

ECO475 HW1¹

1. In class we discussed data truncation from below. Now consider the following truncated model from both above and below:

$$Y = \begin{cases} x'\beta + \epsilon, & \text{if } L < Y^* < U \\ \text{Not observed,} & \text{otherwise} \end{cases}$$

where $\epsilon \sim N(0, \sigma^2)$ and (L, U) are observed bounds. Propose a method to consistently estimate β and σ^2 . Please be as detailed as possible.

2. Consider a binary choice model with linear latent index $y_i^* = x_i'\beta + u_i$. Assume that $u_i/\sigma(x_i) \sim F$ for some continuous and strictly increasing distribution function F , where $\sigma(x)$ is a function of x . Assume that $F(0) = 0$.

- (a) Show that $p(x) \equiv \mathbb{P}(y_i = 1 | x_i = x) = F(x'\beta/\sigma(x))$.
- (b) Show that there are infinite number of combinations of (F, σ) that can generate the same choice probability $p(x)$.
- (c) Show that assuming $F = \Phi$ (the standard normal cdf) is not restrictive, that is, for any choice probability, one can find a function $\sigma^*(x)$ such that $p(x) = \Phi(x'\beta/\sigma^*(x))$.
- (d) You already know that assuming $\sigma(x) = 1$ is restrictive. Intuitively discuss the contrast of assuming a specific functional form for F against assuming a specific functional form for σ .

3. Consider the data in `hw1data.dta`. It contains data about whether KFC open a store at 120 locations.

y: 1 if open a new store, 0 if not.

x1: 1 if there is a shopping mall near the location

x2: 1 if there is already a McDonald store near the location

x3: 1 if there is a subway station near the location

x4: log of pedestrian flow at the nearest major intersection (pedestrian flow measured in 10,000)

x5: log-distance to the nearest KFC distribution center (distance measured in 10km)

x6: population residence density of the location (in 10,000)

Answer the following questions.

- (a) Compute probit estimates of a model in which the market entry decision y is the dependent variable and corresponding t-statistics, tabulate and interpret them.
- (b) Compute the average marginal effect of x2 and x5, interpret your result.

¹Due by 11:59pm, Feb 22, 2021. Online submission through Quercus. Submit a PDF file that includes both theoretic derivations and computer codes (or log file).

- (c) Repeat part (a) and (b) using Logit model.
- (d) Let $\hat{\beta}_P$ and $\hat{\beta}_L$ be the probit estimates and logit estimates. Let $\|\beta\|$ be norm of β , that is, the square root of the sum of squares of each element in the vector β . Compare $\hat{\beta}_P/\|\hat{\beta}_P\|$ and $\hat{\beta}_L/\|\hat{\beta}_L\|$. Are they very different?