

Homework 3:**Question 1:** (5 points)

Suppose that we are interested in estimating the simple regression model $y = \beta_0 + \beta_1 x + u$ and that we have an instrument (a binary variable) z for the possibly endogenous variable x .

Show that the IV estimator of β_1 can be written as $\widehat{\beta}_1 = (\bar{y}_1 - \bar{y}_0) / (\bar{x}_1 - \bar{x}_0)$. The bars show sample averages of the variables. For example, \bar{y}_1 is the sample average of y where $z = 1$ and \bar{y}_0 is the sample average of y where $z = 0$. (This estimator is known as the Wald estimator.)

Question 2: (10 points)

Consider the binary choice model: $E(y|x) = \Pr(y = 1|x) = F(x\beta)$.

I. Suppose the error term has a logistic distribution:

a) $\Pr(y = 1|x) = ?$

b) $\frac{\partial E(y|x)}{\partial x} = ?$

c) Write the likelihood function for a sample of n observations.

d) Write the log-likelihood function for a sample of n observations.

e) Write the first-order conditions for the maximization of the function in part (I.d).

II. Suppose the error term has a standard normal distribution:

a) $\Pr(y = 1|x) = ?$

b) $\frac{\partial E(y|x)}{\partial x} = ?$

c) Write the likelihood function for a sample of n observations.

d) Write the log-likelihood function for a sample of n observations.

e) Write the first-order conditions for the maximization of the function in part (II.d).

Question 3: (5 points)

Suppose you estimated a logit model in Stata and you typed "estat classification".

Let y be a binary response variable. In a sample of 300, suppose that $\bar{y} = 0.70$, 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 $y = 0$ is 40. Find the overall percent correctly predicted. (Hint: Build the matrix that is produced by the command “estat classification”.)

Question 4: (5 points)

In Wooldridge’s textbook, Computer Exercises, 15.15.
Use the dataset “intdef.dta” to do this exercise.

Question 5: (5 points)

In Wooldridge’s textbook, Computer Exercises, 15.16.
Use the dataset “card.dta” to do this exercise.