

# WESS ECONOMETRICS

## Exercise Sheet 2

We will continue to use the data file *qlfs14q1.dta* which we looked at in Exercise Sheet 1 and will be adding to the Stata Do file which you created in Exercise Sheet 2. So open up Stata and load the DO file which you created last week, to which we are now going to add some additional instructions.

1. Calculate the correlation between *HOURPAY* and *EDAGE*,  $\rho(EDAGE, HOURPAY)$ .

Now run a regression of

$$HOURPAY_i = \alpha + \beta EDAGE_i + \varepsilon_i. \quad (1)$$

- (a) What is the interpretation of the coefficient on the *EDAGE* variable?
  - (b) Test the hypothesis  $\beta = 0$ .
  - (c) What is the TSS of the model
  - (d) What is the p-value of the test undertaken in (b)
  - (e) Construct a 90% confidence interval for the coefficient on  $\beta$ .
  - (f) What is the error variance for this model?
  - (g) What is the relationship between the  $R^2$  from equation (1) and  $\rho(EDAGE, HOURPAY)$ ?
  - (h) Calculate the implied semi-elasticity of *earnings* with respect to *EDAGE*, i.e.  $\frac{\partial(HOURPAY) / HOURPAY}{\partial EDAGE}$ , when  $HOURPAY = \overline{HOURPAY}$ ?
  - (i) Use the Test options in Stata to test the null hypotheses that the coefficient on *EDAGE* is 0.25 at the 5% significance level. What is the p-value of this test?
  - (j) Given the true value of  $\beta = 0.20$ , calculate the power of the test in (i).
2. Run a regression of

$$\ln(HOURPAY_i) = \alpha + \beta EDAGE_i + \varepsilon_i. \quad (2)$$

- (a) What is the interpretation of the coefficient on the *EDAGE* variable in (2)?
- (b) What is the semi-elasticity of *HOURPAY* with respect to *EDAGE*?
- (c) Why has the TSS changed compared to that in 1(c)?
- (d) Test the hypothesis  $\beta = 0$ .

3. Run a regression of

$$\ln(HOURPAY_i) = \alpha + \beta_1 EDAGE_i + \beta_2 AGE + \beta_3 [AGE]^2 + \varepsilon_i \quad (3)$$

- (a) What are the degrees of freedom of the error term?
- (b) Why has the TSS not changed from that reported in 2(c)?
- (c) What is the interpretation of the coefficient on *EDAGE* variable in (3)?
- (d) Calculate the semi-elasticity of earnings with respect to *AGE* and draw this relationship in stata. Does this relationship make economic sense?
- (e) Test the hypothesis  $H_0 : \beta_1 = \beta_2 = \beta_3 = 0$ , what is the p-value of this test?
- (f) Test the hypothesis  $H_0 : \beta_2 = \beta_3 = 0$ .
- (g) Test the hypothesis that the semi-elasticity of *HOURPAY* to *AGE* is 0.0, when *AGE* is 48 years.
- (h) Test the hypothesis  $H_0 : \beta_1 = 0.07, \beta_2 = -100\beta_3$
- (i) Estimate the model which has explicitly imposed the restrictions in (f) and test the restrictions in (h) by comparing the RSS from the restricted and unrestricted models.

4. Run a regression of

$$\ln(HOURPAY_i) = \alpha + \beta_1 EDAGE_i + \beta_2 AGE + \beta_3 [AGE]^2 + \beta_4 F + \varepsilon_i \quad (3)$$

Where  $F=1$  if *SEX*=female and 0 if *SEX*=male.

- (a) What is the interpretation of the coefficient on *F* variable in (3)?
- (b) Test the hypothesis  $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ ?