Econ 675 Assignment 6

Nathan Mather

October 14, 2019

Contents

1 Section 1: Binary choice model

1.1 Part 1

Here are the results of my model

Probit results

variable	Estimate	Std. Error
th0	-0.71	0.38
th1	-0.01	0.01
th2	0.10	0.02

1.2 part 2

1.3 part 3

Here are the results of my model

Logit results

variable	Estimate	Std. Error
th0	-1.13	0.61
th1	-0.02	0.01
th2	0.17	0.03

1.4 Part 6

Let

$$m_1 = -\frac{1}{\sigma_w^2}\rho(x_{2i} - (\theta_3 + \theta_4 x_{1i} + \theta_5 z_i))$$

and

$$v_1 = 1 - \frac{\rho^2}{\sigma_w^2}$$

$$L(\theta) = \sum_{i=0}^{n} y_i Log(\Phi_{m_1,v_1}(\theta_0+\theta_1 x_{1i}+\theta_2 x_{2i}))+(1-y_i)log(\Phi_{m_1,v_1}(\theta_0+\theta 1 x_{1i}+\theta_2 x_{2i}))+log(\phi_{0,\sigma_w^2}(x_{2i}-\theta_3-\theta_4 x_{1i}-\theta_5 z_i))$$

The results of my model are below

Joint MLE results

variable	Estimate	Std. Error
th0	-0.43	0.64
th1	-0.01	0.01
th2	0.08	0.04
th3	9.11	0.49
th4	-0.00	0.01
th5	0.37	0.02
p	0.10	0.19
sig	1.98	0.05

2 Question 2

2.1 Part 1

$$s_j = P(\mu_{ij} \geq \mu ij' \quad \forall \quad j' = 0, ..., J|\boldsymbol{\beta}, \alpha) = \frac{exp(\boldsymbol{x}_{jt}\boldsymbol{\beta} - \alpha p_{jct} + \xi_{jct})}{1 - \sum_{j'} exp(\boldsymbol{x}_{j't}\boldsymbol{\beta} - \alpha p_{j'ct} + \xi_{j'ct})}$$

2.2 part 2

$$\delta_j = log(s_j) - \lambda log(s_0)$$

2.3 part 2

2.3.1 sub part a

OLS Results

term	estimate	std.error	statistic	p.value
(Intercept)	-2.99	0.11	-26.80	0.00
mushy	0.05	0.05	1.00	0.32
sugar	0.05	0.00	10.49	0.00
price	-10.12	0.88	-11.51	0.00

2.3.2 sub part b

First IV Results

term	estimate	std.error	statistic	p.value
(Intercept)	-4.42	2.54	-1.74	0.08
mushy	-1.55	1.94	-0.80	0.42
sugar	0.07	0.12	0.62	0.53
price	3.48	23.29	0.15	0.88

2.3.3 sub part c

Second IV Results

term	estimate	std.error	statistic	p.value
(Intercept)	9.24	15.58	0.59	0.55
mushy	-1.10	2.08	-0.53	0.60
sugar	0.02	0.05	0.37	0.71
price	-102.43	115.94	-0.88	0.38

3 Question 3

3.1 Part 1

Market share is

$$s_j(\boldsymbol{p}, \boldsymbol{x}, \boldsymbol{\xi}, \theta) = \int \frac{\exp(\boldsymbol{x}_j \boldsymbol{\beta} - p_j \alpha + \xi_j + \sum_k \sigma_k x_j v_{ki})}{1 + \sum_{j'} \exp(\boldsymbol{x}_{j'} \boldsymbol{\beta} - p'_j \alpha + \xi'_j + \sum_k \sigma_k x_{j'} c_{ki})} dF_v(v_{i1}, ..., v_{iK}, v_{\alpha i})$$

or

$$s_j(\boldsymbol{p}, \boldsymbol{x}, \boldsymbol{\delta}_j, \theta) = \int \frac{\exp(\boldsymbol{\delta}_j + \sum_k \sigma_k x_j v_{ki})}{1 + \sum_{j'} \exp(\boldsymbol{\delta}_{j'} + \sum_k \sigma_k x_{j'} c_{ki})} dF_v(v_{i1}, ..., v_{iK}, v_{\alpha i})$$

3.2 part 2

4 Appendix

4.1 R Code