ISEG – Lisbon School of Economics and Management
ECONOMETRICS
First Semester 2018/2019
Final Exam (RegAP) – Part II
January, 15 2019

Duration: **60 Minutes**

Name:

Question:	**1**	**2**	**3**	**4**	Total
Points:	10	10	10	70	100

Justify all your answers. You are required to show your work on each problem on this test. **Organize your work**. Work scattered all over the page will receive very little credit. A correct answer in a multiple choice question is worth 10 points; an incorrect one is worth −2.5 points. **You are allowed to** use only statistical tables, a calculator and a formula sheet (2 pages maximum).

(10) **1**. Consider the following linear regression model:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i4} + u_i, \qquad i = 1, \ldots, 500 \tag{1}$$

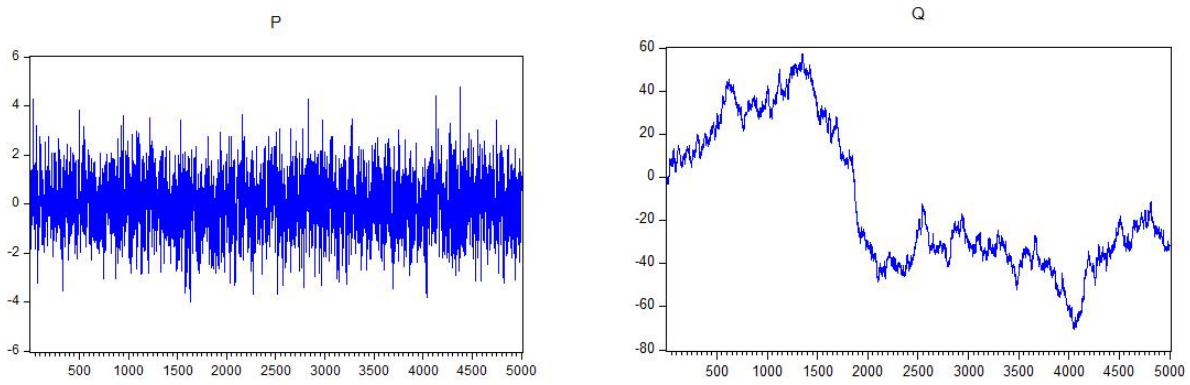
Assume that the sample $\{(x_{i1}, x_{i2}, x_{i3}, x_{i4}, y_i) : i = 1, \ldots, 500\}$ is randomly drawn from the population and that the condition $\mathrm{E}(u_i \,|\, x_{i1}, x_{i2}, x_{i3}, x_{i4}) = 0$ is verified for all i. Now suppose that $\mathrm{Var}(u_i \,|\, x_{i1}, x_{i2}, x_{i3}, x_{i4}) = (x_{i1}^2 + x_{i3}^2)\,\sigma_u^2$, where σ_u^2 is a constant parameter to be estimated. Considering the following statements, which one is **TRUE**?

- ◯ If all the variables of model (1) are divided by $(x_{i1}^2 + x_{i3}^2)$ the resulting error is homoscedastic.
- ◯ There are other linear unbiased estimators that will have lower variance than the OLS estimator.
- ◯ After the OLS estimation of model (1), the usual statistical inference is asymptotically correct for $\hat{\beta}_0$, $\hat{\beta}_2$ and $\hat{\beta}_4$.
- ◯ In general, the WLS estimates are smaller than the OLS estimates for β_j, with $j = 0, 1, 2, 3, 4$.

(10) **2**. Consider the following model $z_t = z_{t-1} + e_t$, with $e_t \overset{iid}{\sim} \mathrm{N}(0, \sigma_e^2)$. Then,

- ◯ $\mathrm{Cov}(z_t, z_{t+h}) = 0$ if $h > 1$.
- ◯ The process $\{z_t\}$ is weakly dependent.
- ◯ $\mathrm{Var}(z_t)$ is a linear function of time.
- ◯ None of the above.

(10) **3**. Let $\{p_t\}$ and $\{q_t\}$ be two processes illustrated by the following graphs:



Then,

◯ $p_t \sim \mathrm{I}(1)$ and $q_t \sim \mathrm{I}(1)$
◯ $p_t \sim \mathrm{I}(1)$ and $q_t \sim \mathrm{I}(0)$
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4. A team of researchers at ISEG is currently discussing the adequacy of NAIRU theory (non-accelerating inflation rate of unemployment) to the Portuguese economy. They are analyzing how the long run and short run dynamics of the unemployment rate ($unem$) affects the long run and short run inflation rate (inf). Using quarterly data, from the first quarter of 2000 until the third quarter of 2018, the following equation was estimated:

$$inf_t = \alpha_0 + \alpha_1\, t + \delta_1\, Q_{1t} + \delta_2\, Q_{2t} + \delta_3\, Q_{3t} + \beta_1\, unem_t + \beta_2\, unem_{t-1} + \beta_3\, unem_{t-2} + u_t \quad (2)$$

The estimated output of this equation can be found in **Annex Part II**. Other results that, may be useful to solve the following questions, can be found in **Annex Part II**, as well.

(5) (a) Interpret the estimate of α_1.

(10) (b) Interpret the estimated coefficient for the variable Q_{3t}.

(10) (c) Is there evidence of seasonality in the quarterly Portuguese inflation rate?

(15) (d) Test the hypothesis that there is no long run effect of the unemployment rate on the inflation rate. In other words, verify the statistical validity of the NAIRU theory.

(10) (e) Is the model (2) dynamically complete? Use an appropriate statistical result, formalize and explain.

(20) (f) Some economists argue that the current unemployment rate depends on past values of the inflation rate. Considering this fact, write the assumptions that make OLS estimation and inference in equation (2) valid, indicating the properties of OLS in this situation.