ECONOMETRICS FINAL EXAM
Wednesday 18th May 2022. 12:00

Family Name:	**Name:**
Grade:	**ID:**
Mobile:	**Email:**

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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		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 AND 15 MINUTES (75’) TO ANSWER THIS

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 12 refer to the following statement. Using observations of 474 employees from one firm the following model has been estimated:

$$LOG\ Sal_i = \beta_1 + \beta_2 Educ_i + \beta_3 LOG\ SalBegin_i + \beta_4 Male_i + \beta_5 Admin_i + \beta_6 Trader_i + U_i$$

where *LOG* stands for natural logarithm, *Sal* is the yearly salary in euros, *Educ* is the number of years of education, *SalBegin* is the salary that the individual earned at his/her first position at this firm, *Male* is a dummy variable with value 1 for males and zero for females. Employees are categorized into three job positions: administrative assistant, trader, and manager. In this sense, *Admin* is a dummy variable with value 1 for an administrative assistant, and zero for traders and managers and *Trader* is a dummy variable with value 1 for traders, and zero for administrative assistants and managers. Table S1 shows the results from the OLS estimation of this model.

Table S1

Dependent Variable: LOG Sal Sample: 1 474 Included observations: 474				
Variable	Coefficient	Std. Error	t-ratio	p-value
C	4.241184	0.437115	9.702676	0.0000
Educ	0.024468	0.003957	6.183716	0.0000
LOG SalBegin	0.615258	0.045331	13.57266	0.0000
Male	0.052355	0.019854	2.637042	0.0086
Admin	−0.241899	0.034451	−7.021531	0.0000
Trader	−0.121613	0.050000	−2.432255	0.0154
R-squared	0.824268	Adjusted R-squared		0.822391
Sum squared resid	13.12270	Schwarz criterion		−0.670996

Question 1. According to Table S1 and holding everything else constant, an additional year of *Educ* increases expected salary by:

A. 2.4%.
B. 2.4 euros.
C. 0.024%.

Question 2. According to Table S1 and holding everything else constant, a 1% increase in *SalBegin* is expected to increase salary by:

A. 61.5%.
B. 0.615%.
C. 61.5 euros.

Question 3. If 2xPr[t(468)≥1.965]=0.05, the 95% confidence interval for β_3 is:

A. [0.541, 0.690].
B. [0.526, 0.704].
C. [0.498, 0.733].

Question 4. The expected difference in salary between two women with same *Educ* and *SalBegin*, but one woman working as a manager and the other as an administrator assistant is expected to be:

A. 24% and statistically significant at the 1% level of significance.
B. 24190 euros and statistically significant at the 5% level of significance.
C. 0.24% and NOT statistically significant at the 10% level of significance.

Question 5. The null hypothesis of NO difference between the salary of a trader and the salary of a manager (with same values in the other regressors) cannot be rejected:

A. At the 5% level of significance.
B. At the 2% level of significance.
C. At the 1% level of significance.

Question 6. The p-value for testing the one-sided alternative hypothesis $H_0: \beta_6 = 0, H_1: \beta_6 > 0$ is equal to:

A. 0.23.
B. 0.9923.
C. 0.77.

Question 7. The expected difference in salary between two men with same *Educ* and *SalBegin*, but one working as an administrative assistant and the other as a trader:

A. Is expected to be approximately 12%.
B. Is expected to be approximately 24%.
C. Cannot be estimated with the available information.

Question 8. The value of the t-statistic to test the hypothesis that (holding everything else constant) expected salary is the same for *Admin* and *Trader* is:

A. –4.23.
B. –6.18.
C. Results from Table S1 do not contain enough information to obtain such t-statistic.

Question 9. If we estimate the alternative model (M2)

$$LOG\ Sal_i = \delta_1 + \delta_2 Educ_i + \delta_3 LOG\ SalBegin_i + \delta_4 Female_i + \delta_5 Admin_i + \delta_6 Trader_i + U_i$$

where *Female* is a dummy variable with value 1 for females and zero for males, then:

A. The R^2 from the alternative model is larger than 0.824268 if in the sample there are more females than males.
B. Schwarz criteria in the alternative model is larger than -0.670996 if in the sample there are more males than females.
C. The OLS estimates $\hat{\delta}_1$ and $\hat{\delta}_4$ from the alternative model are equal to 4.293539 and -0.052355 respectively, while $\hat{\delta}_2$, $\hat{\delta}_3$, $\hat{\delta}_5$ y $\hat{\delta}_6$ are equal to $\hat{\beta}_2$, $\hat{\beta}_3$, $\hat{\beta}_5$ y $\hat{\beta}_6$ .respectively.

Question 10. The null hypothesis that neither gender nor job position are related to salary in M2 can be written as:

A. $\delta_4 + \delta_5 + \delta_6 = 0$.
B. $\delta_4 = \delta_5 = \delta_6 = 0$.
C. $\delta_4 = \delta_5 + \delta_6$.

Question 11. The OLS estimation of the model: $LOG\ Sal_i = \gamma_1 + \gamma_2 Educ_i + \gamma_3 LOG\ SalBegin_i + e_i$ shows R^2=0.800579 and Sum of Squared Residuals (SSR)=14.89166. What is the F-statistic corresponding to the null hypothesis from Question 10?

A. It cannot be calculated with the available information.
B. It is equal to 63.087.
C. It is equal to 21.029.

Question 12. According to Table S1, the estimated *LOGSal* for a woman working as a manager and with $Educ = 20$ and $LOGSalBegin = 10$:

A. Is equal to 11.93.
B. Is equal to 10.88.
C. Cannot be calculated with the available information.

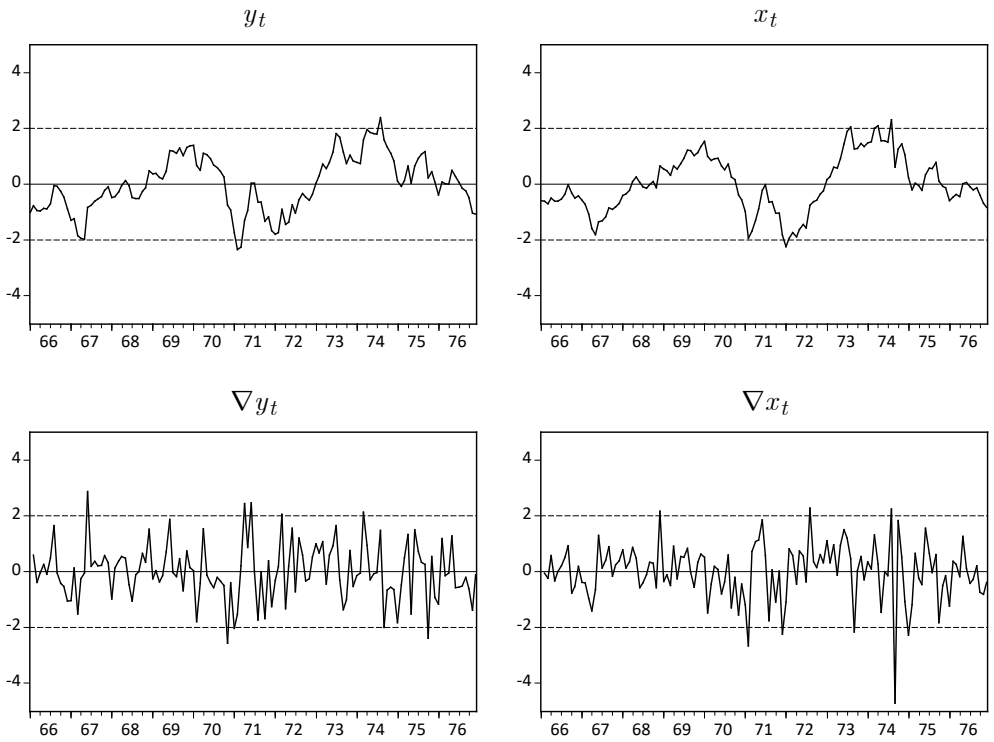
Question 13. Consider the model $\hat{Y} = \hat{\beta}_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3$, estimated using OLS. Which of the following statements is FALSE?:

A. The sum of residuals is equal to zero.
B. If the sample covariance between X_3 and X_2 is equal to zero, when we estimate the simple OLS regression: $\hat{Y} = \hat{\alpha}_1 + \hat{\alpha}_3 X_3$, we get $\hat{\alpha}_3 = \hat{\beta}_3$.
C. If the sample covariance between Y and X_2 is equal to zero, then $\hat{\beta}_2 = 0$.

Question 14. The model $Y = X\beta + U$ satisfies every hypothesis from the classical linear model. Choose the RIGHT answer:

A. The normality hypothesis is not required to show the efficiency of the OLS estimator for β.
B. The OLS estimator for β shows the highest variance among all the unbiased estimators for β.
C. The expected value of the OLS estimator for β is a vector of numbers which is known before the researcher starts the analysis.

Questions 15 and 16 refer to the two monthly time series and to the two OLS models shown below:



Model M1:

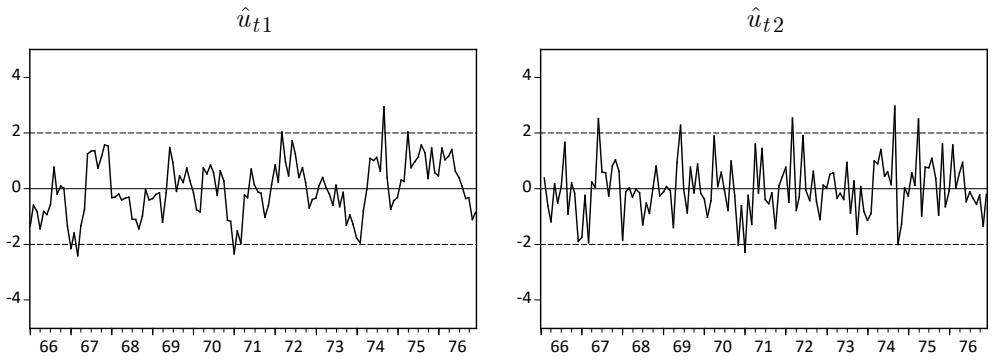
$$y_t = \underset{(0.042)}{0.517} + \underset{(0.025)}{0.772}x_t + \hat{u}_{t1},$$

$$N = 132,\ BG_1 = 60.491\ [0.000].$$

Model M2:

$$y_t = \underset{(0.046)}{0.176} + \underset{(0.066)}{0.695}y_{t-1} + \underset{(0.053)}{0.700}x_t - \underset{(0.066)}{0.475}x_{t-1} + \hat{u}_{t2},$$

$$N = 131,\ BG_1 = 0.027\ [0.869].$$



In models M1 and M2, the numbers between parentheses below the parameter estimates are the standard errors and BG_1 is the calculated value for the Breusch-Godfrey statistic (the significance level is between brackets).

.**Question 15.** Consider the following statements:

[1] Series y_t and x_t are stationary.
[2] Series y_t and x_t are seasonal.
[3] Series ∇y_t and ∇x_t are NON-stationary.
[4] Series $\hat{u}_{t1}$ and $\hat{u}_{t2}$ are stationary.
[5] Residuals $\hat{u}_{t1}$ from model M1 are autocorrelated.
[6] Residuals $\hat{u}_{t2}$ from model M2 do not show autocorrelation of order 1.

A. Every statement is incorrect.
B. Statements [1], [2], [3] and [5] are correct.
C. Statements [4] and [6] are correct.

Question 16. Consider the following statements:

[1] Series y_t and x_t are cointegrated.
[2] Series y_t and x_t are unrelated
[3] Model M2 shows a non-spurious relationship between y_t and x_t.
[4] Model M1 shows a spurious relationship between y_t and x_t.

A. Every statement is incorrect.
B. Statements [1] and [3] are correct.
C. Statements [2] and [4] are correct.

Questions 17 and 18 refer to the following regression model $Y = \beta_1 + \beta_2 X + U$. The OLS estimation with 80 cross-sectional observations shows the following results:

[M1]
$$\begin{array}{ccc} \hat{Y} = 304.2201 & + & 0.3570X, \\ (14.7354) & & (0.1126) \\ [0.0000] & & [0.0022] \end{array}$$
$$N = 80, \;\; WH = 41.2281 \; [0.0001].$$

The numbers between parentheses below the parameter estimates are the standard errors and the numbers between brackets are the p-values from the individual significance tests. WH is the calculated value for the White test (p-value between brackets). The same model has been estimated using the White estimator for the variance-covariance matrix and shows the following results:

[M2]
$$\begin{array}{ccc} \hat{Y} = 304.2201 & + & 0.3570X, \\ (21.9442) & & (0.2934) \\ [0.0000] & & [0.2274] \end{array}$$
$$N = 80, \;\; WH = \cdots \;\; [\cdots].$$

Question 17. The null hypothesis that the error terms from [M1] show constant variance:

A. Should be rejected at the 1% level of significance
B. Cannot be rejected neither at the 5%, nor at the 10% level of significance
C. Cannot be tested with the available information.

Question 18. Which of the following statements is correct?:

A. β_2 is statistically significant at the 1% level of significance in [M1] and in [M2].
B. The estimator for β_2 in [M2] is not unbiased although it is efficient
C. The two missing numbers denoted by $\cdots$ in [M2] are equal to those from [M1].

Question 19. Consider the regression model $Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + U$. If VIF_2 and VIF_3 are the Variance Inflation Factors of the OLS estimators for β_2 and β_3, then:

A. $VIF_2 = 1$ indicates exact collinearity in the model.
B. $VIF_2 = VIF_3$.
C. $VIF_3 = 10$ indicates NO collinearity in the model.

Question 20. Which of the following tools are NOT helpful to detect outliers in a linear regression model?:

A. The Cook statistic.
B. The OLS residuals.
C. The numbers from the main diagonal of the matrix $\mathbf{X}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'$.

CALCULATIONS

SIGNATURE

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