Kiwi Bubble Case Analysis

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Part 1

1.1 Elasticities without Segmentation

Below is the own-and cross- elasticity for all combinations of products with average prices observed

```
##   Product Own.Elasticity Cross.Price.Elasticity
## 1      KB       4.257845              0.9054761
## 2      KR       4.131272              1.0199190
## 3      MB       4.069542              0.9601601
```

We can see from above that all the 3 products KB, KR and MB are price elastic as their elasticities > 1.

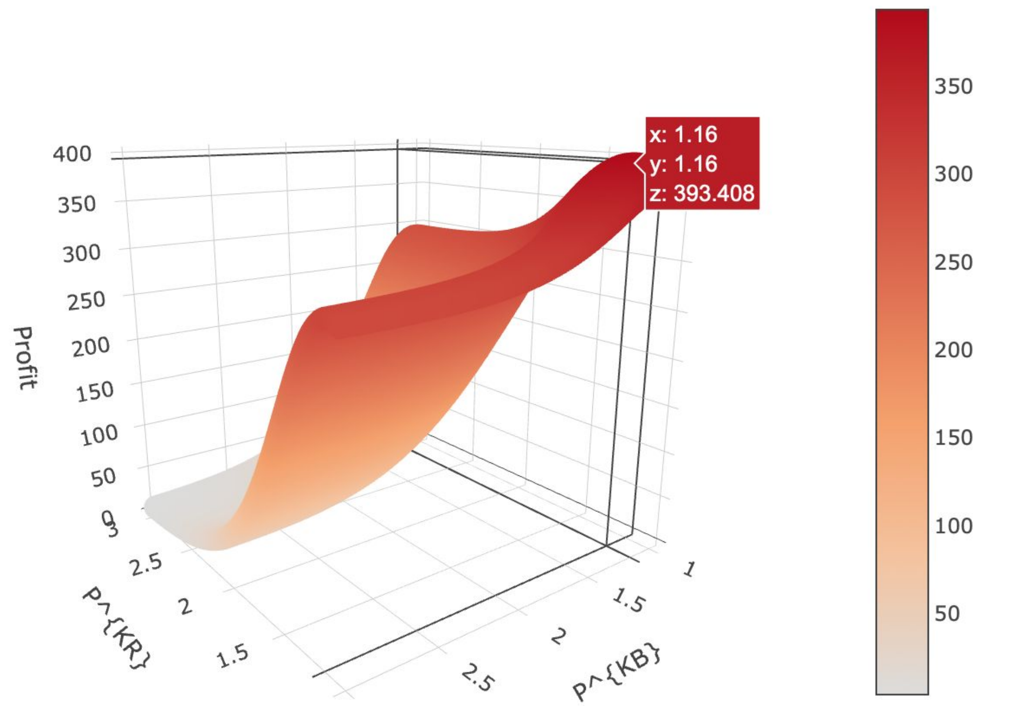
The cross-price elasticities without segmentation are as below:
Elasticity of KR on KB = Elasticity of MB on KB=0.905
Elasticity of KB on KR = Elasticity of MB on KR=1.02
Elasticity of KB on MB = Elasticity of KR on MB=0.96

Therefore,
MB is a closer substitute of KR compared to KB (0.96 > 0.905)
KR is a closer substitute of KB compared to MB (1.02 > 0.96)
KR is a closer substitute of MB compared to KB (1.02 > 0.905)

As KR and MB are close substitutes of each other, and KR is a close substitute of KB which implies a risk of cannibalization, there is no point to launch KB if we only look at the cross elasticities.

1.2 Profit Maximization and Optimal Price

As we can see from the plot, both of the optimal prices for KB and KR are $1.16 when Mango's price is $1.43. At the optimal price of $1.16, Kiwi's profit is $393.408.




```r
pricespace[profitmat==max(profitmat)] #optimal price for KB is 1.16, optimal price for KR is 1.16
```

```
## [1] 1.16 1.16
```

```r
max(profitmat) #393.408; optimal price for KB is 1.16, optimal price for KR is 1.16
```

```
## [1] 393.408
```

Part 2

2.1 Choosing # of Segments

We group consumers into 9 segments (including an additional segment for those who don't fit in any cluster). As we can see from the segList shown below, when there are 10 segments, one of the segments contains less than 4 people (283 *0.014 = 3.962), which makes our segmentation less reliable. Therefore, we took a step back, and chose 9 as the number of our segments

```
## [[8]]
##          1          2          3          4          5          6
## 0.16607774 0.10954064 0.13780919 0.13427562 0.08127208 0.10954064
##          7          8
## 0.14134276 0.12014134 0.00000000
##
## [[9]]
##          1          2          3          4          5          6
## 0.01413428 0.14840989 0.10247350 0.11307420 0.16961131 0.10954064
##          7          8          9
## 0.13427562 0.13780919 0.07067138 0.00000000
```

2.2 Compare Elasticities between Seg and Non-seg

As shown below, the own-price elasticities with segmentation are all greater than the own-elasticities in the non-segmentation case, meaning that after segmentation, consumers are more price sensitive to the products.

Own- and cross-elasticities without segmentation:

```
##   Product Own.Elasticity Cross.Price.Elasticity
## 1      KB       4.257845              0.9054761
## 2      KR       4.131272              1.0199190
## 3      MB       4.069542              0.9601601
```

Own-elasticities with segmentation:

```
##   Product Own.Elasticity
## 1      KB       4.393557
## 2      KR       4.375514
## 3      MB       4.186238
```

Elasticity of KR on KB=0.946, Elasticity of MB on KB=1.122 -> MB is a closer substitute of KB
Elasticity of KB on KR=0.936, Elasticity of MB on KR=1.124 -> MB is a closer substitute of KR
Elasticity of KB on MB=0.935, Elasticity of KR on MB=1.009 -> KR is a closer substitute of MB

With segmentation, the cross elasticities that KR and KB have on each other increased, meaning that KR and MB have become each other's closer substitute compared to the non-segmentation case. In addition, MB has become a close substitute of KB (compared with the non-segmentation case that KR is the close substitute of KB), which implies that segmentation has helped to mitigate the risk of cannibalization between KB and KR.

The cross-price elasticities with segmentation are as below:

```
#cross elasticity
elasticity_cross=function(avgPriceAll,own){
  e=vector()
  coef2=c(1,2,3)[c(1,2,3)!=own][1]
  coef3=c(1,2,3)[c(1,2,3)!=own][2]
  agg_choice=agg_choice(avgPriceAll[own],avgPriceAll[coef2],avgPriceAll[coef3])[1]
  agg_choicenew1=agg_choice(avgPriceAll[own],avgPriceAll[coef2]*1.01,avgPriceAll[coef3])[1]
  agg_choicenew2=agg_choice(avgPriceAll[own],avgPriceAll[coef2],avgPriceAll[coef3]*1.01)[1]

  e=append(e, (agg_choicenew1-agg_choice)/agg_choice)
  e=append(e, (agg_choicenew2-agg_choice)/agg_choice)
  e

}
Cros_KB_KR_MB=(elasticity_cross(avgPriceAll, 1))*100
Cros_KB_KR_MB
```

```
## [1] 0.9459524 1.1224485
```

```
Cros_KR_KB_MB=(elasticity_cross(avgPriceAll, 2))*100
Cros_KR_KB_MB
```

```
## [1] 0.9363006 1.1235926
```

```
Cros_MB_KB_KR=(elasticity_cross(avgPriceAll, 3))*100
Cros_MB_KB_KR
```

```
## [1] 0.9351753 1.0089358
```

2.3 Segments Preference and KB Positioning

Below is beta0 and beta1 for each of the 9 segments

```
##   segment intercept.KB intercept.KR intercept.MB price.coef
## 1       1    3.8689983     4.354056    4.0523865  -3.502896
## 2       2    3.9972969     3.958938    3.8837551  -3.715366
## 3       3    2.9694016     3.867674    2.7276100  -2.909001
## 4       4    7.3034174     7.138563    7.1181389  -5.793619
## 5       5    2.3336806     3.112574    2.9252012  -2.896447
## 6       6    7.6063946     6.661934    7.4775392  -5.897474
## 7       7    4.8086045     4.606528    5.6294806  -4.517302
## 8       8    0.9169255     1.673183    0.4573439  -1.251711
## 9       9    5.1174301     4.509340    4.5449628  -4.062526
```

Calculate the difference between KR and KB, MB and KB across segments

```
##   segments    differKR   differMB
## 1        1  0.48505759  0.1833882
## 2        2 -0.03835883 -0.1135418
## 3        3  0.89827253 -0.2417916
## 4        4 -0.16485417 -0.1852785
## 5        5  0.77889343  0.5915207
## 6        6 -0.94446055 -0.1288554
## 7        7 -0.20207671  0.8208761
## 8        8  0.75625710 -0.4595815
## 9        9 -0.60808976 -0.5724673
```

Average difference between KR and KB, MB and KB across segments

```
##    differKR   differMB
## 1 0.1067378 -0.0117479
```

As we took the average of the difference between intercept.KB and intercept.KR and between intercept.KB and intercept.MB across segments, we can see that the absolute value of difference between MB and KB is smaller than that between KR and KB (0.0117 < 0.1067). This result explains the insight we get from the substitution pattern that MB is a closer substitute of KB compared to KR.

For segment 1, 3, 5, 8, the intercept.KR is bigger than intercept.KB, meaning that for these 4 groups, KR is more appealing to them than KB. Therefore, the firm should sell KR to segment 1, 3, 5, 8. For the rest of the segments (2, 4, 6, 7, 9), the intercept.KB is bigger than intercept.KR, meaning that KB is more appealing to these 5 segments than KR. Therefore, the firm should sell KB to segment 2, 4, 6, 7, 9.

2.4 Optimal Price and Profit Maximization (with or without KB)

Given that MB is priced at $1.43, suppose we only launch KR first. The optimal price of KR=$1.07 and the maximal profit of KR=$294.4419. In this case, the profit of MB=$109.1702

```
###### (4) last question###########
#Profit
#given MB, look at KR

pricespace=seq(1,3,0.01)
uc=0.5
profit=1000*agg_choice2(pricespace,1.43,2,3)[,1]*(pricespace-uc)
priceKRBest=pricespace[profit==max(profit)]
priceKRBest#best price for KR=1.07
```

```
## [1] 1.07
```

```
max(profit)  #max profit for KR 294.4419
```

```
## [1] 294.4419
```

```
#profit for MB
profit_MB=1000*agg_choice2(1.43,priceKRBest,3,2)[,1]*(1.43-uc)  #109.1702
profit_MB
```

```
##    prob1
## 109.1702
```

Suppose next that we do launch KB and now there are 3 products in the market. The optimal price of KB=$1.15, and the optimal price of KR=$1.19, with the maximal profit of Kiwi=$387.6119. In this case, the profit of MB=$89.63174.

```
profitmat=matrix(0L,nrow(pricespace),1)
for (i in 1:nrow(pricespace)){
  profitmat[i]=sum(profit_KB_KR_seg(pricespace[i,1],pricespace[i,2],1.43,para))
}

max(profitmat) #387.6119;
```

```
## [1] 387.6119
```

```
priceKB_KRBest=pricespace[profitmat==max(profitmat)] #optimal price for KB is 1.15, optimal price for KR is 1.19
priceKB_KRBest
```

```
## [1] 1.15 1.19
```

```
#MB new profit

profit_MB2=1000*agg_choice(1.43,priceKB_KRBest,priceKB_KRBest)[2]*(1.43-uc)  #244.3255 new MB profit
profit_MB2 #89.63174
```

```
## [1] 89.63174
```

Below is the table of coefficients for each of the 9 segments

```
##   segment intercept.KB intercept.KR intercept.MB price.coef
## 1       1    3.8689983     4.354056    4.0523865  -3.502896
## 2       2    3.9972969     3.958938    3.8837551  -3.715366
## 3       3    2.9694016     3.867674    2.7276100  -2.909001
## 4       4    7.3034174     7.138563    7.1181389  -5.793619
## 5       5    2.3336806     3.112574    2.9252012  -2.896447
## 6       6    7.6063946     6.661934    7.4775392  -5.897474
## 7       7    4.8086045     4.606528    5.6294806  -4.517302
## 8       8    0.9169255     1.673183    0.4573439  -1.251711
## 9       9    5.1174301     4.509340    4.5449628  -4.062526
```

We can see that as Kiwi launches KB, profit of Kiwi increased $93 and profit of Mango decreased $19.5.

The model justifies the launch of KB. From the perspective of consumer segment and product positioning, since beta0 represents the underlying popularity of a specific product, we can tell that the underlying popularity of KB is the highest among all of the 3 products in segment 2, 4, 6, 9, KR has the highest popularity in segment 1, 3, 5, 8 while MB has the highest popularity in segment 7 only(in which KB has the second highest popularity). Therefore, by selling KB to segment 2, 4, 6, 7, 9 and KR to segment1, 3, 5, 8, we can steal some market share from MB and also set a higher optimal price for KR (here=$1.19) in this case. Now the inclusion of both KB and KR returns a higher profit of $387.61 than $294.44.

Part 3

	KB Price	KR price	Mango Price	Kiwi Profit	Mango Profit
1st Round	1.15	1.19	0.96	387.6119	170.9814
2nd Round	1.01	1.09	0.92	269.6908	140.0129
3rd Round	1.00	1.08	0.92	256.2545	137.4193
4th Round	1.00	1.08	0.92	256.2545	137.4193

3.1 Yes, the new price of Mango bubble, which is 0.96, is lower than 1.43, given that Kiwi's Bubble is 1.15 and Kiwi's Regular is 1.19.

3.2 After three rounds of "competing" prices with each other, this "pricing war" converges when they reach the equilibrium prices: MB is 0.92, KB is 1, and KR is 1.08.

3.3 The first set of price is 1.15 and 1.19, then Mango adjusts their price to 0.96 to maximize their profit; then, Kiwi changes their products' prices to 1.01 and 1.09 to compete with Mango and maximize their profit under rival's price 0.96; next, Mango adjusts their product's price to 0.92, and Kiwi changes prices according to Mango's new price, so on so forth.

Strategic advantages of launching KB differs between "no reaction" scenario and "pricing war" scenario.

With segmentation, risk of cannibalization between KR and KB is mitigated. This is because, as mentioned before, KR is no longer KB's close substitute after segmentation, and MB becomes KB's close substitute.

Thus, under the "no competitive reaction" scenario, Kiwi can maximize their profits and producer surplus by launching Kiwi Bubble and "stealing" market share from MB, as long as KB price is set lower than rival price. Proved by our analysis in Part Four, with fixed MB price 1.43, KR's optimal price is 1.07 without launching KB and Kiwi's profit is 294.4419, and Mango's profit is 109.1702. When launches KB, Kiwi can increase their profits to 387.6119 and the optimal prices for KB and KR are 1.15 and 1.19, Mango's profit is 89.63 with fixed price 1.43.

Under the "pricing war" scenario, the strategic advantage of Kiwi Bubbles is that Kiwi can maximize their profit at these prices and lower rival's profit by reacting to Mango's new prices. However, the strategic advantages of KB are <u>less than</u> what Kiwi can benefit from the "no reaction” scenario. This is because Mango will adjust their pricing based on Kiwi’s next move, and Kiwi as well as Mango will fall into game theory circumstance. They will lower their prices until reaching the equilibrium and consumer surplus will increase along with a lower price and a decreasing producer surplus.