

PROBLEM SET V

1. Given the following model:

$$\ln\left[\frac{P(Y_i=1)}{P(Y_i=0)}\right]=X_i\beta$$

- a. Given that the probabilities sum to one, calculate $P(Y_i=0)$ and $P(Y_i=1)$.
 - b. Determine $E(Y_i)$ and the derivative of the expectation with respect to X_i .
 - c. Derive the likelihood and log likelihood functions for this model.
2. This problem uses the fertility data set. The dependent variable is the binary variable “haschildren”. The explanatory variables are age, education, married, rural, and land.
- a. Estimate this model by logit and interpret the effect of the age and education variables.
 - b. Calculate the psuedo R^2 “by hand” and compare it to STATA’s reported number.
 - b. Determine the impact of being married on the probability of having children through the use of simulations.
3. This problem uses the worktrip data set. The dependent variable is transpmode (1=own vehicle, 2 = carpool, 3 = bus, 4 = rail system, 5 = walk or bicycle). The independent variables are age, education, male, married and salary.
- a. Estimate this model by multinomial logit.
 - b. We are very interested in the odds of use the rail system versus the bus. Show an easy way to make this comparison and discuss the significant predictors of this choice.
 - c. All other things being equal (i.e. variables at their actual values), compare the transportation choices of males and females using predicted probabilities.
4. This problem uses the bf_tobit data set. The dependent variable is dfdur (duration of breast feeding in months) and the independent variables are urban, mother’s age (mothage), mother’ years of education (motgrd) and the price of formula.
- a. Estimate the model by OLS and tobit – note the differences in the coefficient estimates.
 - b. Use Cragg’s generalization of the tobit model to perform a test of the tobit model restrictions – explain you test carefully.
 - c. Estimate the model using Heckman’s sample selectivity method (note bfyfes is a zero one outcome for whether or not the woman breast fed at all). Note that you are identifying the model through the use of functional form. Perform a test for sample selectivity.