Project: A/B Test a New Menu Launch

The Business Problem
Round Roasters is an upscale coffee chain with locations in the western United States of America. The past few years have resulted in stagnant growth at the coffee chain, and a new management team was put in place to reignite growth at their stores.

The first major growth initiative is to introduce gourmet sandwiches to the menu, along with limited wine offerings. The new management team believes that a television advertising campaign is crucial to drive people into the stores with these new offerings.

However, the television campaign will require a significant boost in the company's marketing budget, with an unknown return on investment (ROI). Additionally, there is concern that current customers will not buy into the new menu offerings.

To minimize risk, the management team decides to test the changes in two cities with new television advertising. Denver and Chicago cities were chosen to participate in this test because the stores in these two cities (or markets) perform similarly to all stores across the entire chain of stores; performance in these two markets would be a good proxy to predict how well the updated menu performs.

The test ran for a period of 12 weeks (2016-April-29 to 2016-July-21) where five stores in each of the test markets offered the updated menu along with television advertising.

The comparative period is the test period, but for last year (2015-April-29 to 2015-July-21).

You've been asked to analyze the results of the experiment to determine whether the menu changes should be applied to all stores. The predicted impact to profitability should be enough to justify the increased marketing budget: at least 18% increase in profit growth compared to the comparative period while compared to the control stores; otherwise known as incremental lift. In the data, profit is represented in the *gross_margin* variable.

You have been able to gather three data files to use for your analysis:

- Transaction data for all stores from 2015-January-21 to 2016-August-18
- A listing of all Round Roasters stores
- A listing of the 10 stores (5 in each market) that were used as test markets.

Step 1: Plan Your Analysis

To perform the correct analysis, you will need to prepare a data set.
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?

Sum_of_gross_margin or profit is used as the performance metric to evaluate whether to introduce gourmet sandwiches and limited wine offerings to reignite growth at Round Roasters. The company desires at least 18% increase in profit growth when comparing the test results to the comparative period.

2. What is the test period?

A period of 12 weeks (April 29th, 2016 to July 21st, 2016) is the test period.

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

Data should be aggregated at the weekly level.

Step 2: Clean Up Your Data

RoundRoasterTransactions and **Round-Roaster-Stores** datasets are joined. 76 weeks of data from February 6, 2015 to July 21st, 2016 is collected for all stores. The A/B test requires 52 weeks of historical data plus the minimum of 12 weeks needed to calculate trend (64-weeks total prior to the test start date) and for the period of testing each. A 12-week period is used instead of 6-weeks because the test was only conducted for 12 weeks.

The data is aggregated at the weekly level so *the_week*, *week_begin*, *week_end*, and *new_product_flag* are added to calculate the weekly store traffic and gross margin per store. A **Treatment_Store** file is then introduced to form a list of control and treatment stores.

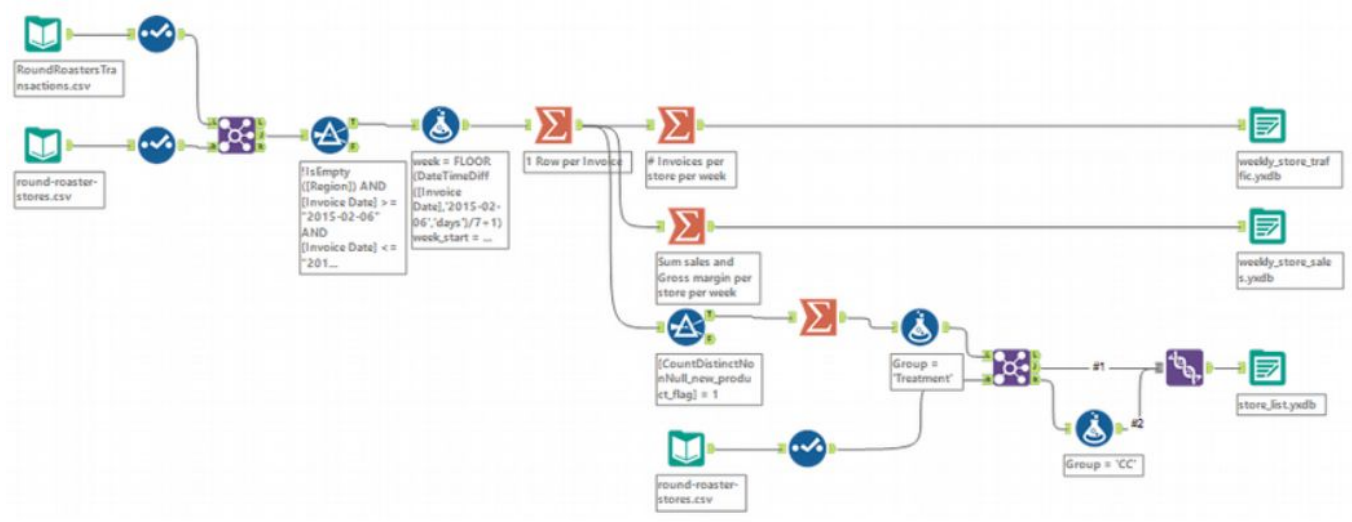


Figure 1: Alteryx Workflow to clean up data

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.

Two control variables to consider are *Avg_Month_Sales* and *Square_Feet*.

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

An association analysis is conducted. The analysis indicates that *Avg_Month_Sales* has high correlation of 0.99 with the performance metric of *Sum_of_Gross_Margin*. *Square_Feet* is discarded for its poor correlation of -0.02 with the performance metric.

Pearson Correlation Analysis

Full Correlation Matrix

	AvgMonthSales	Sum_Gross.Margin
AvgMonthSales	1.00000	0.98822
Sum_Gross.Margin	0.98822	1.00000

Figure 2: Pearson Correlation Analysis for testing Avg_Month_Sales as control variable

Pearson Correlation Analysis

Full Correlation Matrix

	Sq_Ft	Sum_Gross.Margin
Sq_Ft	1.000000	-0.020353
Sum_Gross.Margin	-0.020353	1.000000

Figure 3: Pearson Correlation Analysis for testing square footage as control variable

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

Based on the correlation analysis, *Avg_Month_Sales* will be used together with Trend and Seasonality to match treatment and control stores.

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

Treatment Store	Control Store 1	Control Store 2
1664	7162	8112
1675	1580	1807
1696	1964	1863
1700	2014	1630
1712	8162	7434
2288	9081	2568
2293	12219	9524
2301	3102	9238
2322	2409	3235
2241	12536	2383

Figure 4: Treatment and Control Stores Pairing

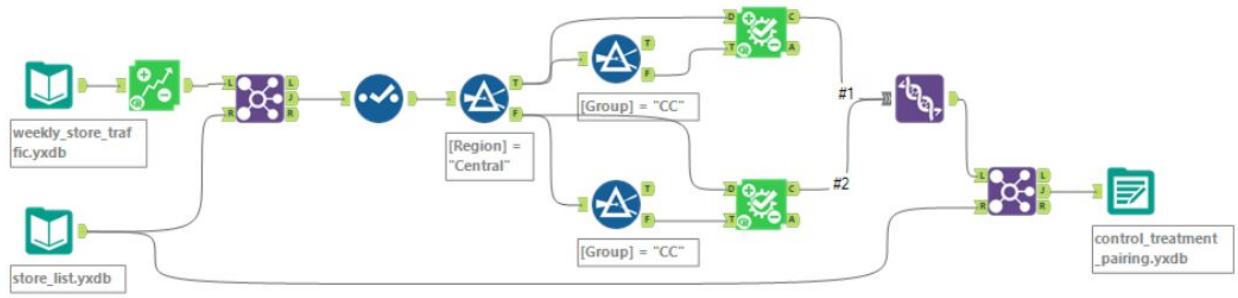


Figure 5: Alteryx Workflow for treatment and control store pairs

Step 4: Analysis and Writeup

Conduct your A/B analysis and create a short report outlining your results and recommendations. Be sure to include visualizations from your analysis:

1. What is the recommendation-should the company release updated menu to all stores?

Round Roasters should release the updated menu to all stores. The expected increase in gross margin exceeds 18% requirement as the lift for both Central Region and West Region are at 43.5% and 37.9% respectively.

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

lift for West region: 37.9% statistical significance: 99.5%
lift for Central region: 43.5% statistical significance: 99.6%

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

The lift from new menu overall is 40.7% with a statistical significance of 100.0%.

West Region

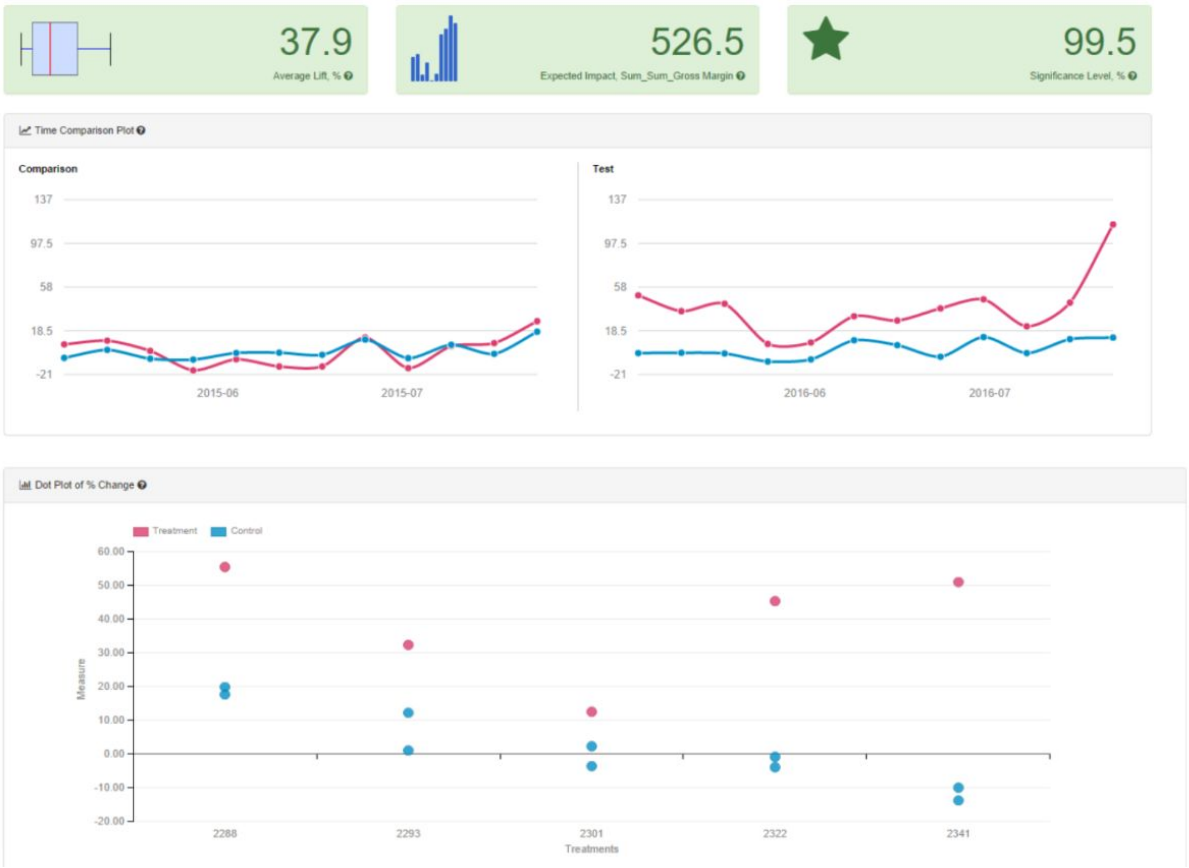


Figure 6: A/B test for West Region

Central Region

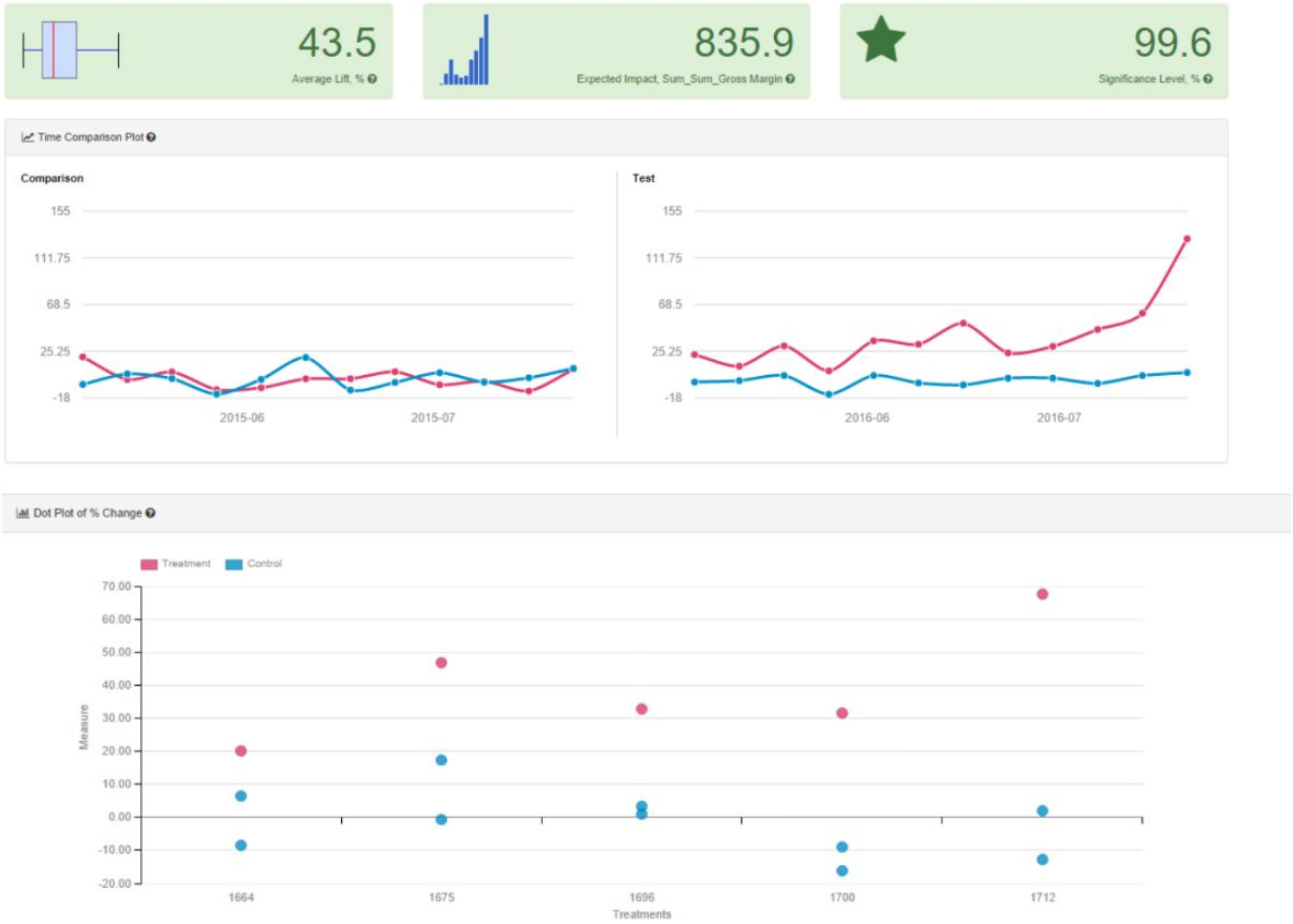
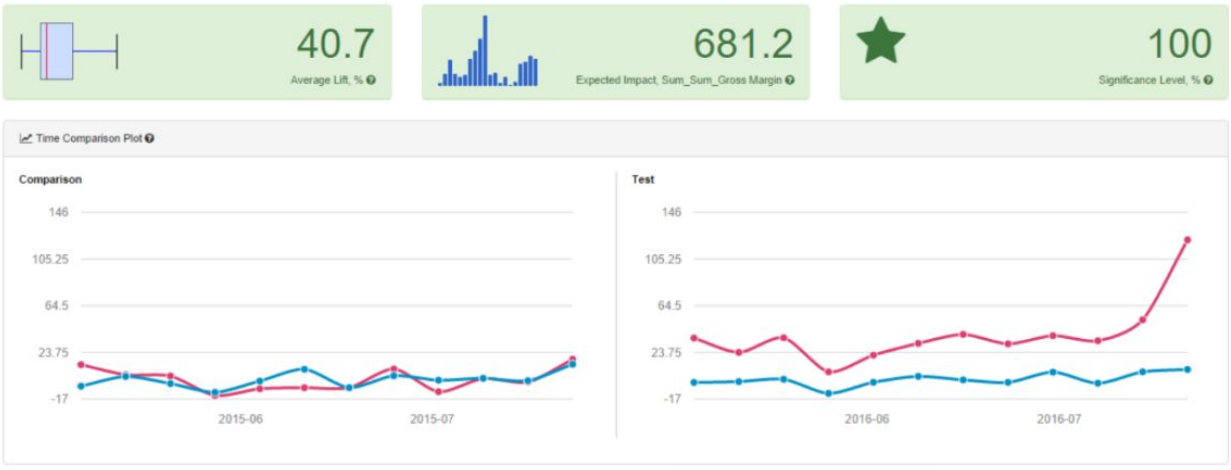


Figure 7: A/B test for Central Region

Overall Region



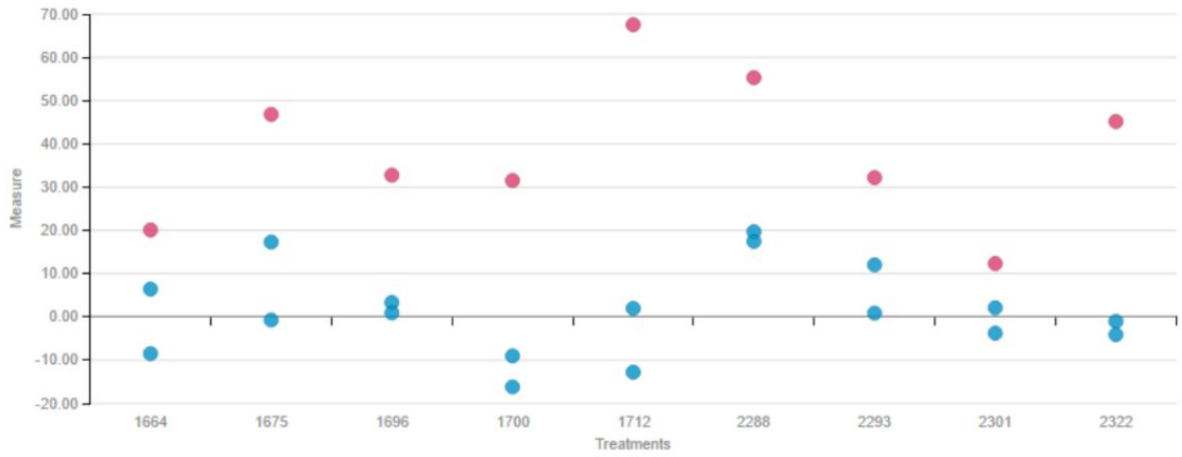


Figure 8: A/B test for Overall Region

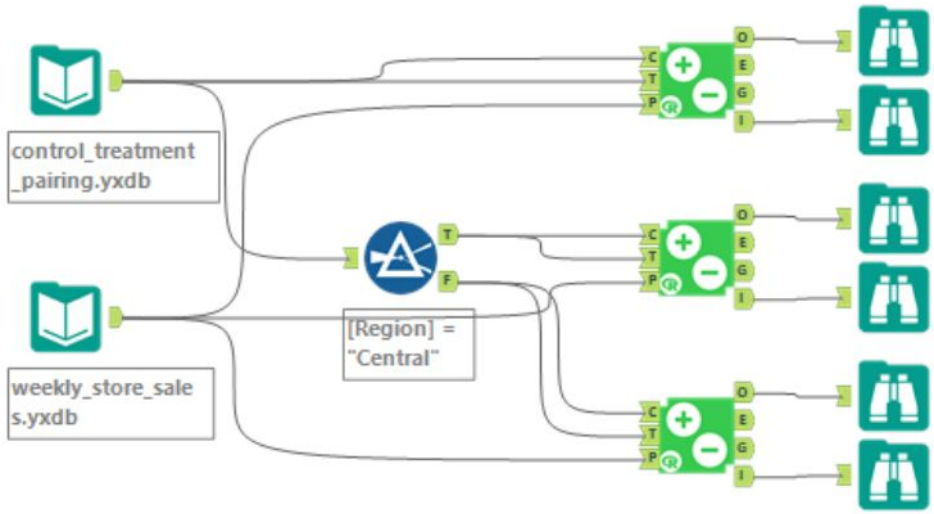


Figure 9: Alteryx Workflow for A/B testing