Exercise Session - Problem Set 4

Simple Regression and Multiple Regression I

Problem 1

Consider the following simple regression model of hourly wage determination

$$wage = \beta_0 + \beta_1 \cdot female + u$$

and let female = 1 when the person is female, and female = 0, when the person is male. Assume that after OLS estimation you obtain positive $\hat{\beta}_0$ and negative $\hat{\beta}_1$.

Does the intercept coefficient have a meaningful interpretation here? Explain. How would you interpret the OLS slope estimate?

Problem 2

Consider the following regression models:

- (a) $Y_i = \beta_1 + \beta_2 \cdot X_i + \beta_3 \cdot X_i^2 + u_i$
- (b) $lnY_i = \beta_1 + \beta_2 \cdot lnX_i + u_i$
- (c) $lnY_i = \beta_1 + \beta_2 \cdot X_i + u_i$

(d)
$$Y_i = e^{\beta_1 + \beta_2 \cdot X_i} \cdot e^{u_i}$$

(e)
$$Y_i = e^{\beta_1} \cdot X_i^{\beta_2} \cdot u_i$$

- (f) $Y_i = \frac{1}{\beta_1 + \beta_2 \cdot X_i + u_i}$
- (g) $Y_i = \beta_1 + \beta_2 \cdot X_{i1} + \beta_3 \cdot X_{i1} \cdot X_{i2} + u_i$
- (h) $Y_i = \beta_1 + \beta_2^2 \cdot X_i + u_i$

Which of these regression models are linear in parameters? Which models may be transformed into a linear regression model using a suitable transformation? Also give the partial effects for the models a), b), c) and g).

Problem 3 (Wooldridge, Problem 3.2, page 104)

The following equation was estimated via OLS,

$$e\hat{duc} = 10.36 - 0.094 \cdot sibs + 0.131 \cdot meduc + 0.210 \cdot feduc$$

$$n = 722, R^2 = 0.214$$

where *educ* is years of schooling, *sibs* is number of siblings, *meduc* is mother's years of schooling, and *feduc* is father's years of schooling.

- (a) Does *sibs* have the expected effect? Explain. Holding *meduc* and *feduc* fixed, by how much does *sibs* have to increase to reduce predicted years of education by one year? (A noninteger answer is acceptable here.)
- (b) Discuss the interpretation of the coefficient on *meduc*.
- (c) Suppose that Man A has no siblings, and his mother and father each have 12 years of education. Man B has no siblings, and his mother and father each have 16 years of education. What is the predicted difference in years of education between B and A?