ARE 212 - Problem Set 3

Due Wednesday, March 28^{th}ish

Wage Regressions - Blackburn and Neumark (*QJE 1992*)

The goal of this problem set is to explore some tests for heteroskedasticity and explore the fixes discussed in class. The paper is available on Jstor. The data can be downloaded from bspace.

1. Read the data into R. Plot the series and make sure your data are read in correctly.

2. Let us explore the issue of heteroskedasticity a bit. We would like to estimate the model:

$$\log(wage) = \beta_o + exper \cdot \beta_1 + tenure \cdot \beta_2 + married \cdot \beta_3 + south \cdot \beta_4 + urban \cdot \beta_5 + black \cdot \beta_6 + educ \cdot \beta_7 + \varepsilon \quad (1)$$

   (a) Estimate the model above via least squares.

   (b) Conduct a White - test for heteroskedastic errors. Use levels, interactions and second order terms only. Do we have a problem?

   (c) Conduct a Goldfeld - Quandt Test for heteroskedastic errors. (Use the tenure variable, leaving out the 235 observations in the middle.) Do we have a problem?

   (d) Conduct a Breusch Pagan Test for heteroskedastic errors. (Use all the covariates as a simple linear combination). Do we have a problem?

   (e) Calculate the White robust standard errors. Comment on how they compare to the traditional OLS standard errors. Is this the right way to go about fixing the potential problem?

   (f) Estimate the model using the two step FGLS estimation procedure outlined in class. (Again in the regression to calculate the weights, use all of the covariates). Talk about the standard errors obtained from your method. And how they compare to the White standard errors.

3. Now let us explore the wonders of the delta method a bit. You are running the following model:

$$\log(wage) = \beta_o + exper \cdot \beta_1 + tenure \cdot \beta_2 + married \cdot \beta_3 + south \cdot \beta_4 + urban \cdot \beta_5 + black \cdot \beta_6 + educ \cdot \beta_7 + \varepsilon \quad (2)$$

   When β_3 is small, $100 \cdot \beta_3$ is the approximate c.p. percentage change in wages between married and unmarried men. When β_3 is large, one would prefer the exact percentage difference in $E[wage|othervariables]$. We will call this θ_1.

   (a) Show that if ε_i is independent of all covariates, then $\theta_1 = 100 \cdot [exp(\beta_3) - 1]$, where β_3 is the OLS coefficient from the OLS equation above. A consistent estimator of θ_1 is $\hat{\theta}_1 = 100 \cdot [exp(\hat{\beta}_3) - 1]$, where $\hat{\beta}_3$ is the estimated OLS coefficient.

   (b) Use the delta method to show that the asymptotic standard error of $\hat{\theta}_1$ is $100 \cdot [exp(\hat{\beta}_3)] \cdot se(\hat{\beta}_3)$

   (c) Using the estimation results, calculate $\hat{\theta}_1$ and its standard error.