Problem Set 3

Simple Regression

INTRODUCTORY ECONOMETRICS, UCM3

1. (Exercise 2.7, Wooldridge (2006)). Consider the savings function

$$sav = \beta_0 + \beta_1 inc + u \, , \; u = \sqrt{inc} \cdot e$$

where e is a random variable with $E(e) = 0$ and $Var(e) = \sigma_e^2$. Assume that e is independent of inc.

a)   Show that $E(u|inc) = 0$, so that the key zero conditional mean assumption (Assumption SLR.3) is satisfied. [*Hint:* If e is independent of inc, then $E(e|inc) = E(e)$.]

b)   Show that $Var(u|inc) = \sigma_e^2 inc$, so that the homoskedasticity Assumption SLR.5 is violated. In particular, the variance of *sav* increases with *inc*. [*Hint:* $Var(e|inc) = Var(e)$, if e and *inc* are independent.]

c)   Provide a discussion that supports the assumption that the variance of savings increases with family income.

2. (Exercise 2.12, Wooldridge (2006)). Use the data in SLEEP75.RAW from Biddle and Hamermesh (1990) to study whether there is a tradeoff between the time spent sleeping per week and the time spent in paid work. We could use either variable as the dependent variable. For concreteness, estimate the model

$$sleep = \beta_0 + \beta_1 totwrk + u$$

where *sleep* is minutes spent sleeping at night per week and *totwrk* is total minutes worked during the week.

a)   Report your results in equation form along with the number of observations and R^2. What does the intercept in this equation mean?

b)   If *totwrk* increases by 2 hours, by how much is *sleep* estimated to fall? Do you find this to be a large effect?

3. (Exercise 3.13, Wooldridge (2006)). Use the data in WAGE2.RAW to estimate a simple regression explaining monthly salary (*wage*) in terms of IQ score (*IQ*).

(i)   Find the average salary and average IQ in the sample. What is the standard deviation of IQ? (IQ scores are standardized so that the average in the population is 100 with a standard deviation equal to 15.)

(ii) Estimate a simple regression model where a one-point increase in *IQ* changes *wage* by a constant dollar amount. Use this model to find the predicted increase in wage for an increase in *IQ* of 15 points. Does *IQ* explain most of the variation in *wage*?

(iii) Now estimate a model where each one-point increase in *IQ* has the same percentage effect on *wage*. If *IQ* increases by 15 points, what is the approximate percentage increase in predicted *wage*?