University of California, Santa Barbara **Olivier Deschenes**
Department of Economics **Winter 2018**

ESM 296
Individual Assignment 2

Due in class 02/14/18

The questions below are from Stock and Watson and from Wooldridge

Question 1 (8 points):

Earnings functions attempt to find the determinants of earnings, using both continuous and binary variables. One of the central questions analyzed in this relationship is the returns to education.

(a) Collecting data from 253 individuals, you estimate the following relationship

$$\widehat{\ln(Earn)} = \underset{}{0.54} + \underset{(0.14)}{0.083} \times Educ, \quad R^2 = 0.20 \quad \underset{(0.011)}{}$$

where *Earn* is average hourly earnings and *Educ* is years of education. What is the effect of an additional year of schooling on hourly earnings?

(b) In Labor Economics, we teach a model of human capital investments where there are returns to on-the-job training. To approximate on-the-job training, researchers often use a potential experience variable, which is defined as *Exper* = *Age* – *Educ* – 6.

You incorporate the potential experience variable into your original regression

$$\widehat{\ln(Earn)} = \underset{(0.16)}{-0.01} + \underset{(0.012)}{0.101} \times Educ + \underset{(0.006)}{0.033} \times Exper - \underset{(0.0001)}{0.0005} \times Exper^2 ,$$

$$R^2 = 0.34$$

(b) Test for the statistical significance of each of the coefficients. Why has the coefficient on education changed little compared to (a)?

(c) You want to find the effect of introducing two variables, gender and marital status. Accordingly you specify a binary variable that takes on the value of one for females and is zero otherwise (*Female*), and another binary variable that is one if the worker is married but is zero otherwise (*Married*). Adding these variables to the regressors results in:

$$\widehat{\ln(Earn)} = 0.21 + 0.093 \times Educ + 0.032 \times Exper - 0.0005 \times Exper^2$$

(0.16) (0.012) (0.006) (0.0001)

$- 0.289 \times Female + 0.062\ Married,$
(0.049) (0.056)

$R^2 = 0.43$

Are the coefficients of the two added binary variables individually statistically significant? In percentage terms, how much less do females earn per hour, controlling for education and experience? How much more do married people make? What is the percentage difference in earnings between a single male and a married female? What is the marriage differential between males and females?

(d) In your final specification, you allow for the binary variables to interact. The results are as follows:

$\ln(\hat{E}arn) = 0.14 + 0.093 \times Educ + 0.032 \times Exper - 0.0005 \times Exper^2$
(0.16) (0.011) (0.006) (0.001)

$- 0.158 \times Female + 0.173 \times Married - 0.218 \times (Female \times Married),$
(0.075) (0.080) (0.097)

$R^2 = 0.44$

Repeat the exercise in (c) of calculating the various percentage differences between gender and marital status.

Question 2 (8 points):

The question below requires the STATA data file "GPA2.dta" is available on the class website. The same file also available in spreadsheet format "GPA2.csv". Now consider the following regression model:

$$COLLGPA = \beta_0 + \beta_1 hsize + \beta_2 hsize^2 + \beta_3 hsperc + \beta_4 sat + \beta_5\ female + \beta_6 athlete + u$$

Where *COLLGPA* is cumulative college grade point average, *hsize* is size of high school graduating class (in hundreds), hsperc is academic percentile in graduating class, *sat* is combined SAT score, *female* is a binary gender variable, and *athlete* is a binary variable equal to one for student-athletes.

(a) Estimate the parameters of the regression model above by OLS. What is the estimated GPA differential between athletes and non-athletes?

(b) Drop sat from the model and re-estimate the parameters of the regression model. What is the estimated GPA differential between athletes and non-athletes? Explain why the estimate is different than the one in (a).

(c) Including the *sat* variable, re-estimate the model while allowing the effect of being an athlete to differ for males and females and test the null hypothesis that there is no difference in the GPA of female athletes and non-athletes. What about male athletes and non-athletes?