**MKT 282: Data Analytics & Dynamic Pricing**

**(Raghunath Rao: Fall 2021)**

**Assignment #2**

*This assignment is due by midnight on 11/03/2021. Please paste your answers within this file and save it as "HW2\_DP\_SOLN" on Canvas at the appropriate place. If you used M.S. Excel/R (or any other statistical software) to arrive at your answers, please submit the relevant files/annotated code as well (so that you can get partial credits for your work even if your answer is incorrect). The scores from your submissions will be reweighted, and you can earn up to 75 points from this exercise.*

*Only one submission per team, please- one person from each team should upload the solution. It is the responsibility of each group to get together and finish the assignment. The team information is available under announcements on Canvas.*

*Late assignments are NOT acceptable.*

**Write the names of your team members here**:

**Part 1: Using Non-Linear Regression to Understand Prices, Promotions, and Entry**

Daniel Mynick been hired as a consultant for a mid-sized local grocery store located in Central Texas. Store management is worried since Wal-Mart has entered the market by opening a "Wal-Mart Super-center" only 3 miles away from the local store. Management is interested in analyzing the impact on store sales of the Wal-Mart entry and whether or not a new strategy is required.

For analysis, management has given Daniel access to one hundred weeks of sales data for the local store covering the period both pre- and post-entry of Wal-Mart.

Look at the data in *“****HW2 Walmart.xls****”* (The file is available on Canvas).

It has the following variables:

|  |  |
| --- | --- |
| WEEK | Week number |
| Sales | weekly sales |
| Promotion Index | Index of weekly promotion activity –higher promotion index indicates more products on promotion in the store |
| Walmart | Walmart dummy = 1 in the weeks after the Walmart opens, and 0 in the weeks before the Walmart opens |
| Feature Advertising Index | Index of feature advertising activity – higher feature advertising index indicates more feature advertising |
| Holiday | Holiday Dummy = 1 during major holiday weeks, and 0 for non-holiday weeks |

**1A.** Estimate the following regression model: Create the appropriate variables[[1]](#footnote-1). (5 points)

*log(sales)* = *α* + *β*1 *log(promotion index)* + *β*2 *WalMart*

Paste results here.

**1B**. What is the interpretation of the coefficient on *log(promotion index)?* ( 5 points)

**1C**. What is the effect of Walmart entry? (5 points)

**1D.** Which independent variables are significant in explaining the variation in sales? (2 points)

**1E.** The local store also engages in feature advertising by mailing ads to households. ‘Feature Advertising Index’ gives the feature advertising activity in a given week. You add the log of this variable to the regression. In addition to this, you also add a ‘Holiday Dummy’ equal to one if the corresponding week covers a major holiday. Add these two variables to the regression and re-estimate the model

*log(sales)* = *α* + *β*1 *log(promotion index)* + *β*2 *WalMart* + *β*3 *log(feature index)* + *β*4 *Holiday*

Paste results here. (5 points)

**1F**. Interpret the two newly estimated coefficients. (4 points)

**1G.** Are the two new coefficients significant? (2 points)

You add a final variable to the regression: *log(promotion Index) × WalMart*, i.e., the Wal-Mart Dummy multiplied by the log(promotion index) variable. Create this interaction variable. The full regression model is now:

*log(sales)* = *α* + *β*1 *log(promotion indext* + *β*2 *WalMart* + *β*3 *log(feature index)*

+ *β*4 *Holiday* + *β*5 (log(promotion Index) × *WalMartt*)

**1H**. What is the interpretation of *β*5 ? (5 points)

**1I.** Estimate the regression. Paste results here. (5 points)

**1J**. Is the effect of promotions on store sales higher or lower after Wal-Mart enters? (2 points)

**1K.** What does the estimate for  imply about the possibility of the local store using promotional activity to fight Wal-Mart? What strategy would you recommend to the local store? (5 points)

**Part 2: Understanding the Drivers of Price Competition**

Attached data file **“HW2 Pizza data.xls**” shows the prices and quantities sold for six major brands of frozen pizza for 156 weeks in a major Midwestern market.

Using the discussion during Session 2 in the class:

1. Calculate Clout, Vulnerability and Dominance ratio for each brands using an elasticity matrix. (25 points)

***Note****: For this question, in any regression, an estimate that has a p-value of less than or equal to 0.1 should be considered statistically significant. An elasticity number with p>0.1 should be considered as zero.*

1. Create a graph with x-axis as “clout” and “y-axis” as vulnerability and locate each brand on this map as a circle whose size represents the average market share (in units) during these 156 weeks. (10 points)

1. I use functions Log and Ln interchangeably both referring to natural logarithm. [↑](#footnote-ref-1)