

Homework 11: Tobit Models

Exercise 1: Comparing Probit and Tobit

Use the data set called `afciopac.dta`. This data set contains contributions of the AFLCIO Political Action Committee to incumbent members of the US House of Representatives in 1992. The variable `TOTCONT` is the total contribution given by the PAC. A great many of these values are ‘censored’ at 0 (or there is a corner solution at 0).

1. Rename some variables: rename `party` `republican`, `totcont` `contribution`, and `fresh` `freshman`.
2. Run a probit model where the dependent variable (`GIVE`) is ‘Did they contribute? 1 Yes, 0 No’. Put the results in column 1 of Table 1.
3. Now run a tobit model where the dependent variable (`CONTRIBUTION`) is the total contribution to incumbents. Put the results in column 2 of Table 1.
4. Rescale the probit coefficients to make them comparable to the tobit coefficients. Put the results in column 3 of Table 1. Now rescale the tobit coefficients to see what the probit’s should be and compare to the actual. Put the results in column 4 of Table 1. Compare the coefficients and standard errors. What do you expect to see and what do you actually see? What can you infer from this? Compare the substantive conclusions that would be reached from the dichotomous outcome rather than the continuous but censored tobit model.

Table 1: Models of PAC Contribution

Tobit Dependent Variable: Contribution Level				
Probit Dependent Variable: Did they contribute? 1 Yes, 0 No				
Regressor	Probit	Tobit	Probit (rescaled)	Tobit (rescaled)
Republican				
Freshman				
Senior				
Vote90				
Distance				
Constant				
σ				
Observations				
Log-Likelihood				
<p style="text-align: center;">* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ (two-tailed) (Standard errors are given in parentheses) 211 observations censored, 136 observations uncensored</p>				

Exercise 2: Comparing OLS and Tobit

1. Run an OLS regression on the full data set (the censored data set) to model PAC contributions with the following independent variables: REPUBLICAN FRESHMAN SENIOR VOTE90 DISTANCE. Put the results in column 1 of Table 2.
2. Now run the same OLS regression on the truncated data set i.e. ignore observations where contributions were 0. Put the results in column 2 of Table 2.
3. Now run a tobit model with the same independent variables as before. Put the results in column 3 of Table 2.
4. How would you interpret the coefficients from the tobit model? Remember that there are three possible expected values. Compare the results from the OLS models and the tobit model. What is the same? What is different?

Table 2: Models of PAC Contribution

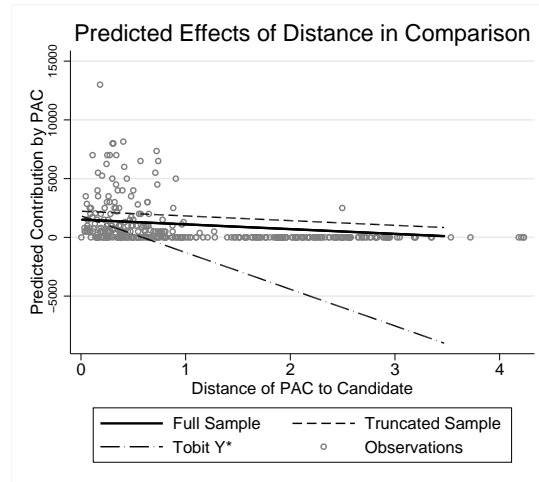
Regressor	OLS (censored)	OLS (truncated)	Tobit
Republican			
Freshman			
Senior			
Vote90			
Distance			
Constant			
σ			
Observations			
Log-Likelihood			

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$ (two-tailed)
(Standard errors are given in parentheses)

211 observations censored, 136 observations uncensored

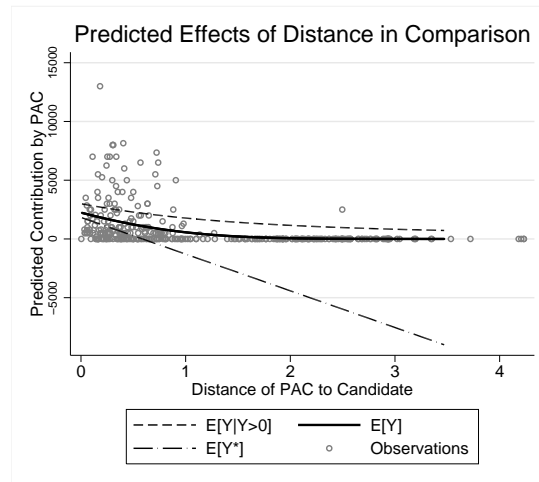
5. We are now going to look at some expected values of PAC contributions from each of these three models. Calculate the expected values for the case where the representative is a democrat, is not a freshman, has mean seniority, and mean voteshare for the 1990 elections. You should plot the expected values for all three models as DISTANCE is allowed to vary from its observed minimum to its observed maximum. The figure that you produce should look like Figure 1. Interpret the figure.

Figure 1: Expected Value of Contribution from OLS (full sample), OLS (truncated) and Tobit (latent)



6. Now we are going to look explicitly at the three expected values that come from the tobit model itself. Calculate and graph $E[Y^*]$, $E[Y|Y > 0]$, and $E[Y]$ for the case where the representative is a democrat, is not a freshman, has mean seniority and mean voteshare for the 1990 elections when the DISTANCE variable is allowed to vary from its observed minimum to its observed maximum. The figure that you produce should look like Figure 2. Interpret the figure.

Figure 2: Expected Values of Contribution from Tobit Model



7. Now we are going to calculate some predicted values and first differences. First, calculate $E[Y^*]$, $E[Y|Y > 0]$, and $E[Y]$ for the case where the representative is a democrat, is not a freshman, has mean seniority, has mean voteshare for the 1990 elections, and has mean distance between PAC and himself. Put the results in the first row of Table 3. Second, calculate $E[Y^*]$, $E[Y|Y > 0]$, and $E[Y]$

for the same case except let the representative be a republican. Put the results in the second row of Table 3. Third, calculate the difference in expected values and put these results in the third row of Table 3. Interpret the results.

Table 3: Expected PAC Contribution

Regressor	$E[y^*]$	$E[y y > 0]$	$E[y]$
Democrat			
Republican			
Difference			

Scenario: Not a freshman, mean Seniority, mean Distance, mean Vote90
(95% Confidence intervals in parentheses)

8. Now calculate the marginal effect of DISTANCE on $E[Y^*]$, $E[Y|Y > 0]$, and $E[Y]$ for the case where the representative is a democrat, is not a freshman, has mean seniority, has mean voteshare for the 1990 elections, and has mean distance between PAC and himself. Put the results in Table 4.

Table 4: Marginal Effect of Distance on PAC Contributions

Regressor	$E[y^*]$	$E[y y > 0]$	$E[y]$
Marginal Effect of Distance			

Scenario: Democrat, Not a freshman, mean Seniority, mean Distance, mean Vote90