**ISEG – Lisbon School of Economics and Management**
**ECONOMETRICS**
**First Semester 2016/2017**
**Problem Set II – Inference (II) and Functional Form**

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

**Justify** all your answers. You are required to show your work on each problem on this problem set. **Organize your work**. Work scattered all over the page will receive very little credit. A correct answer in a multiple choice question is worth 4 points; an incorrect one is worth −1 point.

(4) **1**. Suppose that there is heteroscedasticity in the model. Which of the following statements is **false**?

- ◯ The $t$ and $F$ statistics, obtained from the conventional OLS estimator, do not follow the usual distributions.
- ◯ The OLS estimates are unbiased, once assumption MLR.4 still holds.
- ◯ The variance of the error term is a constant $\sigma^2$.
- ◯ The OLS estimator is no longer BLUE.

(4) **2**. A large $p$-value associated to a test for individual statistical significance implies:

- ◯ The rejection of the null hypothesis.
- ◯ A large $t$ statistic, in absolute value.
- ◯ That the true value of $\beta_j$ is known.
- ◯ That the critical value is larger than the observed absolute value of the test statistic.

(4) **3**. Assume that you had estimated the following quadratic regression model:

$$\widehat{TestScore} = 6.1 + 3.85\, Income - 0.04\, Income^2$$

If income increased from 10 to 12, then the predicted effect on test scores would be:

- ◯ 3.85
- ◯ 3.77
- ◯ 6.10
- ◯ 3.05

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

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i1}^2 + \beta_3 x_{i2} + \beta_4 x_{i3} + u$$

We intend to test the hypothesis that there is no squared effect in this model. The null hypothesis will correspond to:

- ◯ $H_0 : \beta_2 = 0$ vs. $H_1 : \beta_2 \neq 0$
- ◯ $H_0 : \beta_1 = 0$ vs. $H_1 : \beta_1 \neq 0$
- ◯ $H_0 : \beta_1 = \beta_2 = 0$ vs. $H_1 : \beta_1 \neq 0$ and $\beta_2 \neq 0$
- ◯ $H_0 : \beta_1 = \beta_2 = 0$ vs. $H_1 : \beta_1 \neq 0$ or $\beta_2 \neq 0$

**5**. Using the data set Growth.WF1, you will study the average growth rates over 1960-1995 for 67 countries.

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

$$\begin{aligned} Growth_i =& \beta_0 + \beta_1 TradeShare_i + \beta_2 TradeShare_i^2 + \beta_3 \log(YearsSchool_i) \\ &+ \beta_4 RevCoups_i + \beta_5 Assassinations_i + \beta_6 \log(RGDP60_i) + u_i \end{aligned}$$

where:

- ***Growth*** is the average annual percentage growth of real Gross Domestic Product (GDP) from 1960 to 1995;
- ***TradeShare*** is the average share of trade in the economy from 1960 to 1995, measured as the sum of exports plus imports, divided by GDP;
- ***YearsSchool*** is the average number of years of schooling of adult residents in that country in 1960;
- ***RevCoups*** is the average annual number of revolutions, insurrections (successful or not) and "coup d'etats" in that country from 1960 to 1995
- ***Assassinations*** is the average annual number of political assassinations in that country from 1960 to 1995 (per million population);
- ***RGDP60*** is the value of GDP per capita in 1960, converted to 1960 US dollars

Write the estimated equation with the corresponding standard errors.

(4) (b) Interpret the estimated coefficients $\hat{\beta}_5$ and $\hat{\beta}_6$. Discuss the signs of these estimates.

(5) (c) At what point does the marginal effect of ***TradeShare*** on ***Growth*** become positive? Make a brief discussion about the result.

(5) (d) Test whether the coefficients on ***Assassinations*** and ***RevCoups*** are jointly equal to zero. Are they individually significant? For all tests, compute the $p$-values. Show your calculations.

(5) (e) In 1960, a country contemplated a trade policy that would increase the average value of ***TradeShare*** from 0.5 to 1. What is the predicted change in ***Growth*** as a result of this policy? Is this a plausible value? Explain.

(5) (f) Is there any statistical evidence of a quadratic effect of ***TradeShare*** on ***Growth***?

(5) (g) Is the effect of ***TradeShare*** statistically significant? Can you use the test from part (f) to answer this question? Explain.