ISEG – Lisbon School of Economics and Management
ECONOMETRICS
First Semester 2017/2018
Problem Set I

LISBON SCHOOL OF ECONOMICS & MANAGEMENT
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Question:	**1**	**2**	**3**	**4**	**5**	Total
Points:	4	4	4	4	24	40

Justify all your answers. You are required to show your work on each problem (except for multiple choice questions). **Organize your work**. Work scattered all over the page will receive very little credit. A correct answer in a multiple choice question worths 4 points; an incorrect one worths -1 point. **Delivery date: 10 of October**.

(4) **1**. Consider the following Multiple Linear Regression Model (MLRM)

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + u_i, \quad i = 1, \ldots, n$$

Assume that the assumptions MLR.1 to MLR.5 hold. For the OLS estimator of the unknown coefficients, which of the following statements is **true**?

○ The sum of squared residuals (SSR) is equal to zero.

○ It is proven that $\sum_{i=1}^{n} u_i = 0$.

○ The OLS minimizes the residuals, therefore $\hat{u}_i = 0$.

○ The SSR is minimum.

(4) **2**. Which of the following statements is **true**?

○ The R-squared, R^2, cannot be calculated if the dependent variable is logarithmic.

○ Adding an irrelevant variable to the model may result in a reduction of the R^2.

○ The R^2 is always greater or equal than the adjusted R-squared, $\bar{R}^2$.

○ The R^2 can be negative if the explanatory variables of the model are strongly correlated.

(4) **3**. Consider the following MLRM:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + u_i, \quad i = 1, \ldots, n$$

Assume that the assumptions MLR.1 to MLR.4 hold. For the OLS estimator of the unknown coefficients, choose the **correct** statement:

○ The OLS estimator is the Best Linear Unbiased Estimator (BLUE).

○ $\mathrm{E}(y_i \,|\, x_{i1}, x_{i2}) = 0$.

○ Because the assumption MLR.5 does not hold, the OLS estimator may be biased.

○ The error term, u_i, is uncorrelated with x_{i1} and x_{i2}.

(4) **4.** The omission of a relevant variable in a given model:

    ○ Is never a problem if one is not interested on estimating the coefficient of that variable.

    ○ Implies that the assumption MLR.4 does not hold, if the omitted variable is correlated with at least one of the explanatory variables included in the model.

    ○ Implies that the OLS estimator is necessarily biased.

    ○ Increases the variance of the OLS estimates.

    5. Use the data set apple.WF1, to explain the quantity (in pounds) of ecolabeled apples purchased by a family, $ecolbs$.

(5)   (a) Estimate the following regression by OLS:

$$ecolbs_i = \beta_0 + \beta_1 \log\left(faminc_i\right) + \beta_2 regprc_i + \beta_3 ecoprc_i + u_i$$

where $faminc$ is the family income (in thousands of dollars), $regprc$ is the price of regular apples (in dollars), $ecoprc$ is the price of ecolabeled apples (in dollars). Write the estimated equation with the corresponding standard errors.

(6)   (b) Interpret the estimated coefficients. Discuss the signs of these estimates.

(5)   (c) Estimate the quantity of ecolabeled apples purchased by a family with an income of 45 thousand dollars when the price of both types of apples is equal to 1 dollar.

(4)   (d) Suppose that the family referred in part (c) has, in fact, purchased 2 pounds of ecolabeled apples. Calculate the corresponding residual and comment on this result.

(4)   (e) Interpret the value obtained for the R^2 of the regression.