AFG-EXC1(NEUMATICOS)

Data file **g-Neumaticos** (AFG CDRom Data[1]) contains data on Pneumatic Tyre Production (P), Exports (E), Imports (I) and Apparent Consumption (C) in Spain for the period 1983–2001, together with data on World Consumption of Natural Rubber (N) and Synthetic Rubber (S).

Part A: In order to analyse the behaviour of the Spanish tyre market we suggest the following model:

$$P_t = \alpha + \beta C_t + u_t, \quad u_t \overset{iid}{\sim} N(0, \sigma_u^2) \tag{1}$$

(1) Give an interpretation of the model parameters.
(2) Plot the data points in a P-C graph.
(3) Obtain the normal equations for the OLS method.
(4) Estimate model (1) by the OLS method.
(5) Plot the SRF in the same P-C graph as in item 1. Does it cross the point of means?
(6) Obtain the residuals and show that $\sum \hat{u}_i = 0$ and $\sum \hat{u}_i C_i = 0$.

Part B: Later on we extend our model as follows:

$$P_t = \beta_0 + \beta_1 C_t + \beta_2 I_t + u_t \qquad t = 1996, \dots, 2000, \quad u_t \overset{iid}{\sim} N(0, \sigma_u^2) \tag{2}$$

Given the available data:

(1) Estimate model (2) by the OLS method.
(2) Give an interpretation of the estimated coefficients.
(3) Calculate the coefficient of determination. Give an interpretation of its value.
(4) Provided that I is a relevant explanatory variables, what do you think of the properties of the estimator used in Part A?
(5) Estimate the variance-covariance matrix of the model estimator.
(6) Estimate the model subject to the restriction that $\beta_1 = 1$.
(7) Provided that the population regression function is given by

$$E(P_t) = 95000 + 1 \times C_t - 1 \times I_t, \tag{3}$$

is the previous estimator unbiased?
(8) Between this restricted estimation and the one obtained above for model (2), which one would you choose? Justify your answer.
(9) Finally, you decide to report the results in terms of 1000 of units (instead of as a per unit basis). Do you need to reestimate the models? Discuss (see `scale-origin.xls` Excel file in the *IEcnmtx webpage* `http://blpa00.bl.ehu.es/~jf/teaching/iecntx.htm`).

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[1]**AFG:** Alonso Fernández Gallastegui, 2005, Econometría, Pearson Educación.