Assignment #3

These problems are from Baltagi's book titled Econometrics (Springer-Verlag).

The data sets can be downloaded from

WWW. Springer.de/economics/samsup/

1. 16. You are given the following cross-section Data for 1980 on real gross domestic product (RGDP) and aggregate energy consumption (EN) 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	352.677

Note that this data in the Web is 352677.

a. Enter the data and estimate the regression: $\log(En) = \alpha + \beta \log(RGDP) + u$.

b. Be sure and get plots of residuals: What do they show?

d. One of your Energy data observations has a misplaced decimal. Multiply it by 1000.

e. Now repeat parts a, b and c.

f. 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. 17. Using the Energy Data given in the previous problem, corrected as in problem 16 part (d), is it legitimate to reverse the form of the equation?

$\log(RDGP) = \gamma + \delta \log(En) + \epsilon$

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 $\hat{\delta} = 1/\hat{\beta}$. 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?

$\log(En) = \alpha + \beta \log(RDGP) + u$ $\qquad\qquad En = \alpha^* + \beta^* RGDP + v$

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)? **Hint:** Retrieve $\log(En)$ and $\widehat{\log(En)}$ in the log-log equation, exponentiate, then compute the residuals and s. These are comparable to those obtained from the linear model.

3. Use the energy data to estimate the following regressions

$$En = \alpha + \beta \, RGDP + u \quad \cdots (1)$$

and $$En^* = \beta \, RGDP^* + u^* \quad \cdots (2)$$

where $En^* = En - \overline{En}$, $RGDP^* = RGDP - \overline{RGDP}$, $u^* = u - \bar{u}$.

(a) Show that the estimated values of β in (1) and (2) are identical.

(b) R^2_s from (1) and (2) are the same. Why??

4. Reestimate the model without the intercept, i.e.,

$$En = \beta \, RGDP + u \quad \cdots (3)$$

(a) Show that the OLS estimate of β from (3) is different from the one in (1) or (2).

(b) Can you compare R^2_s from (3) and (1)? Explain.

5. (a) Use the cigarette data (Web site: www.springer.de/economics/Samsup/) to estimate the following model

$$\ln C = \beta_1 + \beta_2 \ln P + \beta_3 \ln Y + u$$

(b) Reestimate the model with the restriction $\beta_2 + \beta_3 = -1$.

Compare R^2s from (3a) and (3b).

(c) Test (i) $\beta_3 = 0$

(ii) $\beta_2 + \beta_3 = -1$.

(iii) $\beta_3 = 0$ and $\beta_2 = -1$

(d) Construct 95% confidence intervals for β_3 and $\beta_2 + \beta_3$.

6. Use the cigarette data.

(a) Add 10 to $\ln P$ and -3 to $\ln Y$ and reestimate the model in (3a).

(i) Compare the estimated coefficients in (3a) and (4a).

(ii) Compare R^2s in (3a) and (4a).

(b) Multiply $\ln P$ by 2 and divide $\ln Y$ by 3 and reestimate (3a).

(i) Compare the estimated parameters in (3a) and (4b).

(ii) Compare R^2s in (3a) and (4b).