Project 4: A/B Test for a New Menu Launch

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_marginvariable.

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 for Analysis

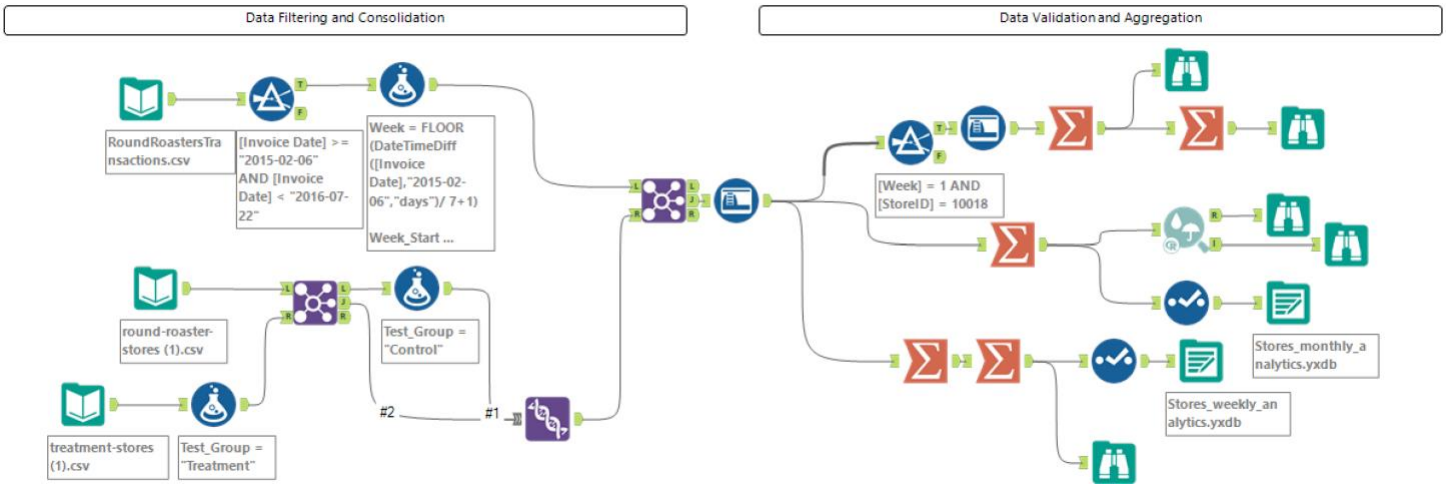
1. What is the performance metric you'll use to evaluate the results of your test?

To justify the increased marketing budget: at least 18% increase in gross_maring (profit) growth compared to the comparative period while compared to the control stores (the incremental lift).

2. What is the test period? It is 12 weeks from 2015-April-29 to 2015-July-21.
3. At what level (day, week, month, etc.) should the data be aggregated? Week level.

Step 2: Data Clean Up

First the transaction data is filtered on the period of 2015-April-29 to 2015-July-21 and the week numbers are calculated, where 2015-April-29 is on the 1st week. Store list and treatment store list is also consolidated to one file, where it is marked if it is a Control or Treatment store. After that data is summarized on weekly and monthly basis and exported for A/B Analysis.



Step 3: Match Treatment and Control Units

1. What control variables should be considered? Since A/B controls using numeric measures, the potential variables could be: StoreID. Sq_Ft. AvgMonthSales, PostalCode, Latitutde, Longitude, Current Timezone Offset.

   It is **Sq_ft** and **AvgMonthSales** was chosen. The other variables are irrelevant for Gross margin: StoreID, PostalCode, Latitutde, Longitude, Current Timezone Offset.

2. What is the correlation between your each potential control variable and your performance metric? AvgMonthSales has strong correlation (0.99) to Gross_Margin, while Sq_Ft shows only weak correlation (-0.025)

Pearson Correlation Analysis

Full Correlation Matrix

	Sum_Gross.Margin	AvgMonthSales	Sq_Ft
Sum_Gross.Margin	1.000000	0.990982	-0.024255
AvgMonthSales	0.990982	1.000000	-0.046967
Sq_Ft	-0.024255	-0.046967	1.000000

Matrix of Corresponding p-values

	Sum_Gross.Margin	AvgMonthSales	Sq_Ft
Sum_Gross.Margin		0.00000	0.78168
AvgMonthSales	0.00000		0.59138
Sq_Ft	0.78168	0.59138	

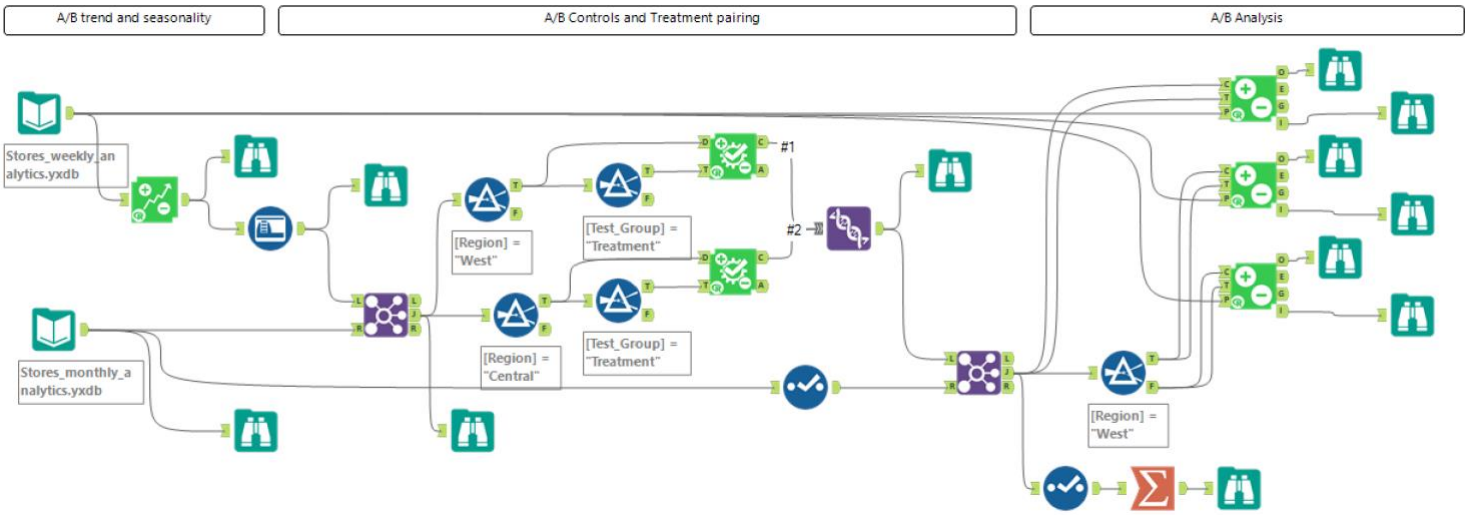
3. What control variables will you use to match treatment and control stores? On the top of Trend and Seasonality, the AvgMonthSales is used as control variable, as that had strong correlation to Gross Margin.

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	1863	1964
1700	1630	2014
1712	7434	8162
2288	2568	9081
2293	9524	12219
2301	3102	9238
2322	2409	3235
2341	2383	12536

Step 4: Analysis and Conclusion

The weekly store statistics from the previous section is used for A/B trend and seasonality calculations, which is then, together with the monthly statistics from the previous section is used for A/B Controls and Treatment pairing. Based on these results, A/B analysis is done to calculate the Average lift and Significance as per region and overall.

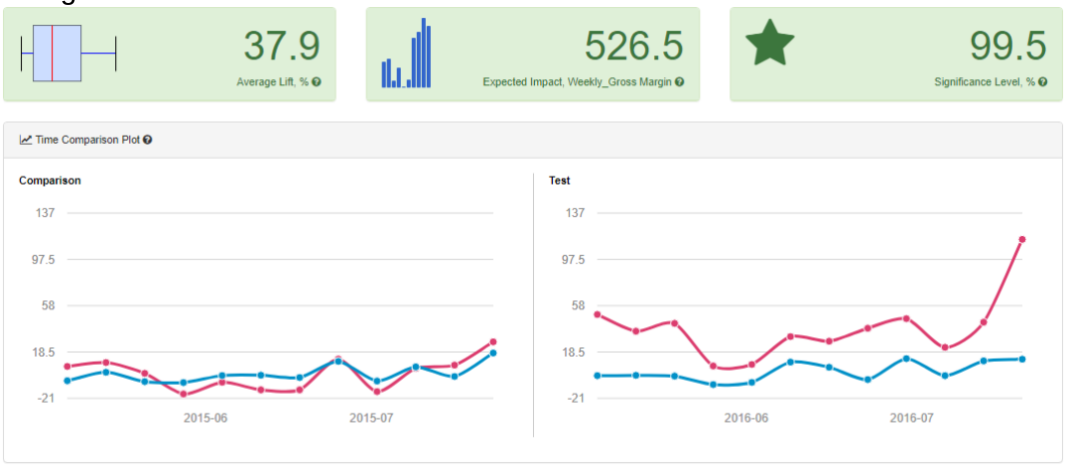


1. What is your recommendation - Should the company roll out the updated menu to all stores?

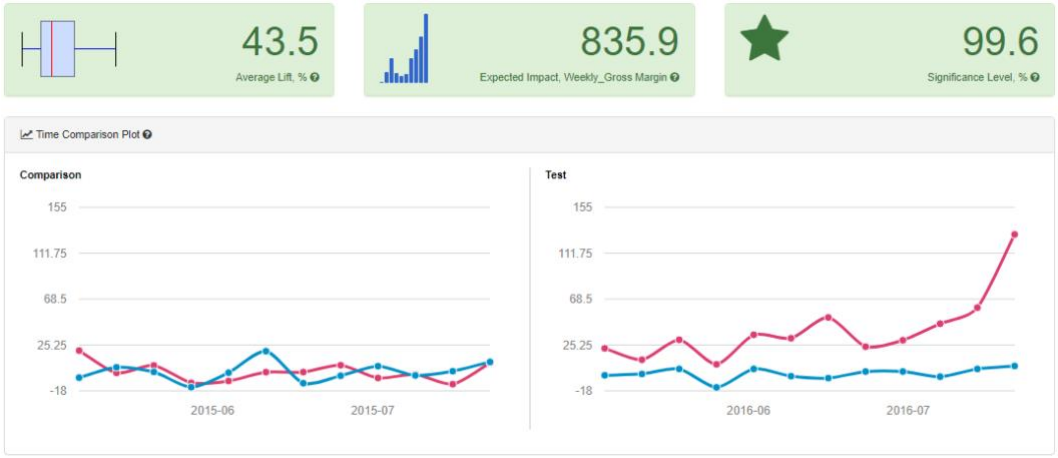
While Central region shows better Average lift (43.5% vs the West region's 37.9%), the Overall average lift is 40.7%, which is well above the minimum 18% increase set in the Plan analysis section. Therefore, the company should roll out the updated menu in all stores, as it will safely cover the increased marketing budget.

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

West region - the Average lift is 37.9% (Gross margin increase of approximately 526.5 $/week) at 99.5% Significance.



Central Region - Average lift is 43.5% (Gross margin increase of approximately 835.9 $/week) at 99.6% Significance.



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

Overall, the Average lift is 40.7% (Gross margin increase of approximately 681.2 $/week) at 100% Significance.