Kiwi Bubbles Case Report

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3. Logit model without segmentation

（1）Own-elasticity and cross-price elasticity

We create two functions to calculate elasticity and build a matrix for both own- and cross-elasticity.

	KB	KR	MB
KB	4.2578474	1.019923	0.9601564
KR	0.9054743	4.131270	0.9601564
MB	0.9054743	1.019923	4.0695469

Own-elasticity of Kiwi Bubble, Kiwi Regular and Mango Bubble is **4.26**, **4.13** and **4.07** respectively (on the diagonal).

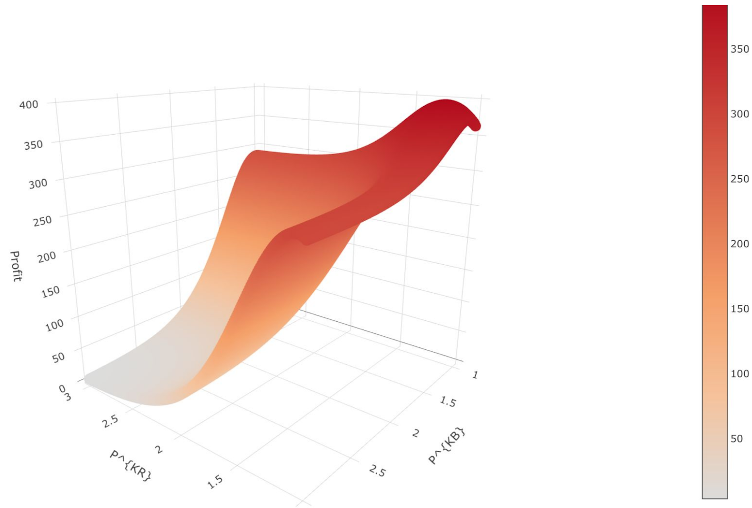
In this scenario, we assume customers are homogenous and there is no segmentation. So with the same price sensitivity level (**beta1: -3.737931**), when one product price changes by 1%, the influence on the choice probability of the other two products are the same.

Since Kiwi bubbles and Mango Bubbles are substitution products, the cross-elasticity should be higher than cross-elasticity between KB and KR or between MB and KR; thus if KB/MB's price change by 1%, the cross-elasticity of other two should be different.

(2) Optimal price of KB and KR

Here, we need to solve a profit maximization problem over three products: KR, KB, MB. For convenience, we write *profit* as a function of prices we set and model parameters. To search over two dimensions, we create a complete combination of the two prices and search for the optimal prices. The optimal price of KB=KR=**1.16**, and the maximum profit of Kiwi is **393.4082**. (The plot is as follows.)

```
pricespace[profitmat==max(profitmat)]
#1.16 1.16
max(profitmat)
#393.4082
```



4. Logit model with segmentation

（1） Decide the number of segments

The criteria that we use to choose the proper k is how big the cross-price elasticity between MB and KB is. The higher the cross-elasticity, the closer they substitute each other. To put it in other words, we are looking for the best way of segment which price change of KB yields the most effective impact on the aggregate choice probability of MB (looking for the maximum number in the third column in the following chart.)

Number of centers	Number of segments	Elasticity between MB and KB(KB price changes by 1%, the impact on the aggregate choice probability MB
4	5	0.8526008
5	6	0.8508778
6	7	0.9070279
7	8	0.9853480
8	9	1.0055021
9	10	0.9932731
10	11	1.0670280 (max)

11	12	1.0604154

（2）Interpretation of elasitisity

n=10,k=11

	KB	KR	MB
KB	4.5966397	0.9006296	1.1452714
KR	0.7621806	3.4668215	0.7916644
MB	1.0670280	0.8715591	4.4723323

(column product price changes by 1%, the impact on the aggregate choice probability of row product)

Different from the non-segmentation case, the cross-elasticity between KB and KR and the cross-elasticity between MB and KR are no longer the same because we have relaxed the restriction that customers are homogenous.

MB and KB are close substitutes but KR and MB are not close substitutes.

	segment	intercept.KB	intercept.KR	intercept.MB	price.coef
1	1	3.0878338	4.006679	3.1802458	-2.826519
2	2	2.3336806	3.112574	2.9252012	-2.896447
3	3	3.0017626	3.916981	2.7620620	-2.951180
4	4	6.6556359	6.515320	6.4858148	-5.043962
5	5	7.6063946	6.661934	7.4775392	-5.897474
6	6	4.7911334	4.456635	5.6901102	-4.606762
7	7	0.8341597	1.673929	0.4294365	-1.233209
8	8	8.2287472	6.680553	8.1223860	-6.788933
9	9	7.0950794	8.325625	7.4949559	-6.299830
10	10	3.9972969	3.958938	3.8837551	-3.715366
11	11	5.1174301	4.509340	4.5449628	-4.062526

After multiple trials, we divide consumers into **11** segmentations. We chose **10** clusters, and named the segment without demographic information as the 11th(which we defined as NA). In this case, the cross-elasticity between KB and MB is more than 1, which indicates they're close substitutes.Moreover, by dividing the market into 11 segments, we gain **18.84%** more preference over our brand. The 18.84% increase is from the market share of segment 5 and 8. Those are the customers who transfer from MB to KB after we launch KB.

We position KB at segment 4, 5, 8, 10 (We dismiss segment 11 because their demographic info is missing and their preference is hence hard to predict).Those are the customers who switch to KB from either MB or KR after we launch KB. Because they have higher intercept on KB, compared with KR and MB, which means KB is the most popular product to them if not considering price factor.

If not launch KB, the optimal price of KR is **1.06** and Kiwi's profit is **285.592** while Mango's profit is 105.4767.

If launch KB, the optimal price of KB and KR is **1.13 and 1.2** respectively, and the profit of Kiwi increased to **395.6119**. Meanwhile, Mango's profit decreased from 105.4767 to 86.57259.

In summary, after launching KB, we 1) gain more market share, 2) have more profit than before, 3) can use it as price discrimination tool, 4) don't need lower all products prices at the same degree in response to price war.

5. Understanding strategic responses

Because we have 11 segments with different preferences and price sensitivity, they have different reactions to the price cut. By launching KB, which is the close substitute of MB, when Mango lowers MB's price, Kiwi can decrease the price of KB while sustain KR's price at a higher level. By 'sacrificing' KB's profit, KR can relax more in the competition, thus maximizing total profit.

For example, when our optimal price of KB and KR is 1.13 and 1.2, Mango will cut the price to 0.95. Next run, we lower KB to 0.99, but the price of KR can be set at 1.1 to maximize total profit. Even MB further lowered the price to 0.91, Kiwi just needs to lower both products by 0.01, to 0.98(KB) and 1.09(KR). Mango's price converges at 0.91, the set of prices reaches the equilibrium. **KB=0.98, KR=1.09, MB=0.91.**