases annual consumption by approximately 2.83%.
C. This model suffers from perfect multicollinearity.

Question 10. According to estimates in TABLE 3, the effect of the household head education on the logarithm of consumption:

A. Increases with the household head age.
B. Decreases with the household head age.
C. Does not vary with the household head age.

Question 11. In the simple linear regression $y = \beta_0 + \beta_1 x + u$, the OLS estimator of β_1:

A. Is equal to the correlation coefficient between x and y divided by the sample variance of x.
B. Is defined even in the case in which the the sample variance of x is equal to zero.
C. Is inversely proportional to the the sample variance of x.

Question 12. Consider the simple linear regression model (SLR) $y = \beta_0 + \beta_1 x_1 + u$ and the multiple linear regression model (MLR) $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$. Choose the correct statement:

A. OLS estimation of β_1 in the SLR is always greater than the OLS estimation of β_1 in the MLR.
B. If the sample covariance between x_1 and x_2 is non-zero, but the true coefficient for x_2 (β_2) is zero, then the variance of the OLS estimator for β_1 is larger in the MLR compared to a SLR.
C. None of the above.

Question 13. If the bounds of a 95% confidence interval for a regression model parameter are -1 and 3, then:

A. The model parameter is statistically significant at 5%.
B. The point estimate of the parameter is equal to 0.
C. None of the above.

Question 14. Which single condition among the following can result in an inefficient OLS estimator in a regression model?

A. Heteroskedasticity.
B. Multicollinearity.
C. Influential observations.

Question 15. Regarding the problem of non-perfect multicollinearity:

A. It often occurs when wide confidence intervals are observed.
B. It causes a bias in the OLS estimator.
C. None of the above.

Question 16. The spurious regression problem:

A. Cannot occur when estimating linear regressions with cross-section data.
B. Can occur when estimating linear regressions with time series data that are not mean stationary.
C. Has got nothing to do with omission of relevant explanatory variables.

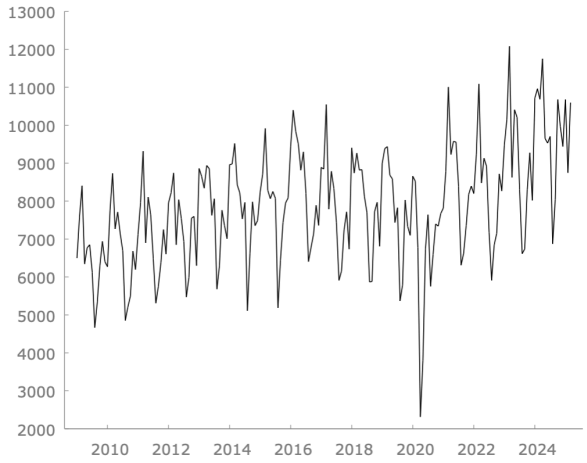
Question 17. A researcher estimates the following regression model: $y = \beta_0 + \beta_1 x + u$. Subsequently, she finds that the value of the Breusch-Godfrey test statistic is 18,3612 and knows that $Pr[\chi^2(1) > 18{,}3612] = 0{,}000$. Choose the correct statement:

A. The researcher should not worry about autocorrelation in the $\hat{}$ model residuals.
B. Detecting autocorrelation in the model residuals implies that β_1 is biased.
C. Detecting autocorrelation in the model residuals affects the inference the researcher may carry out.

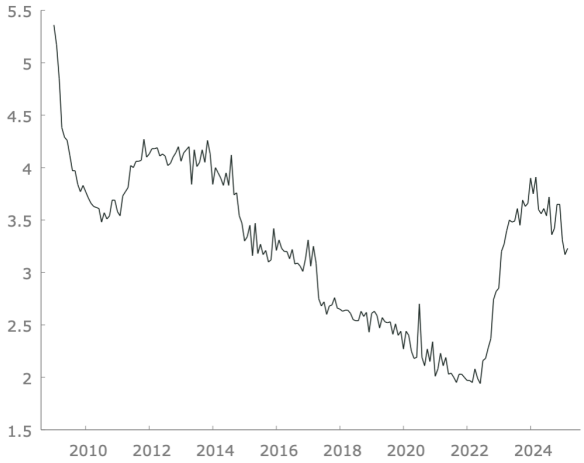
Questions 18-20 refer to Figure 1, which displays monthly data from January 2009 to November 2024 for two time series in Spain: Y_t (number of firms created) and Z_t (average starting interest rate in mortgage contracts signed).

FIGURE 1

Y_t (number of firms created)



Z_t (average mortgage starting interest rate)



Question 18. According to the plots in FIGURE 1:

A. Both series exhibit seasonality and mean stationarity.
B. Series Y_t is not mean stationary and Z_t is mean stationary.
C. None of the above.

Question 19. Choose the correct statement:

A. Taking a seasonal difference (∇_{12}) of series Y_t is unnecessary to remove its seasonal component, because it would result in the loss of 12 observations.
B. Taking a first difference (∇) of series Z_t would remove its seasonal component.
C. Taking a first difference and a seasonal difference of series Y_t would remove the trend and seasonal component, respectively.

Question 20. The first difference (∇) of series Y_t can be interpreted as the:

A. Absolute monthly variation in the number of firms created.
B. Relative monthly variation in the number of firms created.
C. Absolute annual variation in the number of firms created.

SPACE FOR MATHS CALCULATIONS

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