

Advanced Quantitative Methods in Marketing
Coding Assignment #1: Multinomial Probit

We assume there are $i=1 \dots I$ consumers and $j=0,1,2$ options. Consumer i choosing brand j gets utility

$$u_{ij} = \varepsilon_{ij}.$$

We assume

$$\begin{pmatrix} \varepsilon_{i1} - \varepsilon_{i0} \\ \varepsilon_{i2} - \varepsilon_{i0} \end{pmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, LL'\right)$$

where

$$L = \begin{bmatrix} 1 & 0 \\ \sigma_{21} & \sigma_{22} \end{bmatrix}.$$

(We normalize the upper-left hand element of L because otherwise the model is not identified.)

Utility maximization implies

$$y_{ij} = \begin{cases} j & \text{if } u_{ij} > u_{ik} \text{ for } k \neq j \\ 0 & \text{otherwise} \end{cases}.$$

Using these assumptions,

- 1) download simulated data from either <http://www-rcf.usc.edu/~kwilbur/mkt599/y.mat> (MATLAB format) or <http://www-rcf.usc.edu/~kwilbur/mkt599/y> (ASCII format).
- 2) Construct three vectors, y_{i0} , y_{i1} , and y_{i2} .
- 3) Use simulation so that you can calculate predicted choices \hat{y}_{i0} , \hat{y}_{i1} , and \hat{y}_{i2} given a guess of the parameters σ_{21} and σ_{22} .
- 4) Use the data and your predictions to recover σ_{21} and σ_{22} . Make sure you use a constant set of simulated draws while you optimize over σ_{21} and σ_{22} .