Project: Analyzing a Market Test

Step 1: Plan Your Analysis

We have been tasked by a coffee store chain to determine the validity of a new advertising campaign. The new campaign expects to introduce new menu items across all stores across America. We will use analytical techniques to predict potential profits resulting from the introduction of these new items in specific test stores that business has determined to be equivalent to all other stores. The business team has determined that the gain in *Gross Margin* needs to be above 18% in order to be able to justify the advertising costs of the new campaign

For this business approach we utilized AB testing due to no historic data being available for these specific new products. For the purposes of AB testing, ten test stores with the new menu items were setup and data collected for a specific test period. The test stores are separated by two regions, with five in the west region and five in the central regions.

It will be possible to make a recommendation with the limited data by projecting the results from the 'treatment test units' to equivalent 'control units' using *Matched Pair AB Testing.* Match Pairing unlike *Random AB Testing* matches control units to treatments with very specific guidelines. Match Pairing requires specifying a P*erformance Metric* that will represent the lift in profitability while also setting set timelines to keep testing costs within budget. Details for the key metrics are highlighted below:

- Performance Metric: Gross Margin
- Test Period: 12 weeks [April 29th, 2016 to July 21st, 2016]
- Level of data aggregation: Weekly

Step 2: Clean Up Your Data

We start by preparing our datasets to use with the different AB analytical tools in Alteryx. We will prepare our data into 3 sets to effectively use with our *Matched Pair AB Analysis*:

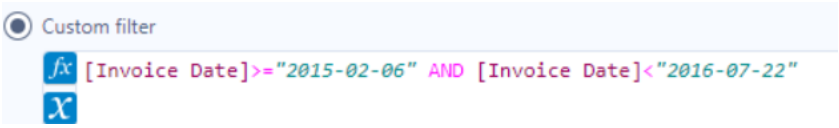
- Weekly Store Traffic data
- Sales data
- Treatment-Control Store List

Weekly Traffic data

We will source the weekly traffic data from the transaction data provided, where each record is a transaction. Each transaction is identified with the specific store and other details pertaining to that transaction.

Record	StoreID	Invoice Number	Invoice Date	SKU	Category	Product	QTY	Size	Gross Margin	Sales
1	10018	16296643	2015-01-21	1043	Espresso	Mocha	3	L	6.7365	14.97
2	10018	16296643	2015-01-21	2001	Pastry	Croissant	1	N/A	1.1	2.75
3	10018	16297717	2015-01-21	1021	Espresso	Espresso	3	S	4.185	8.37

We start by filtering this data to the relevant dates, in line with the AB test dates. In order to have enough data to create the *trend* and *seasonality* variables using the Alteryx *AB Trend* tool, we need to have 76 weeks of data leading to the end of the AB test on July 21st, 2016. The 76 weeks is calculated by adding 52 (for 1 year minimum), plus 12 (for testing period), plus another 12 for the actual testing period taking place from April 26th to July 21st.



Now that we have the relevant dataset, we then aggregate the data into one-week periods, based on the transaction's *Invoice date*. For example, a transaction that took place on '2015-07-18' is categorized as 'Week 24' with 'Week begin' at '2015-07-17' and 'Week end' at '2015-07-23'. Aggregating weekly ensures that any *Null* transactions are excluding before using the Trend tool.

With the transaction dates identified in a specific 'Weekly' bucket, we continue aggregating each individual transaction record to a unique customer transaction grouped by *Transaction ID* (while also tallying up the total sales and total gross margin). The aggregation identifying unique customers will ultimately be used to track number of customers (or foot traffic) per week, to be used to determine the trend and seasonality numbers

We can now create the final *Weekly Traffic Data* with all the inner aggregations complete. Aggregating by Store ID and the Weekly identifiers, we count the transactions to get the weekly foot traffic per store. This is the data that will be used with the Alteryx Trend tool

Record	StoreID	Week	Week_begin	Week_end	Count
1	10018	1	2015-02-06	2015-02-12	308
2	10018	2	2015-02-13	2015-02-19	288
3	10018	3	2015-02-20	2015-02-26	204

Sales Data

The steps leading up to the Sales data are the same as we also sourced it from the same transaction data source as above. We continue from the point where we aggregated weekly and instead of doing a count of transactions, we add up the *Sales* and *Gross Margin* data. Gross margin will be used as the Performance metric for the final analysis. The only other column added to this dataset is the *Region* for each store. This was sourced from a 'list of stores' data set which is also used in the next section to prepare the data set for treatment and control stores.

Record	StoreID	Region	Week	Week_begin	Week_end	Total_Gross_Margin	Total_Sales
1	10018	West	OK: 100%	2015-02-06	2015-02-12	2212.7105	4741.48
2	10018	West	2	2015-02-13	2015-02-19	2164.007	4571.25
3	10018	West	3	2015-02-20	2015-02-26	1560.929	3348.25
4	10018	West	4	2015-02-27	2015-03-05	2342.984	5114.96

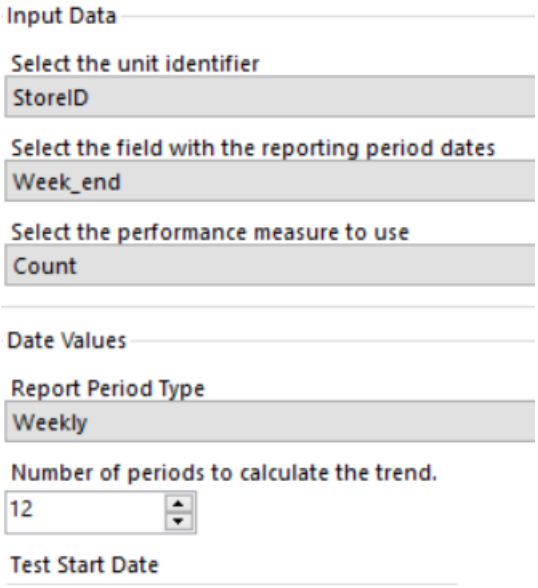
Treatment-Control Store list

The purpose of data being prepared in this step is to label the appropriate stores as either being a 'Treatment' store or a 'Control' store. We use a *join* here to programmatically separate the Treatment stores from the complete list of stores by joining the complete list of total stores to the list of treatment stores. With all the treatment stores separated, we add a column 'Test group' with the value 'Treatment'. We can do the equivalent for the control stores by using the 'L' (or Left) node of the same join, and setting a new field with the exact same name of 'Test group' and setting the value as 'Control'. Two potential predictor variables, 'square foot' and 'Average monthly sales' were left in as fields for every store.

Record	StoreID	Region	Sq_Ft	AvgMonthSales	Test_group
44	1630	Central	1582	17000	Control
45	1662	Central	1471	11000	Control
46	1664	Central	1475	11000	Treatment
47	1675	Central	1472	15000	Treatment

Step 3: Match Treatment and Control Units

We determine the key predictor variables, Trend and Seasonality, from the weekly transaction count, which was aggregated previously in the Weekly Store Traffic dataset. With the dataset attached to the Alteryx *Trend* tool, we identify the key inputs for the tool to make the Trend and Seasonality calculations:



NOTE: Test Start Date (cut off in image above) was set to 'April 29th 2016'

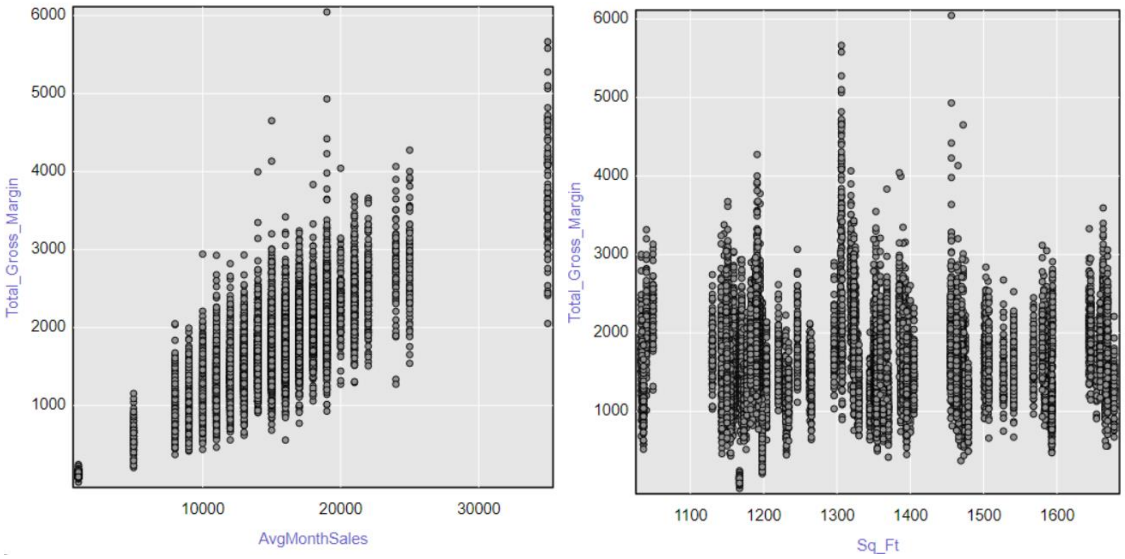
With the *unit, Performance measure,* and date related inputs correctly identified, the Trend tool allocates Trend and Seasonality variables per store.

Record	StoreID	Trend	Seasonality
44	1630	-0.354314	0.004872
45	1662	-0.260686	0.00974
46	1664	0.33986	-0.010523

The Trend and Seasonality values are the ideal numeric measures to determine Treatment and Control pairs. Along with this, we have two other Store related numerical variables that could potentially be added numerical measures. The *Association Analysis* charts below show correlation of store square footage and store monthly average sales to Gross Margin. You can see below that there is no relationship to square footage, while Monthly sales has a strong positive correlation of 0.79. This means we only need to add 'Monthly sales' to the Trend and Seasonal variables to match Treatment and Control units.

Full Correlation Matrix

	Total_Gross_Margin	Sq_Ft	AvgMonthSales	Total_Sales
Total_Gross_Margin	1.000000	-0.019345	0.790358	0.998666
Sq_Ft	-0.019345	1.000000	-0.046967	-0.022036
AvgMonthSales	0.790358	-0.046967	1.000000	0.788317
Total_Sales	0.998666	-0.022036	0.788317	1.000000



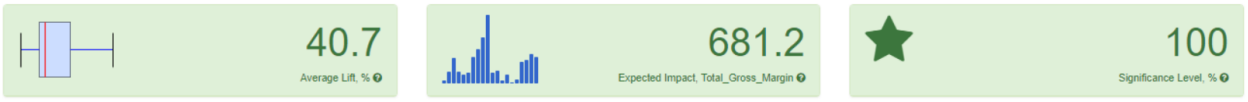
We use the *AB Controls* tool now, to figure out two control unit pairs per treatment unit based on the three numerical control variables. We run the Controls tool separately for the two regions ensuring that the control and treatment matching takes places within the two regions (West and Central), matching corresponding treatment and control stores accordingly (as shown below)

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
2341	12536	2383

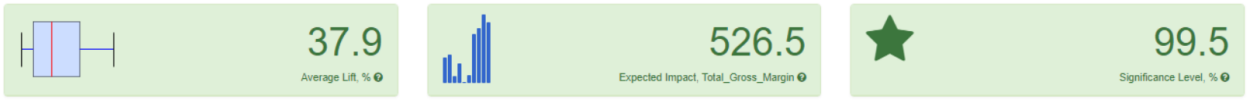
Step 4: Analysis and Writeup

With the Sales data prepared in the first step and the Control-Treatment pairs identified (in the previous step), we use the *AB Analysis* tool to generate the report, by setting the 'Gross Margin' as the *Performance Measure.* For our purposes we created three reports: one per region and a final consolidated report with both regions.

Regions combined

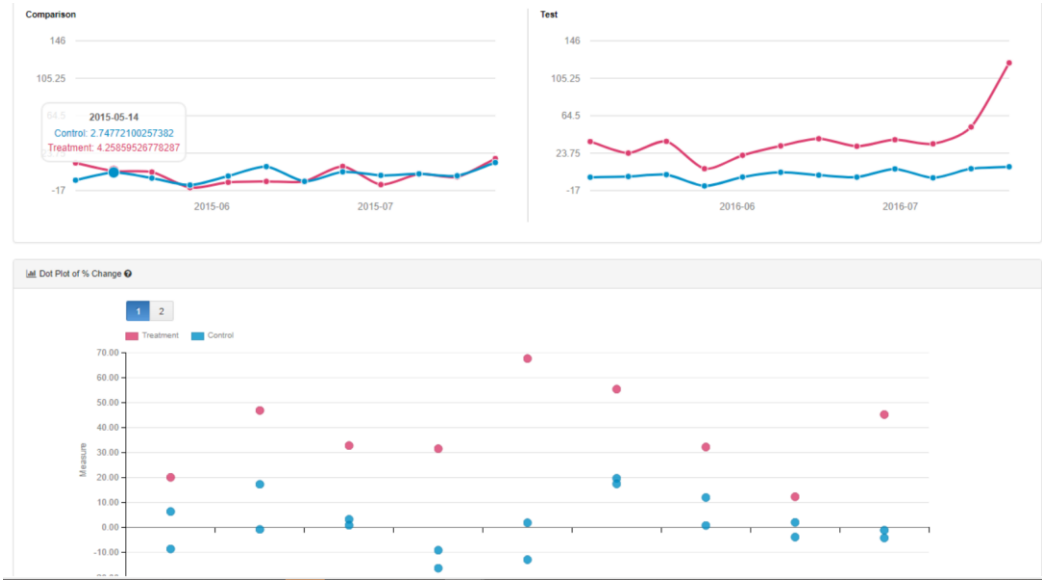


West Region



Central Region

We can see from all three reports that the *Lift* amount for Gross margin is much higher than the required rate of 18%. The Significance level is also above 95% confirming that the Average Lift amounts are statistically significant



Looking at the charts above confirms how significantly the Treatments gross margins are above the Control stores for the equivalent time period. We recommend that the new menu items be rolled out across stores in both regions.