BOSTON COLLEGE
Department of Economics
EC771: Econometrics
Spring 2012
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Problem Set 5: due Monday 30 April 2012 at classtime

1. Using the “canned” dataset grunfeld, which you may access from within Stata with the command
   \texttt{webuse grunfeld}
   
   a. Run the regression
      \[ Invest_{it} = \beta_1 + \beta_2 Mvalue_{it} + \beta_3 Kstock_{it} + u_t \]
      using firm fixed effects and random effects. Perform a Hausman test to determine which estimator is appropriate for this model.
   
   b. Estimate the model via two-way fixed effects.
   
   c. Estimate the original model employing the Seemingly Unrelated Regression estimator (\texttt{help sureg}). You will need to reshape the data into “wide” format. Discuss how this model differs from the fixed effects model estimated in part a. Test for cross-equation equality of the slope coefficients.

2. Use the “canned” dataset pntsprd, which you may access from within Stata with the command
   \texttt{use http://fmwww.bc.edu/ec-p/data/wooldridge/pntsprd}
   You may want to
   \texttt{type http://fmwww.bc.edu/ec-p/data/wooldridge/pntsprd.des}
   
   a. The variable favwin is a binary variable which equals 1 if the team favored by the Las Vegas point spread wins the game. Estimate a linear probability model of favwin on spread. Explain why, if the spread incorporates all relevant information, we expect an intercept of 0.5. Test this hypothesis using robust standard errors. Is spread statistically significant? What is the estimated probability that the favored team wins when spread=10?
   
   b. Estimate a probit model for Pr(favwin = 1|spread). Interpret and test the null hypothesis that the intercept is zero. What is the estimated probability that the favored team wins when spread=10? What is \( \frac{\partial \text{Pr}(\cdot)}{\partial \text{spread}} \) when spread=10?
   
   c. Add the variables favhome, fav25, und25 to the probit model and test their joint significance. Does the spread incorporate all relevant information?
3. Use the “canned” dataset loanapp, which you may access from within Stata with the command

   use http://fmwww.bc.edu/ec-p/data/wooldridge/loanapp

   You may want to
type http://fmwww.bc.edu/ec-p/data/wooldridge/loanapp.des

   a. Estimate a probit model of approve on white. Find the estimated probability of loan approval for both whites and nonwhites. How do these compare with the linear probability model estimates?
   b. Add the variables hrat, obrat, loanprc, unem, male, married, dep, sch, cosign, chist, pubrec, mortlat1, mortlat2, vr to the probit model. Is there statistically significant discrimination against nonwhites?
   c. Estimate this expanded model by logit and compare the coefficient on white to the probit estimate. Use the mfx command to calculate the effects of white on the probability of approval.
   d. Use Tamas Bartus’ margeff (ssc install margeff) on the probit form of the model. Why do the effects differ from those of mfx?

4. Use the “canned” dataset fringe, which you may access from within Stata with the command

   use http://fmwww.bc.edu/ec-p/data/wooldridge/fringe

   You may want to
type http://fmwww.bc.edu/ec-p/data/wooldridge/fringe.des

   a. For what percentage of workers in the sample is pension equal to zero? What is the range of pension for workers with nonzero pension benefits? Why is a Tobit model appropriate for modeling pension?
   b. Estimate a Tobit model explaining pension in terms of exper, age, tenure, educ, depends, married, white, male. Do whites and males have statistically significant higher expected pension benefits?
   c. Use the results from (b) to estimate the difference in expected pension benefits for a white male and a nonwhite female, both of whom are 35 years old, single with no dependents, with 16 years of education and 10 years of work experience. Hint: see mfx.
   d. Add union to the Tobit model and comment on its significance.
5. Use the “canned” dataset `mroz`, which you may access from within Stata with the command
   
   ```
   use http://fmwww.bc.edu/ec-p/data/wooldridge/mroz
   ```

   You may want to
   
   type `http://fmwww.bc.edu/ec-p/data/wooldridge/mroz.des`

   a. Using the 428 women who were in the workforce, estimate the return to education (`educ`) by OLS on `lwage` including `exper`, `expersq` as additional explanatory variables.

   b. Estimate the return to education via two-step Heckit (hint: `help heckman`) where all exogenous variables show up in the second-stage regression, as well as `nwifeinc`, `age`, `kidslt6`, `kidsge6`. Is there evidence of selection bias? What parameter provides you with an indication of selection bias?

   c. Reestimate the model with Heckman’s maximum likelihood approach. Does any of your inference change? What parameter provides you with an indication of selection bias?