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

Question:	**1**	**2**	**3**	**4**	**5**	Total
Points:	4	4	4	4	34	50

Justify all your answers (except for multiple choice questions). 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: 25 of October**.

(4) **1**. Suppose that assumption MLR.5 is not verified in the model. Which of the following statements is **TRUE**?

- ◯ The t and F statistics, obtained from the conventional OLS estimator, do not follow the usual distributions.
- ◯ The OLS standard errors are unbiased, once assumption MLR.4 still holds.
- ◯ The conditional variance of the error term is a constant, σ^2.
- ◯ The OLS estimator is BLUE, once assumption MLR.4 still holds.

(4) **2**. Assume that you had estimated the following quadratic regression model:

$$\widehat{wage} = 6.1 + 0.35\, educ + 0.25\, exper - 0.01\, exper^2$$

If experience increases from 5 to 6, holding education fixed, then it is estimated that wage increases, in average, approximately:

- ◯ 0.25
- ◯ 0.20
- ◯ 0.90
- ◯ 0.15

(4) **3**. Suppose you are performing a test $H_0 : \beta_j = 0$ against $H_1 : \beta_j < 0$ and you obtain the observed value for the test statistic equal to t_{obs}. Then the p-value is equal to:

- ◯ The probability of rejection of the null hypothesis.
- ◯ $P(T \leq t_{obs})$ with T distributed according to a *t-student* with $n - k - 1$ degrees of freedom.
- ◯ $P(T \leq -t_{obs})$ with T distributed according to a *t-student* with $n - k - 1$ degrees of freedom.
- ◯ $2P(T \geq |t_{obs}|)$ with T distributed according to a *t-student* with $n - k - 1$ degrees of freedom.

(4) **4**. Consider the regression model:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2$$

We intend to test the hypothesis that if x_1 and x_2 increase by the same amount then the estimated effect on y is in average equal to zero. The null hypothesis will be:

- ◯ $H_0 : \beta_1 + \beta_2 = 0$
- ◯ $H_0 : \beta_1 - \beta_2 = 0$
- ◯ $H_0 : E(\beta_1 - \beta_2) = 0$
- ◯ none of the above.

5. Use the data set affairs.WF1 to explain the numbers of affairs a married person had last year. Estimate the following regression by OLS:

$$naffairs_i = \beta_0 + \beta_1 \, educ_i + \beta_2 \, age_i + \beta_3 \, yrsmarr_i + \beta_4 \, yrsmarr_i^2 + \beta_5 \, relig_i + u_i$$

where:

- ***naffairs*** is the number of affairs within last year;
- ***educ*** is number of years in schooling;
- ***yrsmarr*** is the number of years married;
- ***relig*** gives the religious status of the individual where 5 = very religious, 4 = somewhat, 3 = slightly, 2 = not at all, 1 = anti religious.

(5) (a) Write the estimated equation with the corresponding standard errors.

(7) (b) Interpret the estimated coefficients $\hat{\beta}_3$ and $\hat{\beta}_5$. Discuss the signs of these estimates.

(5) (c) Write the estimated marginal effect of ***yrsmarr*** on ***naffairs*** in the specified model and comment.

(6) (d) Test the individual statistical significance of all variables and comment.

(5) (e) Test whether the coefficients on ***educ*** and ***age*** are jointly significantly. Show your calculations.

(6) (f) Estimate now the following regression by OLS:

$$naffairs_i = \beta_0 + \beta_1 \, age_i + \beta_2 \, yrsmarr_i + \beta_3 \, relig_i + u_i$$

Estimate the effect on the number of affairs of an individual that is very religious and is 15 years married relatively to another that is 2 years married and anti-religious, having both the same age. Write the hypothesis that this effect is equal to zero and test it. Show how to calculate the test statistic.