Marketing Analytics – Homework 4

Individual Assignment
MS Section: Due 1 PM October 14th
MBA Section: Due 1 PM October 15th

This assignment will tie together what you've learned in the class to quantitatively set the price Orange Juice. The dataset used in this study was originally from journal article. Montgomery, 1997 used it to study pricing decisions at the store level. It contains the prices, marginal costs, and sales by week, making it well suited for a pricing exercise.

The written portions will be evaluated the use of data and analysis to support your statements, and the quality of the writing.

Homework Materials for Download:

1. An Rmarkdown template for this homework
2. A dataset containing consumer purchases.

Submission Checklist:

To help us grade the assignments efficiently and correctly, we ask that you submit your assignments in a specific format. A complete submission for this assignment will send the following to averyhavivgrading@gmail.com:

- A .rmd Rmarkdown file, based on the template for this assignment.
- An .html file, generated by knitting the .rmd file in RStudio.
- All file names should be '[last name], [first name].[file extension]', where you replace everything in the square brackets with the appropriate values, and delete the square brackets.
- Do not archive the files or combine the files. Each of these files should be a separate attachment in the email.
- Do not send the assignment to my work address – thank you!

Data Guide:

store: A unique store identifier

brand: A brand identifier. Brand identifiers correspond as follows:

1 Tropicana Premium 64oz	5 Minute Maid 64oz	9 Florida Gold 64oz
2 Tropicana Premium 96oz	6 Minute Maid 96oz	10 Dominicks 64oz
3 Florida's Natural 64oz	7 Citrus Hill 64oz	11 Dominicks 128oz
4 Tropicana 64oz	8 Tree Fresh 64oz	

week: An identifier for the week

isFeature: A binary variable that indicates whether this brand was featured

units: The total units of this brand sold in this store/week

price: The price, in dollars, for one unit of this brand

marginalCost: A numeric variable that specifies the cost per unit in that store/week

Part 1: Optimal Prices (12 marks total):

You will now use an estimated demand model to calculate the optimal price for a particular type of orange juice. You will also see how bias in an estimated demand model can cost a firm profit because it makes worse decisions.

I highly recommend you review homework 2 before starting this section. In homework 2, you developed a causal demand model. In this homework, you will use a causal demand model to set prices. Furthermore, the example here is similar to case 5.
This part can be completed with the `subset`, `lm`, `factor`, `log`, `seq`, `mean`, `data.frame`, `predict`, and `which.max` functions.

a) Load the data. Then take a subset of the initial data file while only keeping data for the brand that corresponds to the last digit of your student number. That is, if your student number ends with a '3', only analyze the data for brand 3, Florida's Natural 64oz. If your student number ends with a '0', analyze the data for Dominicks 64oz.

b) Using the data for part a, run a regression where `log(units)` is the dependent variable and `isFeature` and `price` are independent variables. Store this regression as `thisLM` (you can store the results of a regression in the same way you would store any other variable)

c) You will use the predict function to predict demand at a wide range of prices. Create a new dataframe as follows:

```
possiblePrices = data.frame(price = seq(0,10,.01),isFeature = FALSE)
```

We will predict demand and profit margins for each potential price to figure out which price will yield the most profit.

d) Use the data frame estimated in part 1d to get predicted demand for each of the possible prices. Add these predictions as a column to the `possiblePrices` data frame. *Hint: Use the predict function.*

e) Estimate the marginal cost for your brand as the average marginal cost across your dataset. Add a column to the `possiblePrices` dataframe called `profitMargin`. Calculate `profitMargin` as the price minus the average marginal cost.

f) Multiply the estimate of demand in part 1d and the profit margin in part 1f to calculate expected profit by multiplying demand by the profit margin (`price - marginalCost`) for each potential price. Store this as a column in the `possiblePrices` dataframe. ***Hint: Remember that the regression predicts log(units), not units itself. You have to transform the prediction to get the true predicted demand.***

g) Use the `which.max` function to find the optimal price, and store it as `optPrice`. Write `optPrice` on a new line so it displays in the html file. (4 Marks)

h) Repeat parts 1b-1g but use a model that omits `isFeature`. (4 Marks) *Hint: This is easier than it looks – just copy and paste your previous code, and make the single change to the model formula to omit* `isFeature`

i) Repeat parts 1b-1g but calculate a price when the product is featured by (4 marks)

- Interacting `isFeature` and `price` in part b.
- Setting `isFeature = TRUE` when generating `possiblePrices` in part c.

Part 2: Discussion (12 marks)

a) Compare the demand models you estimated in parts in parts 1b and 1h. Which model would you expect to yield a higher optimal price? Why? Answer in 2-4 short sentences. (4

marks)

b) Compare the optimal prices calculated in part 1g and 1h. Based on this data analysis and the course materials, which would you expect would yield higher profits if implemented? Why? Answer in 2-4 short sentences. (4 marks)

c) Compare the standard price you calculated in part 1g and the featured price in part 1i. Which price was lower? Why? Answer in 2-4 short sentences. (4 marks)

Bibliography

Montgomery, A. L. (1997). Creating micro-marketing pricing strategies using supermarket scanner data. *Marketing Science*, 315-337.