TSP Exercise Session - Problem Set 12

Probit and Logit

Preparations

Please create a new folder for this exercise session with your name in directory T:. Then go to L:\Intermediate Econometrics\PC5 and copy the files into your folder.

1) Approval of mortgage loans

(Based on Wooldridge, Computer Exercise C7.8 and C17.2, pages)

Use the data in *approval.xls* taken from the Boston Home Mortgage Disclosure Act (HMDA) data set for this exercise. The binary variable to be explained is approve, which is equal to one if a mortgage loan to an individual was approved. The key explanatory variable is white, a dummy variable equal to one if the applicant was white. The other applicants in the data set are black and Hispanic. To test for discrimination in the mortgage loan market, we will use three kinds of models: a linear probability model, a probit model and a logit model. The relevant variables are:

approve	= 1 if mortgage loan was approved
white	= 1 if applicant white
male	= 1 if applicant male
married	= 1 if applicant married
dep	number of dependents
unem	unemployment rate by industry
vr	= 1 if tract vacancy rate $> MSA$ median
	(MSA = Boston Metropolitan Statistical Area)
mortlat1	one or two late payments
mortlat2	more than two late payments
chist	consumer payments credit history:
	= 0 if accounts delinquent $>=$ 60 days
loanprc	loan-to-price ratio
pubrec	= 1 if filed bankruptcy
cosign	=1 if there is a cosigner
sch	= 1 if > 12 years schooling
hrat	housing exp, % total inc
obrat	other oblgs, % total inc

- (a) If there is discrimination against minorities, and the appropriate factors have been controlled for, what is the sign of the coefficient on *white* going to be in the above-mentioned models?
- (b) Regress *approve* on *white* using a *simple linear regression model*. Interpret the coefficient on *white*. Is it statistically significant? Is it practically large?
- (c) As controls, add the variables *hrat*, *obrat*, *loanprc*, *unem*, *male*, *married*, *dep*, *sch*, *cosign*, *chist*, *pubrec*, *mortlat1*, *mortlat2*, *and vr* to the linear regression model. What happens to the coefficient on *white*? Is there still evidence of discrimination against nonwhites?
- (d) 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 estimates?
- (e) Now, add the variables *hrat, obrat, loanprc, unem, male, married, dep, sch, cosign, chist, pubrec, mortlat1, mortlat2, and vr* to the *probit model*. Is there statistically significant evidence of discrimination against nonwhites?
- (f) Estimate the model from part (e) by *logit*. Compare the coefficient on *white* to the *probit* estimate.
- (g) How would you compare the size of the discrimination effect between probit and logit?

2) Probit model for mothers' labor force participation

Read in the data set LFP.raw into TSP. It contains selected variables of the German Socio-Economic Panel (SOEP) for German mothers for the year 2004. We will study mothers' labor supply: participation and hours worked. The data set contains the following variables in the given order:

ifwork	dummy=1 if mother working
hours	working hours (0 if not working)
manearn	partner's labor earnings
married	dummy=1 if married
kids	number of children

- (a) Estimate the influence of partner's earnings, marriage and the number of children on the probability of working. In order to do so use a probit model with labor force participation as the dependent variable.
- (b) **Marginal effect at the mean for a continuous variable:** What is the marginal effect of partner's earnings on the probability of working for an average individual?
- (c) **Marginal effect at the mean for a dummy variable:** What is the marginal effect of marriage on the probability of working for an average individual?

- (d) **Average marginal effect of a continuous variable:** What is the average marginal effect of partner's earnings on the probability of working?
- (e) **Average marginal effect of a dummy variable:** What is the average marginal effect of marriage on the probability of working? Keep in mind that a dummy variable only takes on values 0 and 1.

3.1) Appendix I: TSP-commands

probit	probit (options) $\mathbf{y} \in x1 \times 2 \times 3$;
logit	logit (options) y c x1 x2 x3 ;
	\rightarrow when estimating a binary logit model, add the option nchoice=2 ,
	otherwise, TSP will run a multinomial logit estimation