# Project: Analyzing a Market Test

A/B tests are very commonly performed by data analysts and data scientists. For this project, we will be working to understand the results of an A/B test run by an upscale coffee chain with locations in the western United States of America. A new management team was put in place to reignite growth at their stores by introducing gourmet sandwiches to the menu, along with limited wine offerings. The main goal is to help the management team understand whether the menu changes should be applied to all stores, keep the old menu, or perhaps run the experiment longer to make their business decision. We will perform an A/B test using Alteryx tools and different analysis concepts seen through the course.

**Data:** Through this project we will work with data presented below

- round-roaster-stores.csv - This file contains store information for each Round Roaster store in the USA.
- treatment-stores.csv - This file contains store information for each store that offered the new menu items.
- round-roaster-transactions.zip - This file contains transaction level information for all of Round Roaster's stores.

## Step 1: Plan Your Analysis

*To perform the correct analysis, you will need to prepare a data set. (500 word limit)*
*Answer the following questions to help you plan out your analysis:*

1. **What is the performance metric you'll use to evaluate the results of your test?**
   **Answer 01**: The performance metric we will use to evaluate our AB test results is the total profit growth which is represented by 'Gross_Margin' in our dataset. An increased marketing budget should be justified by at least 18% increase in profit growth compared to the comparative period while compared to the control stores.
2. What is the test period?

**Answer 02**: The test period is 12 weeks, from April 29th, 2016 to July 21st, 2016.

3. At what level (day, week, month, etc.) should the data be aggregated?

**Answer 03**: The data should be aggregated at weekly level.

## Step 2: Clean Up Your Data

*In order to prepare our data for next steps and matching treatment and control units we should clean up our data by aggregating the transaction data to weekly level and applying filter on the appropriate data ranges. At first, we have combined* 'round-roaster-stores' and 'round-roaster-transactions' datasets, as an A/B test requires at least 52 weeks of data added to the 12 weeks to calculate trend and seasonality and 12 weeks for the test duration we get a total of 76 weeks of data. Then 'treatment_stores' dataset is introduced in order to create a list of control and treatment stores. During the cleaning step we have created three new variables 'Week', 'Week_start' and 'New_product_flag' as *in the Alteryx workflow below.*

The cleaning process results are represented by two datasets **'store_weekly_trafic'** and **'store_list'.** along the rest of our A/B test we will work with these datasets.

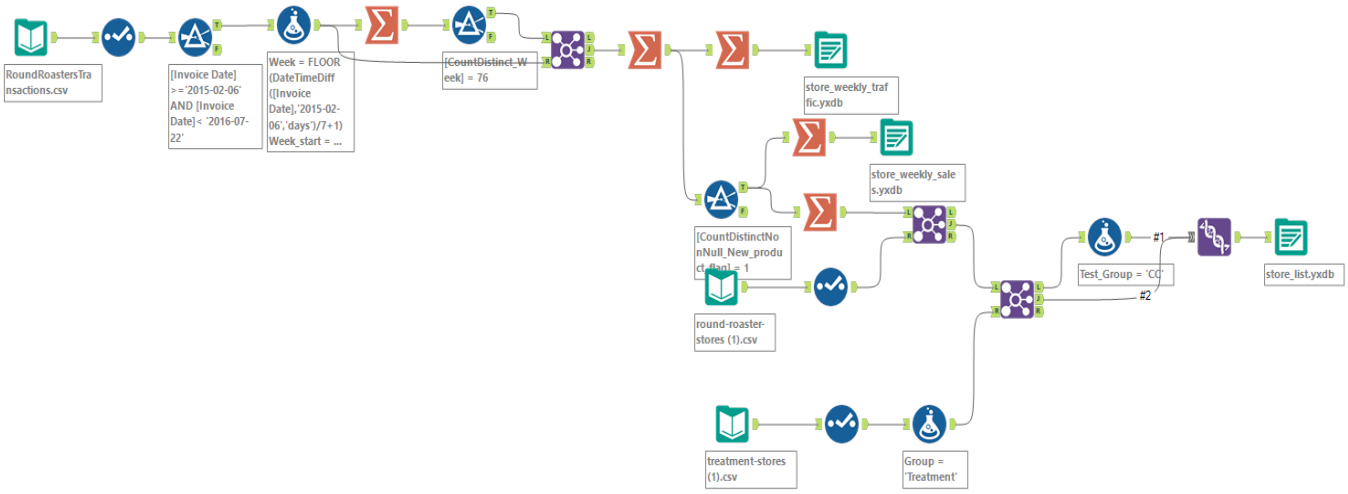


**Figure 01: Cleaning data process workflow with Alteryx**

## Step 3: Match Treatment and Control Units

*In this step, you should create the trend and seasonality variables, and use them along with you other control variable(s) to match two control units to each treatment unit. Note: Calculate the number of transactions per store per week to calculate trend and seasonality.*

*Apart from trend and seasonality…*

1. What control variables should be considered? Note: Only consider variables in the RoundRoastersStore file.

   **Answer 01**: The 'AvgMonthSales' variable should be considered a constant control variable through our A/B test. Also we maybe can use 'Sq_Ft' as a control variable, these choices should be justified by a correlation analysis.

2. What is the correlation between each potential control variable and your performance metric?

   **Answer 02**: The 'AvgMonthSales' control variable selected in the previous question is justified by the Pearson correlation analysis result shown below, since this feature is highly correlated with our performance metric 'Gross.Margin' with a coefficient of determination of 0.79. Also, by looking at p-values, we can say that have statistical significance to work with this feature as a control variable. In the other hand we won't work with 'Sq_Ft' as a control variable, since it has a negative weak correlation with the performance metric.

Layout

**Pearson Correlation Analysis**

*Full Correlation Matrix*

| | Sum_Sum_Gross.Margin | Sq_Ft | AvgMonthSales |
|---|---|---|---|
| Sum_Sum_Gross.Margin | 1.000000 | -0.019345 | 0.790358 |
| Sq_Ft | -0.019345 | 1.000000 | -0.046967 |
| AvgMonthSales | 0.790358 | -0.046967 | 1.000000 |

*Matrix of Corresponding p-values*

| | Sum_Sum_Gross.Margin | Sq_Ft | AvgMonthSales |
|---|---|---|---|
| Sum_Sum_Gross.Margin | | 5.1796e-02 | 0.0000e+00 |
| Sq_Ft | 5.1796e-02 | | 2.3119e-06 |
| AvgMonthSales | 0.0000e+00 | 2.3119e-06 | |

**Figure 02: Pearson Correlation Analysis**

3. What control variables will you use to match treatment and control stores?

**Answer 03**: Added to seasonality and trend, we will also use 'AvgMonthSales' as control variables to match treatment and control stores.

The figure below show the Alteryx workflow performed in order to match the control store to the treatment stores, we have used 12 periods to calculate the seasonality and trend with April 29th 2016 as the start date, to finally produce 'control_treatment_pairs' data which we will use to perform the AB analysis in the next step.

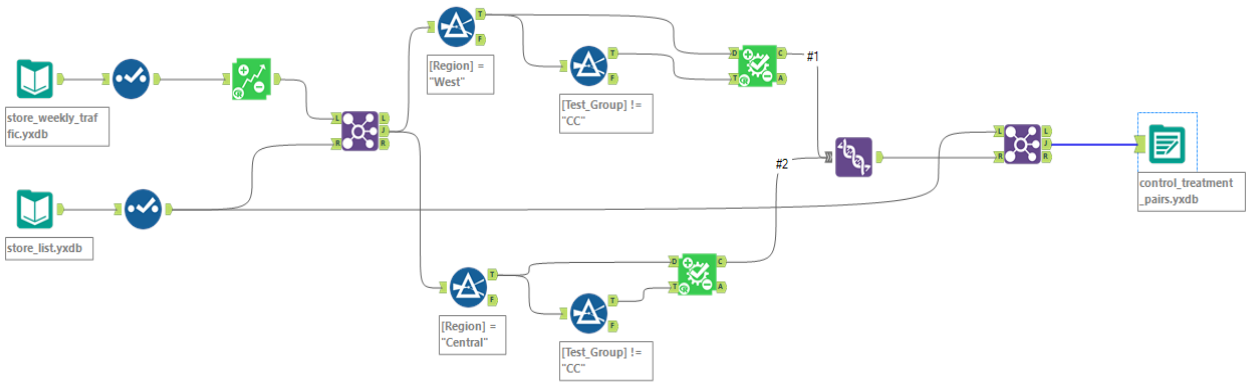


**Figure 03: Match control to treatment stores Alteryx workflow**

4. Fill out the table below with your treatment and control stores pairs:

| Treatment Store | Control Store 1 | Control Store 2 |
|---|---|---|
| 1664 | 1857 | 7484 |
| 1675 | 2114 | 8562 |
| 1696 | 1964 | 7584 |
| 1700 | 1508 | 7384 |
| 1712 | 7284 | 8212 |
| 2288 | 9081 | 12069 |
| 2293 | 11568 | 12219 |
| 2301 | 10018 | 10468 |
| 2322 | 2409 | 3102 |
| 2341 | 2333 | 11368 |

## Step 4: Analysis and Writeup

*Conduct your A/B analysis and create a short report outlining your results and recommendations. (250 words limit)*

*Answer these questions. Be sure to include visualizations from your analysis:*

Finally, in this part we will perform the AB analysis using the **'control_treatment_pairs'**, **'store_weekly_trafic'** datasets produced in previous steps and the AB testing Alteryx tools.

The Alteryx workflow for this part is presented below in figure 04.

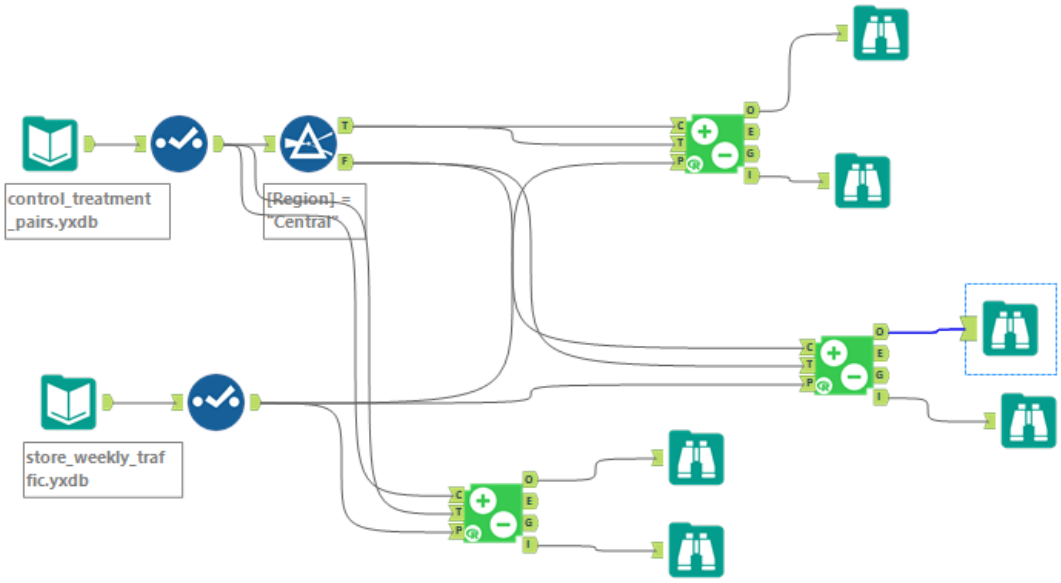


**Figure 04: AB Analysis Alteryx workflow**

We have applied a filter tool for 'Region' = 'Central', in order to get the lifts for each region (AB Analysis tool connected to True lead to the central region lift, while False values produce the west region lift), and the third AB Analysis tool gives us both regions combined lift. Whatever, we should use 'Gross_Margin' as the performance metric.

The results of the AB analysis for each region and the overall combined results are represented in the figures below.

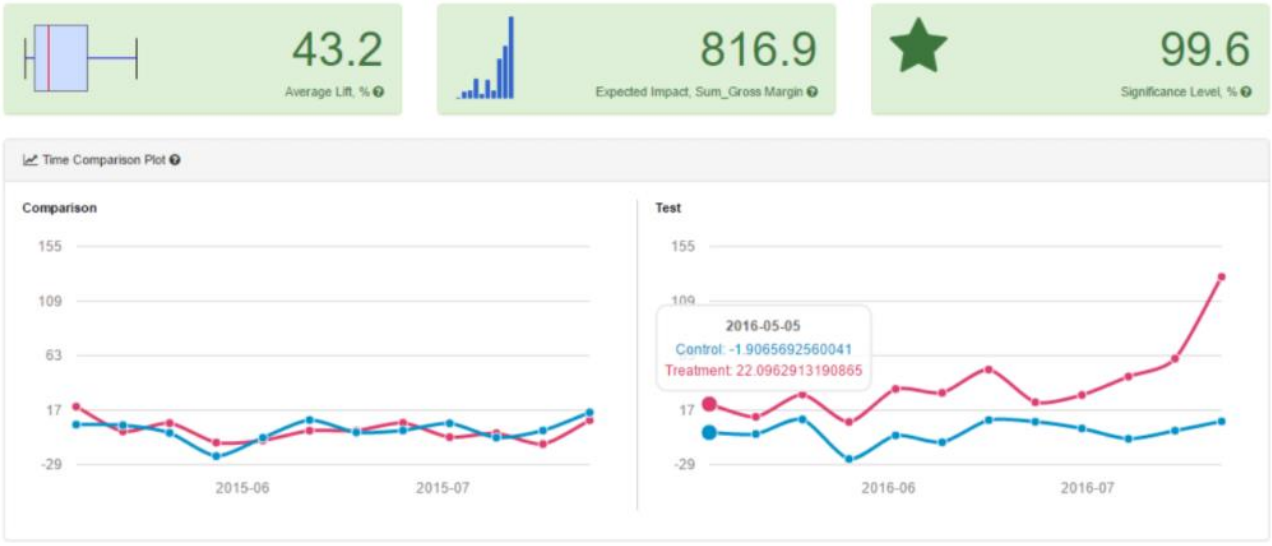


**Figure 05: AB Analysis result for the 'Central' region**

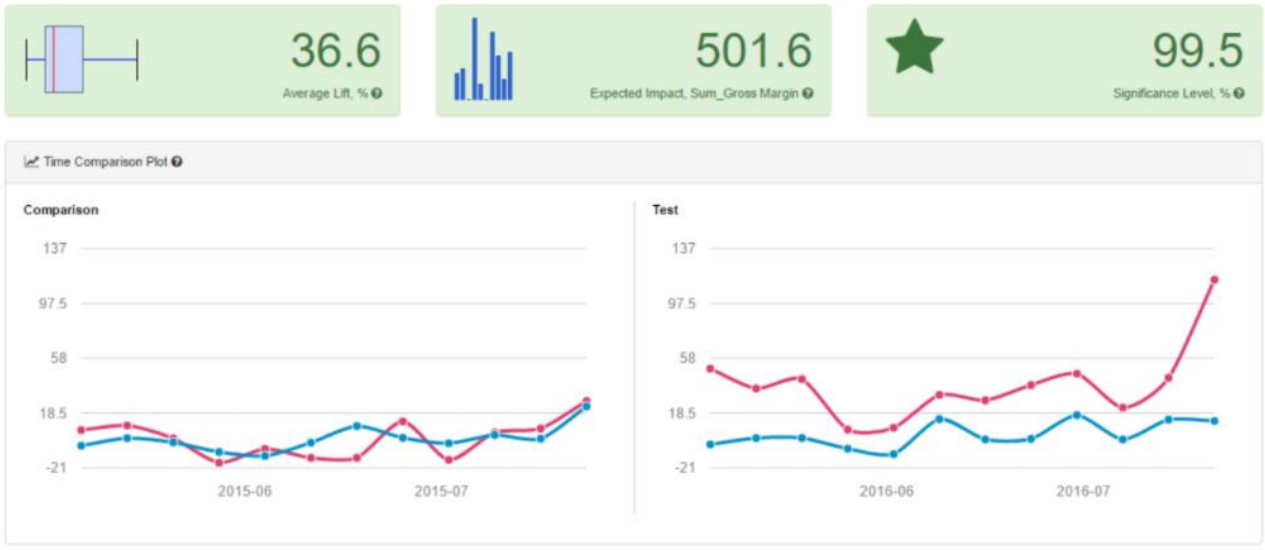


**Figure 06: AB Analysis result for the 'West' region**

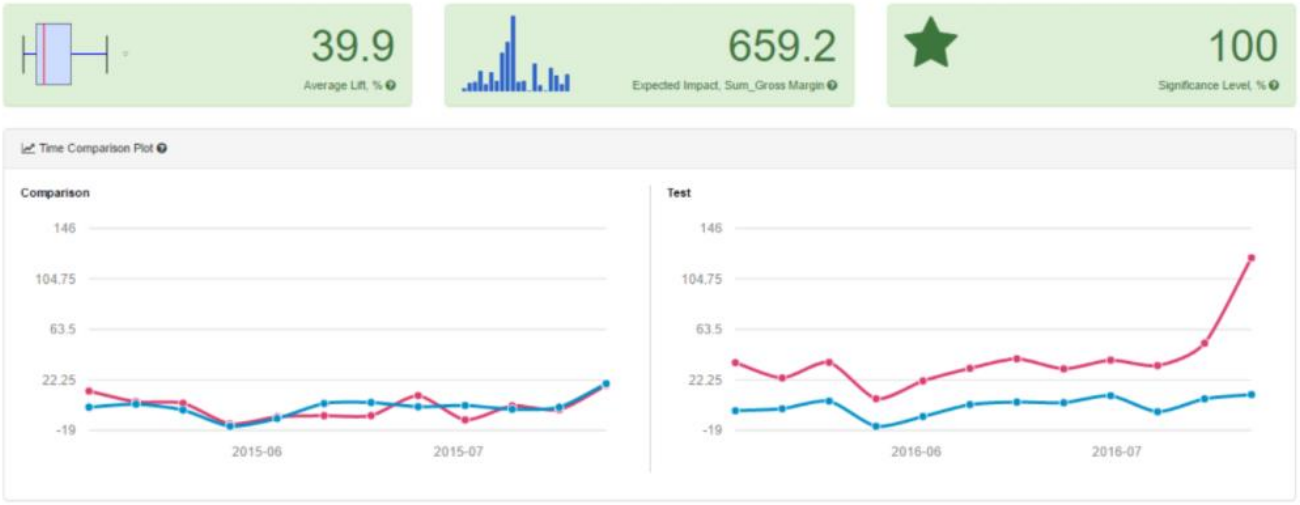


**Figure 07: AB Analysis result for the 'Central' & 'West' regions combined**

1. What is your recommendation - Should the company roll out the updated menu to all stores?

**Answer 01**: The company should roll out the updated new menu for all their chain stores.

2. What is the lift from the new menu for West and Central regions (include statistical significance)?

**Answer 02**:

- The lift from the new menu for Central region is 43.2% with a statistical significance of 99.6%.
- The lift from the new menu for West region is 36.6% with a statistical significance of 99.5%.

3. What is the lift from the new menu overall?

**Answer 03**: The lift from the new menu overall is 39.9% with a statistical significance of 100%.