ECONOMETRICS - FINAL EXAM
JUN 22, 2022 – 18:00

First name:	**Last Name:**
DNI/ID:	**Mobile:**
E-mail:	**Instructor:**

Answer SHEET

Question 1	A	B	C	NO Answer
Question 2	A	B	C	NO Answer
Question 3	A	B	C	NO Answer
Question 4	A	B	C	NO Answer
Question 5	A	B	C	NO Answer
Question 6	A	B	C	NO Answer
Question 7	A	B	C	NO Answer
Question 8	A	B	C	NO Answer
Question 9	A	B	C	NO Answer
Question 10	A	B	C	NO Answer
Question 11	A	B	C	NO Answer
Question 12	A	B	C	NO Answer
Question 13	A	B	C	NO Answer
Question 14	A	B	C	NO Answer
Question 15	A	B	C	NO Answer
Question 16	A	B	C	NO Answer
Question 17	A	B	C	NO Answer
Question 18	A	B	C	NO Answer
Question 19	A	B	C	NO Answer
Question 20	A	B	C	NO Answer

RIGHT		WRONG		NO Answer		MARK	

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 "NO Answer" 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 TEST

REMINDER

YOU ARE NOT ALLOWED TO USE DEVICES WITH CONNECTIVITY TO THE INTERNET, INCLUDING MOBILE PHONES, TABLETS, SMARTWATCHES OR MP3/4 PLAYERS

Question 1. In the simple linear regression model, the sample correlation coefficient between the dependent and the independent variables …

A) is always equal to the slope estimator.

B) is always equal to the R^2 of the model.

C) is always equal to the slope estimator when the standard deviation of the independent and dependent variables is equal.

Question 2. When the errors in a regression model are not normally distributed…

A) the OLS estimator is not BLUE anymore.

B) normality plays no role in showing that the OLS estimators is BLUE.

C) *t* and F statistic are still valid for determining which variables are statistically significant even when the sample is small.

Question 3. To forecast the U.S. unemployment rate (*unem*) for 2022 as a function of unemployment and inflation (*inf*) in 2021, which are 5.4 and 3.0, respectively, we use the model:

$$unem_t = 1.304 + 0.647 unem_{t-1} + 0.184\ \mathrm{inf}_{t-1} + \hat{u}_t$$

Therefore, the forecast for $unem_{2022}$is:

A) 5.35.

B) 1.304.

C) Unfortunately, there is not enough information to forecast $unem_{2022}$ because the actual value of $unem_{2022}$is needed.

Question 4. In the simple linear regression model, an **outlier** observation …

A) will never be **influential**.

B) If removed from the sample, it will never change significantly the estimated parameters using OLS.

C) usually implies a LARGE (positive or negative) OLS residual.

Question 5. Which of the following p-values will lead us to **FAIL** to reject a null hypothesis if the level of significance equals 10%?

A) 0.050
B) 0.070
C) 0.136

Question 6. Suppose that using 200 observations we estimate by OLS the linear regression model

$$LOG(wage_i) = 0.25 + 0.05AGE_i - 0.23Female_i$$

where the gender dummy variable *female* is equal 1 for women and 0 for men. Therefore, according to these results is expected that …:

A) a woman will ear 23% less than a man of the same age.
B) a woman will ear 0.23% less than a man of the same age.
C) a man will ear 23% less than a woman of the same age.

Question 7. Consider the model $y_i = \beta_1 + \beta_2 x_i + \beta_3 z_i + u_i$ (i *=1, …, 50*). The OLS regression of $\hat{u}^2{}_i$ as a function of a constant term, x_i, z_i, x_i^2, z_i^2 and $x_i \cdot z_i$ for all i *=1, 2, …, 50,* yields an R-squared equal to 0.20 and a sample variance ($\hat{\sigma}^2$) equal to 0.45. If $\Pr[\chi^2(5) > 11.07] = 0.05$ and $\Pr[\chi^2(5) > 9.24] = 0.10$, the null that the errors (u_i) are homoscedastic:

A) …must be rejected at the 5%, but not at the 10% level of significance.
B) …must be rejected at both the 10% and 5% levels of significance.
C) …must be rejected at the 10%, but not at the 5% level of significance.

Question 8. Under the standard hypotheses of the Simple Linear Regression Model $y_i = \beta_1 + \beta_2 x_i + u_i$, efficiency (BEST) in the Gauss-Markov sense of the OLS estimator of β_1 and β_2 means that:

A) the variance-covariance matrix of the OLS estimator is an identity matrix I_{2x2} (ones in the main diagonal and zeros off diagonal)
B) There is no alternative linear and unbiased estimator of β_1 and β_2 with a smaller variance.
C) The expected value of the OLS estimator of β_1 and β_2 is always equal to zero.

Question 9. When a model suffers from **perfect collinearity …**

A) It can be estimated by OLS.

B) The determinant $|X^T X|$ is equal to 0 and the model CANNOT be estimated by OLS.

C) There are no **exact linear** relationships among the independent variables.

Question 10. Identify which of the following statements are TRUE or FALSE

1. A spurious correlation represents a connection between two variables that seems to be causal but really is not.
2. Variance Inflation Factor (VIF) is a measure of the amount of heteroscedasticity in a linear regression model.
3. The classical linear regression assumptions (S1-S7) are important for the Gauss Markov theorem to state that the OLS estimator is BLUE
4. Diagnostic checks based on OLS model residuals using both, formal testing procedures and graphical tools, can be useful to detect heteroscedasticity.
5. The OLS estimator of the parameter is VLUE, that is, it is a Linear Unbiased Estimator of the Variance.

A) Statements 1, 2 and 5 are TRUE and 3 and 4 are FALSE.

B) Statements 2, 3 and 4 are TRUE and 1 and 5 are FALSE.

C) Statements 1, 3 and 4 are TRUE and 2 and 5 are FALSE.

Questions 11 to 15 refer to the following statement**.** To explain infant birth weight in terms of various factors, the following simple regression was estimated using data on n=1387 births.

$$\text{LOG}\,(bwght_i) = \beta_0 + \beta_{faminc} LOG(faminc_i) + \beta_{cigs} cigs_i + \beta_{boy} boy_i + \beta_{wht} white_i + u_i$$

where **bwght** is the infant birth weight in grams, **faminc** is the annual family income in thousands of euros, **cigs** is the average number of cigarettes the mother smoked per day during pregnancy, **boy** is a dummy variables with value 1 if the child is a boy and 0 if is a girl, **white** is a dummy variable with value 1 for a white child and 0 for a black child. Tables P1 and P2 show the OLS estimation of both the full [**M1**] and a restricted

version [**M2**] of the previous model, respectively. **Note: for computation use all the available decimals in Tables B1 and B2.**

Table B1: OLS estimation M1

Dependent variable: LOG ($bwght_i$) **Method: Least Squares** **Sample: 1-1387**				
	Coefficient	*Std. error*	*t-Statistic*	*P-value*
Const	8.032933	0.019307	416.0674	0.0000
LOG (FAMINC)	0.007997	0.005897	1.356131	0.1753
CIGS	-0.004187	0.000847	----------	0.0000
BOY	0.027265	0.009989	2.729535	0.0064
WHITE	0.052386	0.012978	4.036496	0.0001
R-squared	0.041846	**Mean dependent var.**		8.104051
Adjusted R-squared	0.39073	**S.D. dependent var**		0.189384

Table B2: OLS estimation M2

Dependent variable: LOG ($bwght_i$) **Method: Least Squares** **Sample: 1-1387**				
	Coefficient	*Std. error*	*t-Statistic*	*P-value*
Const	8.063970	0.018126	444.8936	0.0000
LOG(FAMINC)	0.015813	0.005548	2.850358	0.0044
CIGS	-0.004058	0.000853	----------	0.0000
R-squared	0.025478	**Mean dependent var.**		8.104051
Adjusted R-squared	0.024069	**S.D. dependent var**		0.189384

Question 11. (Complete the next statement with the right option) According to Table B1, holding constant all other factors, ...

A) Smoking 1 more cigarette per day, will reduce birth weight by 0.4%.

B) If the family income increases by 1%, birth weight will increase by 0.8%.

C) If the family income increases by 1%, birth weight will increase by 800 grams.

Question 12. According to Table B1, the expected **LOG** ($bwght_i$) for a WHITE GIRL baby, whose mother does not smoke, and the FAMILY INCOME is 60 thousand euros IS:

A) 8.12.

B) 8.20.

C) 8.03.

Question 13. (Complete the next statement with the right option) According to Table B1, holding constant all other factors, a BOY will weight …

A) Around 270 grams MORE than a GIRL, but this difference is not statistically significant at the 1% level of significance

B) Around 2.7% MORE than a GIRL, and this difference is statistically significant at the 5% level of significance.

C) 0.0027 % MORE than a GIRL, and this difference is statistically significant at the 5% level of significance.

Question 14. If $Prob[F(2, 1382) \geq 3.00] = 0.05$ and taking into account the results in Tables B1 and B2, the null hypothesis of **NO DIFFERENCES** in birth weight among babies of different sex and race (holding constant **FAMINC,** and **CIGS**)

A) cannot be rejected at the 5% level of significance, because the corresponding value of the F statistic is 11.80.

B) should be rejected at the 5% level of significance, because the corresponding value of the F statistic is 23.60.

C) should be rejected at the 5% level of significance, because the corresponding value of the F statistic is 11.80.

Question 15. According to Table B2 results, the t-statistic (t*) for testing the null hypothesis $H_0: \beta_{CIGS} = 0$ is:

A) 4.757.

B) -4.757.

C) -3.757.

Question 16. According to the **Adjusted R-squared** reported in Tables B1 and B2 …

A) comparing the **Adjusted R-squared** from regressions does not tell us anything about which model fits better.
B) we prefer model **M2** to model **M1.**
C) we prefer model **M1** to model **M2.**

Questions 17 to 19 refer to the following statement. Figure 1 displays the quarterly interest rate of long-term UK Treasury bonds (LR_UK) and Figure 2 shows the quarterly interest rate of short-term UK Treasury bills (SR_UK) from the 2nd quarter of 1952 to the fourth quarter of 1979, both included.

Figure 1: UK Treasury bonds returns (LR_UK)

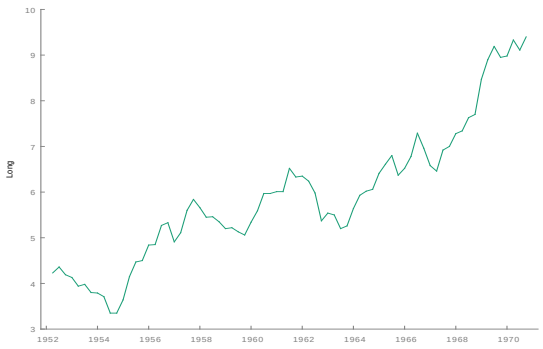
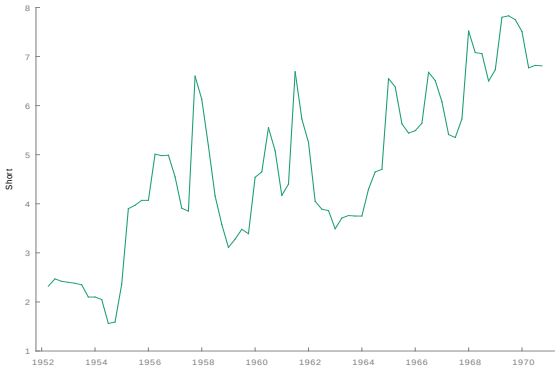


Figure 2: UK Treasury bills returns (SR_UK)



Question 17. Choose which of the following statements is TRUE:

A) LR_UK is stationary.
B) LR_UK is non-stationary.
C) Although LR_UK is mean stationary, it might have seasonality.

Question 18. Choose which of the following statements is TRUE:

A) The quarterly change of SR_UK could be stationary.

B) SR_UK is stationary.

C) Although SR_UK is mean stationary, it might be heteroscedastic

Question 19. Choose which of the following statements is TRUE:

A) SR_UK and LR_UK could be cointegrated because both are stationary.

B) SR_UK and LR_UK could be cointegrated because both are non-stationary.

C) SR_UK and LR_UK **CANNOT** be cointegrated because both are interest rates.

Question 20. Consider a SIMPLE linear regression. Which of the following instruments would **NOT** be suitable to detect heteroscedasticity in the error term:

A) White test.

B) A scatter plot of the squared residuals against the independent variable.

C) Jarque-Bera test.

CALCULATIONS

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Answer Key

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