**Advanced Marketing Analytics (MKTG 881)**

**Assignment 2. ProBio**

**Jordan Martin**

**Due Date: 10/11 (Sunday) by 11:59 PM**

* Using the Probio case, answer questions below (each question is worth 2 points). Copy and paste the (Stata) analysis results for relevant questions.
* For analysis, download ‘ProBio data.xlsx’ on Canvas and import the Excel file into Stata. Variable descriptions are included in the Excel file.

1. Summarize the issues ProBio faces. How would you tackle those issues?
   1. ProBio is a start-up probiotic organic juice company that is trying a couple different marketing strategies to break into the $15.4 billion global probiotic market. Their strategies include in-person demonstrations, endcap displays, and just meeting with stores directly in-person. They think that in-person demonstrations are ineffective at small stores due to insufficient traffic, so they’re focusing on large Whole Foods stores. They also encourage competition between sales representatives to get endcap space. Because they have small marketing resources as a start-up, they need to be more lean by cutting marketing costs that don’t generate results. They’re worried that demos are effective in the short-term, but not longer term and that the endcap competition wasn’t helping.
   2. As a result of these observations, they’re asking a marketing manager to justify the programs which is what we’re doing to tackle these issues. Acting as Carol, the ProBio intern with business analytics skills, I would create a model that shows the results of each of the programs so that the manager can compare the benefits to the costs and determine whether to keep the programs or to cut them. This will be important to help the company decide how to move forward and use marketing expenses in the best way possible.
2. Report summary statistics for SALE and PRICE by the following dummy variables: DEMO, SALEREP, and ENDCAP. What do you find?
   1. There were 81 stores that had a demo and on average, this increased sales from 244 to 400 and increased price from $4.10 to $4.20. Full results are below.
   2. 
   3. There were 762 stores that met face to face with a national sales rep and on average, this increased 199 to 299 and increased price from $3.94 to $4.25. Full results are below.
   4. 
   5. There were 53 stores that had ProBio on an endcap and on average, this increased sales from 240 to 584 and decreased price from 4.11 to 3.95. Full results are below.
   6. 
3. Run correlations on the following variables: SALE, PRICE, SALEREP, ENDCAP, DEMO, DEMO13, DEMO45, NATURAL, and FITNESS. Which variable has the highest correlation with SALE? Is the correlation between PRICE and ENDCAP statistically significant at the 5% level?
   1. 
   2. The variable with the highest correlation to SALE was ENDCAP.
   3. The correlation between PRICE and ENDCAP is statistically significant at the 5% level.
4. Draw two graphs that describe the data. Explain your findings from the graphs.
   1. 
   2. From this graph, it’s clear that the best option is to have an endcap display, recent demonstration, and have a sales representative talk to the company. Individually, we can see that sales rep visits and demos help sales, and endcap displays usually help, except in the case of no sales rep visit and a recent demo. It seems that endcap displays and in-store demonstrations are the best way to increase sales.
   3. 
   4. This graph shows us that having a demo in the last week usually increases the amount of sales in comparison to not having a demo in the last week. Also, we can also see that higher prices tend to lower the number of sales, but that trend isn’t perfectly linear, particularly for stores that have had an in-store demonstration in the last week.
5. Develop a regression model (i.e., using β and ε terms) to answer the questions ProBio wants answered and report the regression results.
   1. These are the results of developing the regression model.
6. Interpret the R-squared (the model fit).
   1. The R-squared value for our regression model is 67%. This means that 67% of our data fits this model. This doesn’t necessarily tell us that our model is good or bad, but it is probably a good sign that it is high. The best way to measure the model, though, would be to test in the real world with locations that we don’t know sales and see how well we can predict their sales as we do in question 8.
7. Interpret each coefficient in your regression model. Are they significant? Do in-store demonstrations and endcap displays increase sales? Do in-store demonstrations have a long-term effect on sales?
   1. I removed natural and fitness as they were not statistically significant at 5%, so we are left with price, salerep, endcap, demo, demo13 and demo45 as shown in my answer to question 5.
   2. For our statistically significant variables, we see the following results:
      1. For every increase of one dollar in price, sales go down by 29 units on average.
      2. If a sales rep came to the store, sales went up by 77 units on average.
      3. If ProBio was on an endcap, sales went up by 305 units on average.
      4. If there was a demo in the last week, sales went up by 111 units on average.
      5. If that demo was one to three weeks ago, sales went up 74 units on average.
      6. If that demo was four to five weeks ago, sales went up 67 units on average.
      7. Thus, the effect of the in-store demonstrations is less as time goes by, but still has an effect even a month later.
8. Predict sales at a store where the average price is $3, with sales rep, but no endcap, and a demonstration 3 weeks ago only. Show the calculation process.
   1. Constant+Price\*3+SalesRep+Demo13=294.189+-28.60916\*3+76.95121+73.66309 = 358.9758, so approximately 359 units would be predicted to be sold in a store with like the one described.
9. Generate predicted revenues for the observations in the data. Draw and interpret the graph: REVENUE (Y) vs. PREDICTED REVENUE (X).
   1. 
   2. This graph shows us that, for the most part, our predictions are pretty good as they are along the line corresponding to y=x or sale=predicted sale. There are a few outliers a bit below this line where we over predicted sales, but overall it looks like our predictions are very consistently good. It would probably be worth investigating why we over predicted sales in those couple cases, though, so that we can determine how to avoid whatever issues these stores are facing that our current marketing strategies are not working to fix.
10. What are your recommendations to ProBio’s management?
    1. Based on our results, I would tell ProBio’s management the statistics I mentioned above, notably that sales increase by 77 units if a sales representative meets with a store, sales increase by 305 units if ProBio was on an endcap display, sales increase by 111 units for an on-site demo in the last week, 74 units for an on-site demo in one to three weeks ago and 67 units for a an on-site demo four to five weeks ago. Depending on how much it costs to send representatives to stores, do on-site demos and pressure stores to put ProBio on an endcap, the company will have to make a cost-benefit analysis decision. For example, if the margin on ProBio is two dollars and it costs 200 dollars to send a sales representative to a store, then ProBio would make 154 dollars, but lose 200 dollars which would not be worth it. From what I see, though, I think that periodic demonstrations clearly help for several weeks and endcaps are the best option, so it is likely that ProBio should continue to pursue both of these strategies.