Additional Tutorial 7

Logit, Probit, Tobit

Problem 1 (Wooldridge, problem 17.1)

(i) For a binary response $y$, let $\bar{y}$ be the proportion of ones in the sample (which is equal to the sample average of the $y_i$). Let $\hat{q}_0$ be the percent correctly predicted for the outcome $y = 0$ and let $\hat{q}_1$ be the percent correctly predicted for the outcome $y = 1$. If $\hat{p}$ is the overall percent correctly predicted, show that $\hat{p}$ is a weighted average of $\hat{q}_0$ and $\hat{q}_1$:

$$\hat{p} = (1 - \bar{y})\hat{q}_0 + \bar{y}\hat{q}_1$$

(ii) In a sample of 300, suppose that $\bar{y} = .70$, so that there are 210 outcomes with $y_i = 1$ and 90 with $y_i = 0$. Suppose that the percent correctly predicted when $y = 0$ is 80, and the percent correctly predicted when $y = 1$ is 40. Find the overall percent correctly predicted.

Problem 2 (Wooldridge, problem 17.5)

(Requires calculus) Let $patents$ be the number of patents applied for by a firm during a given year. Assume that the conditional expectation of patents given $sales$ and $RD$ is

$$E(patents|sales, RD) = \exp[\beta_0 + \beta_1 \log(sales) + \beta_2 RD + \beta_3 RD^2]$$

where $sales$ is annual firm sales and $RD$ is total spending on research and development over the past 10 years.

(i) How would you estimate the $\beta_j$? Justify your answer by discussing the nature of $patents$.

(ii) How do you interpret $\beta_j$?

(iii) Find the partial effect of $RD$ on $E(patents|sales, RD)$.