

Due in class Tuesday, September 8

This assignment is worth up to 15 extra credit points if turned in during class on **Tuesday, September 8**. Its purpose is to acquaint the student with basic computer methods used in econometric analysis. The necessary data are contained in any one of the following: the STATA file 'e418XCreditData.dta', the Excel file 'e418XCreditData.xls', and the text file 'e418XCreditData.txt' available at <http://u.arizona.edu/~rlo>. Be sure to attach the supporting computer print out to the completed assignment and make clear where your answers are shown..

The data for this exercise pertain to the supply of Australian wine over a twenty year period where  $Q$  is real per capita consumption of wine,  $P$  is the price of wine in real terms, and  $C$  is an index of storage costs

1. Consider the simple regression model given by  $Q_t = \beta_0 + \beta_1 P_t + u_t$ ,  $t = 1, \dots, 20$  where  $u_t$  is an unobserved error term.
  - a. Estimate the parameters  $\beta_0$  and  $\beta_1$  by the standard regression method (ordinary least squares). Denote your estimates by  $\hat{\beta}_0$  and  $\hat{\beta}_1$  and identify their values.
  - b. Use the computer to solve for the estimated residuals  $\hat{u}_t$ , where  $\hat{u}_t = Q_t - \hat{\beta}_0 - \hat{\beta}_1 P_t$ . You might give the estimated residuals the name *uhat1*.
  - c. Verify that the sample mean of the  $\hat{u}_t$ 's is 0, i.e.,  $\sum_{t=1}^{20} \text{uhat1}_t = \sum_{t=1}^{20} \hat{u}_t = 0$ .
  - d. Construct a new variable obtained by multiplying the variable  $\hat{u}_t$  by the variable  $P_t$ , i.e. let  $M_t = \hat{u}_t \cdot P_t$ .
  - e. Verify that the mean of the new variable  $M$  is 0, i.e.  $\sum_{t=1}^{20} M_t = \sum_{t=1}^{20} \hat{u}_t \cdot P_t = 0$ .
2. Consider the multiple regression model given by  $Q_t = \beta_0 + \beta_1 P_t + \beta_2 C_t + u_t$ ,  $t = 1, \dots, 20$ 
  - a. Estimate the parameters  $\beta_0$ ,  $\beta_1$ , and  $\beta_2$  by the standard regression method (ordinary least squares). Denote your estimates by  $\hat{\beta}_0$ ,  $\hat{\beta}_1$  and  $\hat{\beta}_2$  and identify their values.
  - b. Use the computer to solve for the estimated residuals  $\hat{u}_t$ , where  $\hat{u}_t = Q_t - \hat{\beta}_0 - \hat{\beta}_1 P_t - \hat{\beta}_2 C_t$ . You might give the estimated residuals the name *uhat2*.
  - c. Verify that the sample mean of the  $\hat{u}_t$ 's is 0, i.e.,  $\sum_{t=1}^{20} \text{uhat2}_t = \sum_{t=1}^{20} \hat{u}_t = 0$ .
  - d. Construct two new variables obtained by multiplying the variable  $\hat{u}_t$  by the variable  $P_t$ , and by the variable  $C_t$ , i.e. let  $M1_t = \hat{u}_t \cdot P_t$  and  $M2_t = \hat{u}_t \cdot C_t$ .

- e. Verify that the means of the new variables  $M1$  and  $M2$  are 0, i.e.  
 $\sum_{t=1}^{20} M1_t = \sum_{t=1}^{20} \hat{u}_t \cdot P_t = 0$  and  $\sum_{t=1}^{20} M2_t = \sum_{t=1}^{20} \hat{u}_t \cdot C_t = 0$ .

### 3. Functional Forms

- a. Generate three new variables formed by taking the natural logarithms of  $Q_t$ ,  $P_t$  and  $C_t$ , i.e. let  $LQ_t = \ln(Q_t)$ ,  $LP_t = \ln(P_t)$ , and  $LC_t = \ln(C_t)$ .
- b. Generate a new variable formed by taking the reciprocal of  $P_t$ , i.e. let  $RP_t = \frac{1}{P_t}$ .
- c. Consider the double-log model  $\ln(Q_t) = \gamma_0 + \gamma_1 \ln(P_t) + \gamma_2 \ln(C_t) + u_t$ ,  $t = 1, \dots, 20$ . Estimate the parameters  $\gamma_0$ ,  $\gamma_1$ , and  $\gamma_2$  by the standard regression method (ordinary least squares). Identify the values of the estimates  $\hat{\gamma}_0$ ,  $\hat{\gamma}_1$ , and  $\hat{\gamma}_2$ .
- d. Consider the semi-log model  $\ln(Q_t) = \alpha_0 + \alpha_1 P_t + \alpha_2 C_t + u_t$ ,  $t = 1, \dots, 20$ . Estimate the parameters  $\alpha_0$ ,  $\alpha_1$ , and  $\alpha_2$  by the standard regression method (ordinary least squares). Identify the values of the estimates  $\hat{\alpha}_0$ ,  $\hat{\alpha}_1$ , and  $\hat{\alpha}_2$ .
- e. Consider the reciprocal model  $Q_t = \delta_0 + \delta_1 \left( \frac{1}{P_t} \right) + \delta_2 C_t + u_t$ ,  $t = 1, \dots, 20$ . Estimate the parameters  $\delta_0$ ,  $\delta_1$ , and  $\delta_2$  by the standard regression method (ordinary least squares). Identify the values of the estimates  $\hat{\delta}_0$ ,  $\hat{\delta}_1$ , and  $\hat{\delta}_2$ .