

E40201 Problem Set 1

Franco Calle

Brief discussions with Chuhan Guo

University of Chicago

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Part 1:

1 Preliminaries:

Table 1: Summary Statistics:

	Prod. 1	Prod. 2	Prod. 3	Prod. 4	Prod. 5	Prod. 6	Prod. 7	Prod. 8
Price	0.14	0.13	0.13	0.15	0.13	0.13	0.13	0.14
Display	0	1.12	3.03	0.58	0	0.27	0	0
Loyalty	7.39	15.14	7.64	8.59	11.8	6.34	17.25	4.37
Choice Prob (%)	0.52	0.96	0.40	0.65	0.85	0.45	1.22	0.23

Micro-econometric Models of Consumer Demand

For this question and the following I used 3000 MCMC draws and 300 burn in for each estimation, the results are as follows:

- Price only:
 - Coefficient: -37.4
 - Credibility interval (%5): [-37.66, -37.16]
 - Posterior Log-Likelihood: -15925.58
- Price and three dummies:
 - Coefficient: -25.38
 - Credibility interval (%5): [-28.64, -22.0]
 - Posterior Log-Likelihood: -15644.41
- Price, three dummies, and promotion:
 - Coefficient: -25.03
 - Credibility interval (%5): [-22.11, -19.41]
 - Posterior Log-Likelihood: -14701.78

The price sensitivity decreases a lot after controlling by product fixed effects. However, promotion or loyalty programs do not seem to affect much the sensitivity. My intuition about results is that fixed effects might control for many unobserved heterogeneity at the product level that prices were absorbing. And then, loyalty programs or promotions seem to not have an effect over individual decisions as was explained in class.

It seems that the third model is fitting the data best. First because it has more variables explaining choice heterogeneity, but also because loyalty programs seem to capture unobserved behavior that might be relevant for purchasing decisions.

After getting these results the conclusion is that consumers seem to be very elastic to prices and peanut butter is a very competitive market. Therefore, any policy for the company that might help reduce costs must be a good one if our primary focus is increasing profits rather than expanding market.

Heterogeneity in Preferences

The best model seems to be model 3 with 5 components.

Table 2: Log Likelihood for all models

	Model 1	Model 2	Model3
Comp = 1	-13819.2	-12348.5	-12318.1
Comp = 2	-12335.8	-13789.3	-12279.3
Comp = 3	-12405.5	-12316.5	-13779.2
Comp = 4	-13801.1	-12287.3	-12284.5
Comp = 5	-12365.3	-13779.6	-12263.4

Optimal Pricing: [0.1819553 0.1658083 0.1746508 0.2230104 0.1711336 0.1723780 0.1892543 0.1858923]

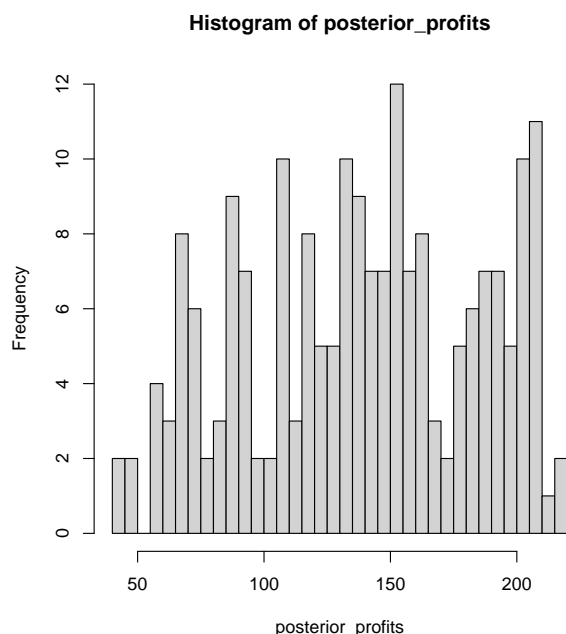


Figure 1: Posterior difference in profits

According to the histogram we can see that there is a lot of scope for increasing profits conditional on the cost structure that was suggested by the question. If we believe in the cost structure of the problem then using the optimal pricing guarantees 100% of increasing profits between the range of 50 to 200.

Brands and Branding

Here I will use the model with brand dummies and loyalty variable, with the model of 5 components of the last session. What is interesting from the model results is that the loyalty coefficient vanishes

when we include individual heterogeneity over preferences. That tells us that loyalty programs might not have an effect over the utility of consumers, it is just correlated with their unobserved preferences. The case is even more salient in the last specification when controlling for brand characteristics and unobserved preferences. Results show that the coefficient is even lower than what was initially found.

- Only Dummies:
 - Coefficient: Price (-40.980618) Loyalty (1.907684)
 - Posterior Log-Likelihood: -14908.69
- Price and Brand Intercept:
 - Coefficient: Price (-22.165056) Loyalty (1.877455)
 - Posterior Log-Likelihood: -14703.69
- Price and heterogeneity (5 components):
 - Coefficient: Price(-41.8914573) Loyalty (0.7502276)
 - Posterior Log-Likelihood: -13857.88
- Price , Brand, and heterogeneity:
 - Coefficient: Price(-22.6084155) Loyalty(-0.3796665)
 - Posterior Log-Likelihood: -12230.81