Problem Set 2
Due Thursday January 23

This problem set asks you to replicate and extend the analysis by Hayashi and Nerlove of cost functions for electricity generation. Note that data sets for Hayashi's text can be downloaded from

http://fhayashi.fc2web.com/datasets.htm

The data set for this problem can be obtained in either ASCII format

http://fhayashi.fc2web.com/hayashi%20econometrics/ch1/NERLOVE.ASC

or Excel spreadsheet

http://fhayashi.fc2web.com/hayashi%20econometrics/ch1/nerlove.xls

This text file has data on 145 electric utility companies in 1955 for the following:
Column 1: total costs (call it *TC*) in millions of dollars
Column 2: output (*Q*) in billions of kilowatt hours
Column 3: price of labor (*PL*)
Column 4: price of fuels (*PF*)
Column 5: price of capital (*PK*)

Note that Columns 4 and 5 are in reverse order to that reported in equation (1.7.7) in Hayashi's text– in equation (1.7.7), the price of capital p_{i2} is the next-to-last variable and the price of fuel p_{i3} is the last variable, whereas in the database, the price of fuel is the next-to-last variable and the price of capital is the last variable. You can analyze this data set using any software package you like. You should hand in a copy of your computer output along with a brief write-up of your calculations and answers to the following specific questions. This problem set includes instructions for carrying out some of the steps on STATA, since that is up in the lab.

STATA wants to input data in csv format (comma separated values), which you can create by opening nerlove.xls with a spreadsheet program such as Excel and saving as csv type.

After opening STATA, you can make sure you have a new session by typing the command

```
clear
```

If the directory you're using for your anlysis has the address c:\mydocs\probset2 you can migrate to that directory using the command

```
cd "c:\mydocs\prob2"
```

We'll next read the data into the format of a STATA data file (*.dta file) which we'll call "nerlove.dta" using the STATA "insheet" command. We can create a log that records what we did (call it "convert.log") using the "log using" command, like this:

```
log using convert.log,replace
insheet using nerlove.csv
save nerlove.dta
log close
```

You can then set up a new log (call it "nerlove.log") of your regression results, which could look something like this:

```
clear
use nerlove.dta
log nerlove.log, replace
gen ltc = ln(tc)
reg lq lpl ltc
⋮
log close
```

The "gen" command calculates the natural log of the variable tc and gives it the name ltc, while the following line performs an OLS regression of lq on a constant, lpl, and ltc. Other STATA commands you might find helpful for completing this exercise are "test", "constraint", and "cnsreg". You can find out how to use these by typing a command like "help reg"

1.) Replicate the estimate of the unrestricted model in equations (1.7.4) and (1.7.7) of Hayashi's text.

2.) Suppose that you wanted to test the null hypothesis that the coefficient on the price of fuel is really 0.4. Calculate the test statistic for this hypothesis and its *p*-value three different ways, and summarize in each case whether you would reject or fail to reject the hypothesis.

i.) a *t*-test of the null hypothesis that $\beta_F = 0.4$.

ii.) Formulate an *F* test using equation (1.4.9). What are **R** and **r**?

iii.) Re-estimate the regression imposing the restriction and use formula (1.4.11).

3.) Suppose next that you wanted to test the null hypothesis of homogeneity ($\beta_3 + \beta_4 + \beta_5 = 1$). Again test this restriction two ways, using formulas (1.4.9) and (1.4.11).