

Homework

Econometrics

October 14, 2003

1 General Instructions

The purpose of these exercises is to help you become more comfortable with the tools of econometrics. To accomplish this, you are to write IML programs to obtain the results for the problems found below. Doing these exercises will contribute to your matrix algebra, computing, and overall econometric skills. The data for these exercises can be found in William Greene's *Econometric Analysis*, at the web site:

<http://pages.stern.nyu.edu/~wgreene/Text/econometricanalysis.htm>,

or at my website.

Most of these exercises can be found in Greene's book which also includes the numerical results for some of the problems found below. Feel free to use the book to provide check figures for key results. An additional source of check figures is the use of the canned SAS procedures AUTOREG and MODEL.

You may turn in your answers in the form of annotated notes made on your SAS output. Otherwise, make sure your results and answers are easy to identify and supported by relevant IML programs and SAS output. In order to obtain credit for the exercises you must turn in both the IML programs and output. Each of the hypothesis tests need to be carried out fully, meaning that you should state the null and alternative hypotheses, the distribution of your test statistic under the null hypothesis, your decision criterion, and your decision. Unless otherwise stated, conduct all hypothesis tests at the 5% level.

Problem 1

Data on gasoline consumption in the United States from years 1960-1995 appear in Table F2.2 of *Econometric Analysis*. The variables are:

- G = total gasoline consumption
- P_g = the price of gasoline
- Y = per capita disposable income
- P_{nc} = price index of new cars
- P_{uc} = price index of use cars
- P_{pt} = price index of public transportation
- P_d = price index of durable goods
- P_n = aggregate price index of nondurable goods
- P_s = aggregate price index of consumer services

$$\ln G = \beta_1 + \beta_{P_g} \ln P_g + \beta_Y \ln Y + \beta_{nc} \ln P_{nc} + \beta_{uc} \ln P_{uc} + \beta_{pt} \ln P_{pt} + \beta_d \ln P_d + \beta_n \ln P_n + \beta_s \ln P_s + e \quad (1)$$

Using the data provided on the website, use IML and SAS to answer the following.

1. Estimate the model using least squares. Compute and report coefficient estimates, their standard errors, t-ratios, and their p-values.
2. Compute R^2 .
3. Perform the overall F-test for regression significance.
4. Report your estimate of the scale parameter, σ^2 .

Problem 2

Using the same model and data do the following:

1. Test the following hypotheses at the 5% level using a Wald test (i.e., equation (6.6)):
 - (a) $\beta_{pg} = 0$ and $\beta_Y = 1$. Own price elasticity of demand is one and the income elasticity is zero.
 - (b) $\beta_{nc} = \beta_{uc}$ and $\beta_Y = 1$.
 - (c) $\beta_{nc} = \beta_{uc}$, $\beta_n = \beta_d$, and $\beta_Y = 1$.
2. Find the p-values associated with the Wald tests.
3. Find the 3 sets of restricted estimates using the RLS estimator

$$b^* = b + (X'X)^{-1}R'[R(X'X)^{-1}R']^{-1}(r - Rb) \quad (2)$$

as discussed in class. Compute and report standard errors, t-ratios, and p-values.

4. Repeat the tests using the other forms of the statistics λ_2 and λ_3 discussed in class.
5. Find the restricted estimates and repeat the hypothesis tests using the RESTRICT and TEST statements in SAS's PROC AUTOREG.

Important Note: Whenever you do a hypothesis test, be sure to state the null and alternative hypotheses, the distribution of your test statistic under the null hypothesis, your decision criterion, and your decision.

References

- [1]William H. Greene. *Econometric Analysis*. Prentice-Hall, 5th edition, 2003.
- [2]J. Longley. An appraisal of least squares programs from the point of the user. *The Journal of the American Statistical Association*, 62:819–841, 1967.