Assignment 3

DUE DATE: Thursday 27^{th}, September 2018 before 15.30 pm

I pledge to the Honor Code and to obey all rules for taking and performing homework assignments as specified by the course instructor.

Full name _____ **Student ID.** _____

1.(50 points) Table 1 gives cross-section Data for 1980 on real gross domestic product (RGDP) and aggregate energy consumption (EN) for 20 countries:

Table1: Energy Data for 20 countries

Country	RGDP (in 10^6 1975 U.S.$'s)	EN 10^6 Kilograms Coal Equivalents
Malta	1251	456
Iceland	1331	1124
Cyprus	2003	1211
Ireland	11788	11053
norway	27914	26086
Finland	28388	26405
Portugal	30642	12080
Denmark	34540	27049
Greece	38039	20119
Switzerland	42238	23234
Austria	45451	30633
Sweden	59350	45132
Belgium	62049	58894
Netherlands	82804	84416
Turkey	91946	32619
Spain	159602	88148
Italy	265863	192453
U.K.	279191	268056
France	358675	233907
W. Germany	428888	352677

(a) Enter the data and provide descriptive statistics. Plot the histograms for RGDP and EN. Plot EN versus RGDP.

(b) Estimate the regression:

$$log(En) = \alpha + \beta log(RGDP) + u$$

Be sure to plot the residuals. What do they show?

(c) Test $H_0 : \beta = 1$

(d) One of your Energy data observations has a misplaced decimal. Multiply it by 1000. Now repeat parts (a), (b) and (c).

(e) Was there any reason for ordering the data from the lowest to highest energy consumption? Explain.

Lesson Learned: Always plot the residuals. Always check your data very carefully.

2.(80 points) Using the Energy Data given in Table 1, corrected as in problem 1 part (d), is it legitimate to reverse the form of the equation?

$$log(RGDP) = \gamma + \delta log(En) + \varepsilon$$

(a) Economically, does this change the interpretation of the equation? Explain.

(b) Estimate this equation and compare R^2 of this equation with that of the previous problem. Also, check if $\hat{\delta} = \frac{1}{\hat{\beta}}$. Why are they different?

(c) Statistically, by reversing the equation, which assumptions do we violate?

(d) Show that $\hat{\delta}\hat{\beta} = R^2$

(e) Effects of changing units in which variables are measured. Suppose you measured energy in BTU's instead of kilograms of coal equivalents so that the original series was multiplied by 60. How does it change α and β in the following equations?

$$log(En) = \alpha + \beta log(RGDP) + u$$

$$En = \alpha^* + \beta^* RGDP + v$$

Can you explain why $\hat{\alpha}$ changed, but not $\hat{\beta}$ for the log-log model, whereas both $\hat{\alpha}^*$and $\hat{\beta}^*$ changed for the linear model?

(f) For the log-log specification and the linear specification, compare the GDP elasticity for Malta and W. Germany. Are both equally plausible?

(g) Plot the residuals from both linear and log-log models. What do you observe?

(h) Can you compare the R^2 and standard errors from both models in part (g)?