

## Econometrics A

### Problem Set #6

Date Due: Tuesday, June 2

1. Stock and Watson, Exercises 9.5, 12.3, 12.4, 12.8, 12.9, 12.10, E12.1
2. Consider fertility among women in Botswana during 1988
  - (a) Consider the model

$$\text{children} = \beta_0 + \beta_1 \text{educ} + \beta_2 \text{age} + \beta_3 \text{age}^2 + U ,$$

where

$$\begin{aligned} \text{children} &= \text{number of children} \\ \text{educ} &= \text{years of education} \\ \text{age} &= \text{age measured in years} . \end{aligned}$$

The researcher estimates this model using OLS using 4,361 observations and finds that

$$\begin{aligned} \hat{\beta}_0 &= -4.1, & \text{s.e.}(\hat{\beta}_0) &= 0.24 \\ \hat{\beta}_1 &= -0.09, & \text{s.e.}(\hat{\beta}_1) &= 0.006 \\ \hat{\beta}_2 &= 0.3, & \text{s.e.}(\hat{\beta}_2) &= 0.02 \\ \hat{\beta}_3 &= -0.003, & \text{s.e.}(\hat{\beta}_3) &= 0.003 . \end{aligned}$$

The  $R^2$  for the regression is .57.

- i. How would you interpret  $U$ ? Is it reasonable to assume that  $U$  is normally distributed? Why or why not?
  - ii. Holding age fixed, what is the estimated effect of another year of education on fertility? If 100 women receive another year of education, how many fewer children are they expected to have?
  - iii. Holding education fixed, what is the estimated effect on children of being older? Discuss the sign of  $\hat{\beta}_3$ .
- (b) Download the dataset for this problem from the TA's webpage. `Frsthalf` is a dummy variable equal to one if the woman was born during the first six months of the year. Assuming `Frsthalf` is uncorrelated with the error term from part (a), show that `Frsthalf` is a reasonable candidate instrument for `educ`. (Hint: You need to do a regression.)

- (c) Estimate the model from part (a) by using `Frsthalf` as an instrument for education. Compare the estimated effect of education with the OLS estimate from part (a).
- (d) Add the binary variables `electric`, `TV`, and `bicycle` to the model and assume they are exogenous. Estimate the equation by OLS and TSLS, and compare the estimated coefficients on `educ`. Interpret the coefficient on `TV` and explain why TV ownership has a negative effect on fertility.