Business Economics HW

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1 Question 1

Assuming that individual indirect utility is given by:

$$u_{ij} = \beta x_j - \alpha p_j + \xi_j + \varepsilon_{ij}$$

and that $\varepsilon_{ij} \sim \text{GeneralizedExtremeValue}(0, 1, 0)$, I simulate a market with $N = 10000$ individuals and $J + 1$ products.

Given that $\alpha = \beta = 1$, we have the following purchase decisions. Note that in this first case (Case 1), the market is covered:

j	chosen1_sum	market_share1	cum_chosen1
Int64	Int64	Float64	Int64
0	41	0.41	41
1	71	0.71	112
2	120	1.2	232
3	241	2.41	473
4	388	3.88	861
5	764	7.64	1625
6	1337	13.37	2962
7	2469	24.69	5431
8	4569	45.69	10000

The share of the individual choices can be interpreted in two equivalent ways: the share of the market captured by each product, or the probability of purchasing a given product j.

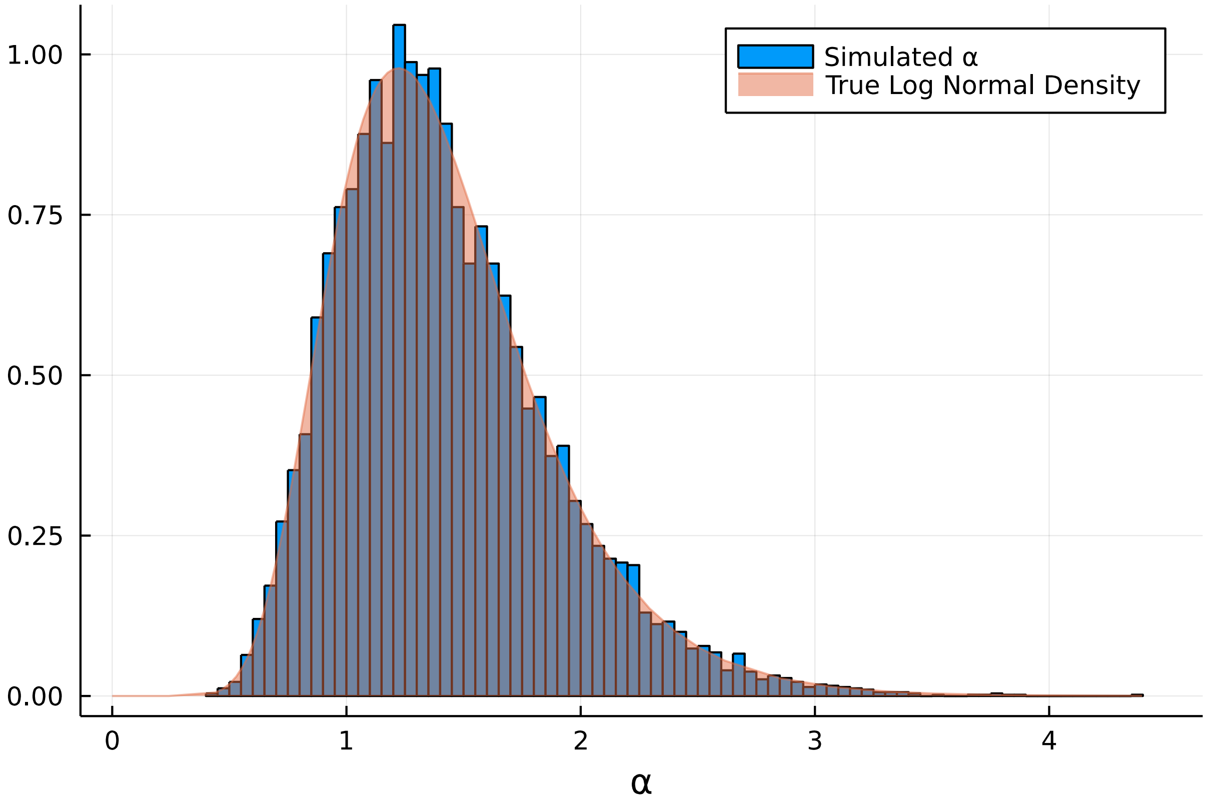
Let $P_i(j)$ indicate that individual i choses good j. Since we assume that the distribution of ε_{ij} conditional on i is the same as its unconditional distribution:

$$P_i(0) = P(0) = 0.41\%$$

and so on, as in the table above.

2 Question 2

Now we assume that $\alpha_i \sim LogNormal(\mu = 0.3, \sigma = \sqrt{0.1})$. I again use 10000 individuals to simulate this market.

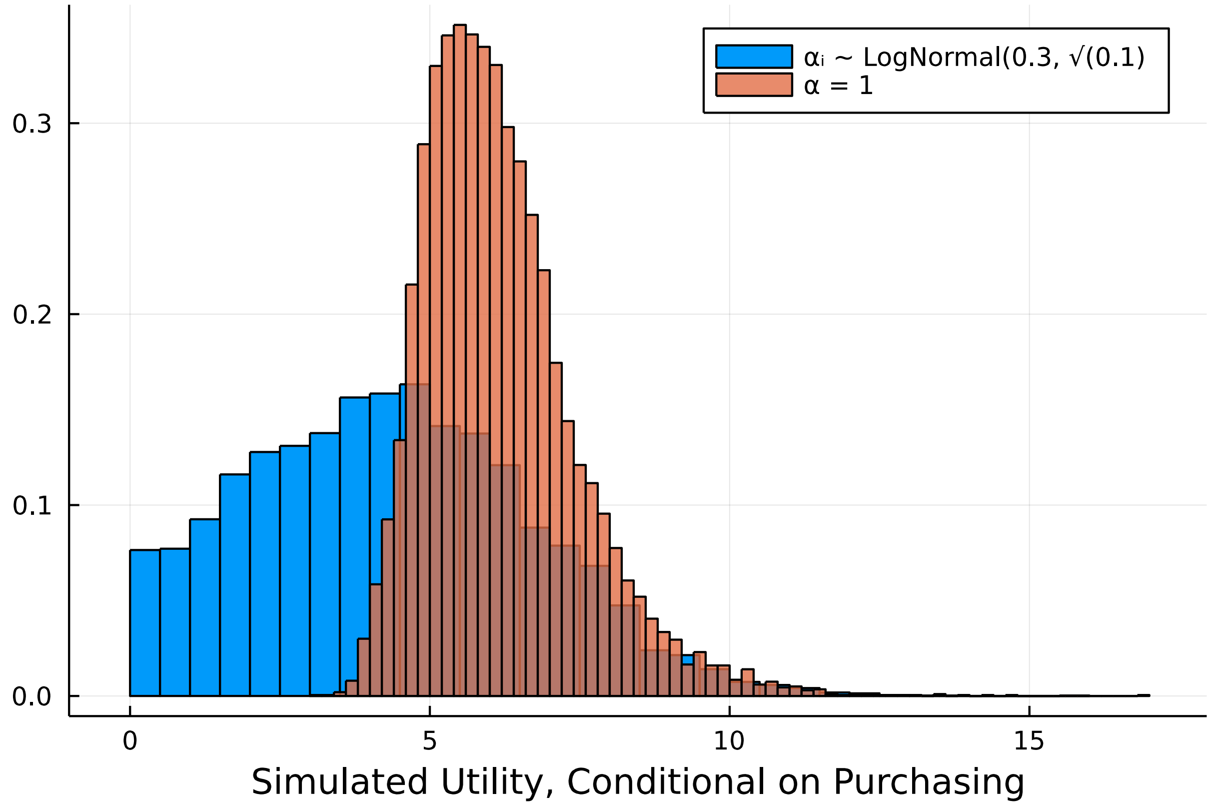


In thise case (Case 2), the market is no longer covered: some 1314 people choose not to purchase any good.

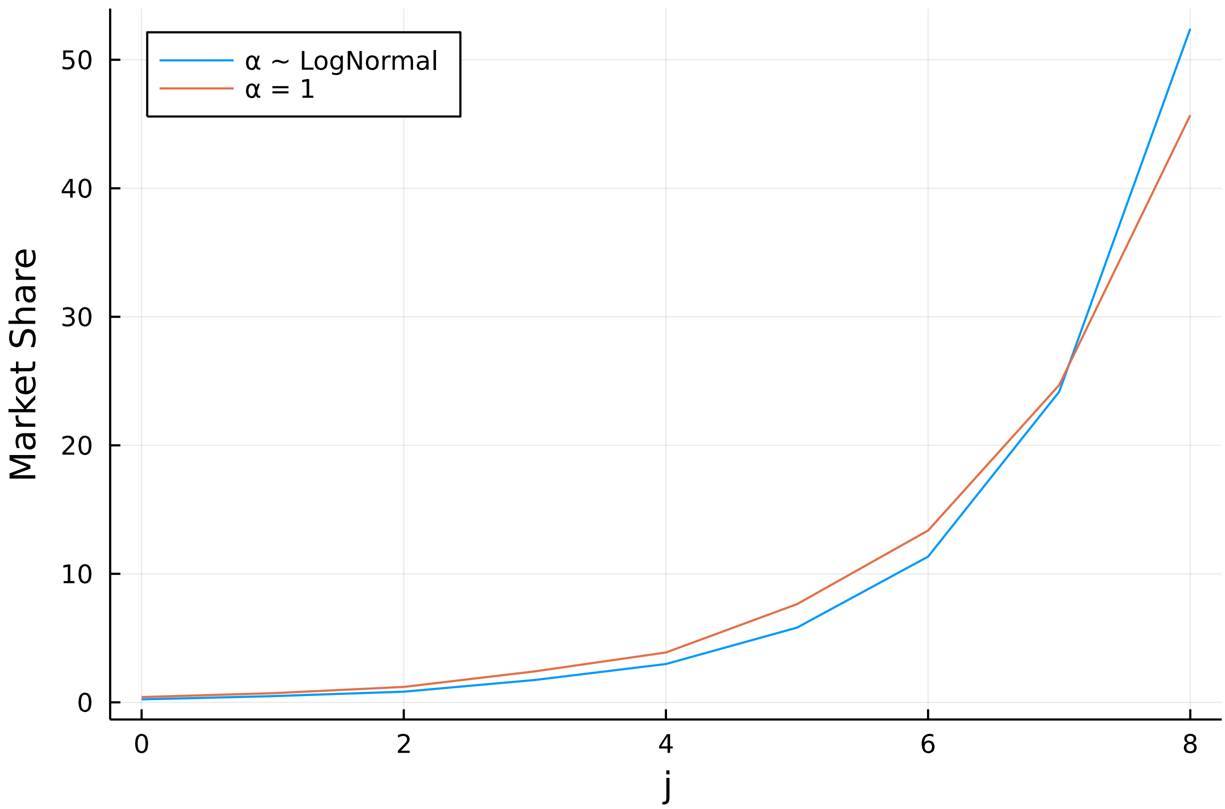
The following table shows the market share of each good j, which can be interpreted as the probability that an individual purchases good j conditional on having chosen to purchase any good.

j	chosen2_sum	market_share2	cum_chosen2
Int64	Int64?	Float64	Int64?
0	20	0.230256	20
1	42	0.483537	62
2	72	0.82892	134
3	151	1.73843	285
4	259	2.98181	544
5	505	5.81395	1049
6	985	11.3401	2034
7	2099	24.1653	4133
8	4553	52.4177	8686

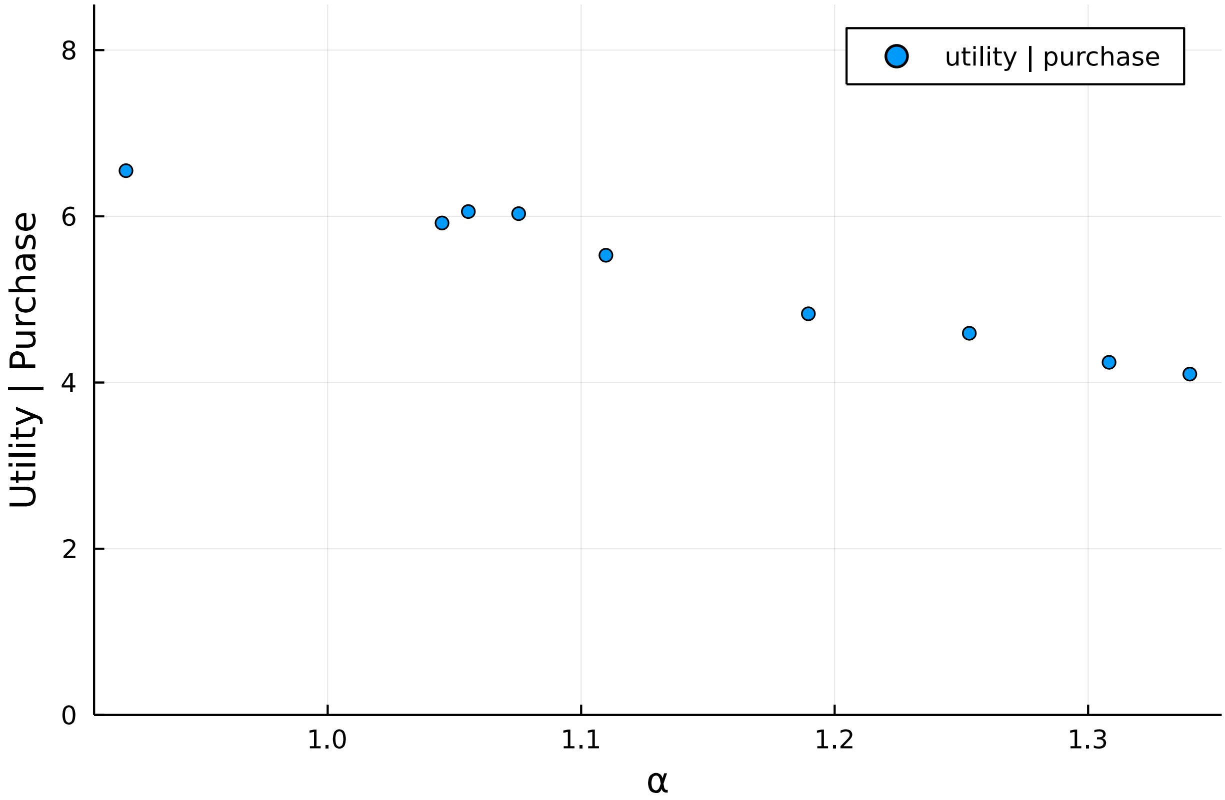
The conditional distributions of utility are plotted below:



Market shares under Case 1 and Case 2 are shown below:



We may also be interested in how utility varies with the value of α. Since α is is the marginal utility of income, we would expect that a *higher* α would be associated with a *lower* utility; a person with a greater marginal utility of income would have fewer profitable options, and would be more sensitive to prices.



The suggests that this may be the case.

3 Question 3

In this question, we assume that there is a good, the utility of which is independent of j; its utility depends only on the marginal utility of income α and on the random shock ε_{ij}.

Under the given conditions, we find:

j	chosen_sum	market_share	cum_chosen
Int64	Int64	Float64	Int64
0	19	0.218743	19
1	42	0.483537	61
2	70	0.805895	131
3	148	1.70389	279
4	252	2.90122	531
5	502	5.77942	1033
6	978	11.2595	2011
7	2089	24.0502	4100
8	4535	52.2105	8635
9	51	0.587152	8686

Under the mixed logit (Case 2), the new good has a market share of 0.587%, with only 51.0 people choosing to purchase it. Those who purchase have a mean α equal to 0.985.

Under the standard logit from Case 1, the new good has a market share of 1.11%, with only

111.0 people choosing to purchase it.

4 Question 4

The welfare gains brought by this new good are negligible. Under Case 2, the welfare gain is 0.197%, and under Case 1 it is 0.19%.