

# Project: Analyzing a Market Test

## Business Issue

*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?*  
Our target variable is the gross\_margin variable since we are concerned with assessing the impact of the variation on profitability. More specifically, we should determine whether the profit growth will result in a 18% increase in the test period relative to the comparative period.
2. *What is the test period?*  
The test period to calculate the trend includes 12 weeks from 2016-April-29 to 2016-July-21.
3. *At what level (day, week, month, etc.) should the data be aggregated?*  
Data should be aggregated at a weekly level since our test period is also being measured in weeks.

## Step 2: Clean Up Your Data

*In this step, you should prepare the data for steps 3 and 4. You should aggregate the transaction data to the appropriate level and filter on the appropriate data ranges. You can assume that there is no missing, incomplete, duplicate, or dirty data. You're ready to move on to the next step when you have weekly transaction data for all stores.*

The cleaning process starts with converting all fields to the correct data type.

After joining the files RoundRoasterTransactions and Round-Roaster-Stores, we notice that the first invoice date field dates back to 2015-01-21. For the project, we are asked to use 12 weeks to calculate trend, so we'll need 64 weeks of data prior to the test start date (52 weeks for a year + 12 weeks to calculate the trend). Since the test lasted for 12 weeks (29<sup>th</sup> April 2016 to 21<sup>st</sup> July 2016), meaning a total 76 weeks of data (52 + 12 + 12 = 76).

We can filter out the above date range in Alteryx by using the expression [Invoice Date]>="2015-02-06" AND [Invoice Date]<="2016-07-21"

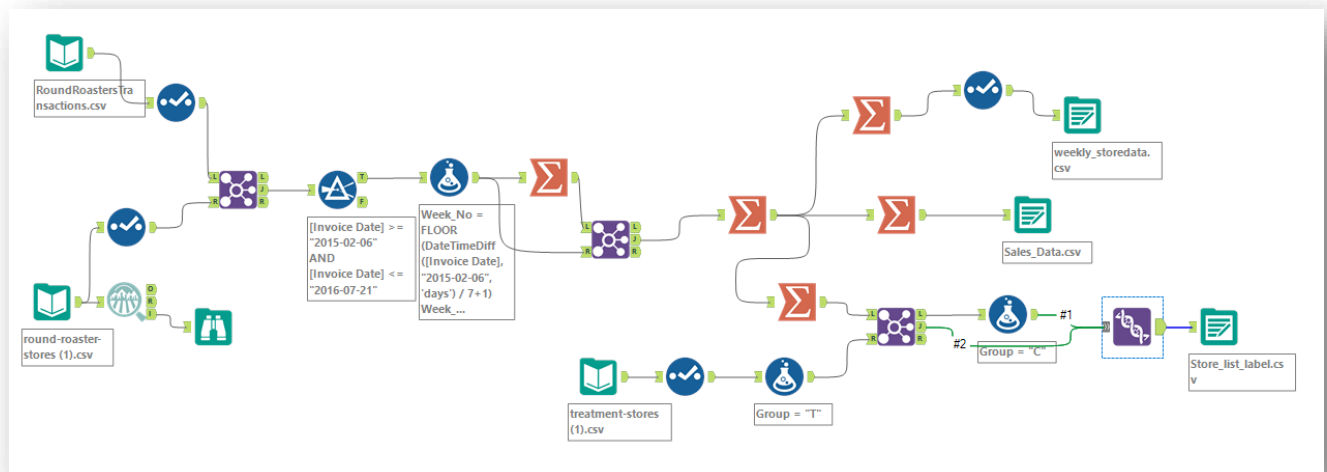
Now we can proceed to aggregate data at a weekly level by creating our temporal variables in 3 steps:

- **Week\_no**  
FLOOR(DateTimeDiff([Invoice Date], "2015-02-06", 'days') / 7+1)
- **Week\_start**  
DateTimeAdd('2015-02-06', 7\*([Week\_No]-1), 'days')
- **Week\_end** – this is the field that we are going to use in the AB Trend Tool.  
DateTimeAdd([Week\_Start], 6, 'days')

To solve our problem, we'll need:

- **Number of weekly invoices as a measure to indicate foot traffic at each store.** We'll use this data with the AB trend tool to calculate trends and seasonal patterns that can be used to build control and treatment pairs.
  - We can obtain this dataset by grouping data by StoreId, Week\_no, Week\_start, Week\_end and by counting the number of invoices.
- Sales data that aggregate the **weekly gross margin by store** to perform the analysis.
  - We can obtain this dataset by grouping data by StoreId, Region, Week\_no, Week\_start, Week\_end while summing for Gross\_Margin and sales figures.
- A complete **list of stores broken down into control and treatment units** that we need to perform the matching process.
  - Starting from the treatment-stores file, we can label the 10 treatment stores, 5 per market (West and Central, respectively) with the formula tool. Afterwards, we can join the treatment stores file to the current workflow and use the formula tool to label control units appearing on the L output of the Join Tool. Lastly, we can union both control and treatment flows that are now grouped into "T" for treatment and "C" for control.

Here below you may find the clean-up workflow:



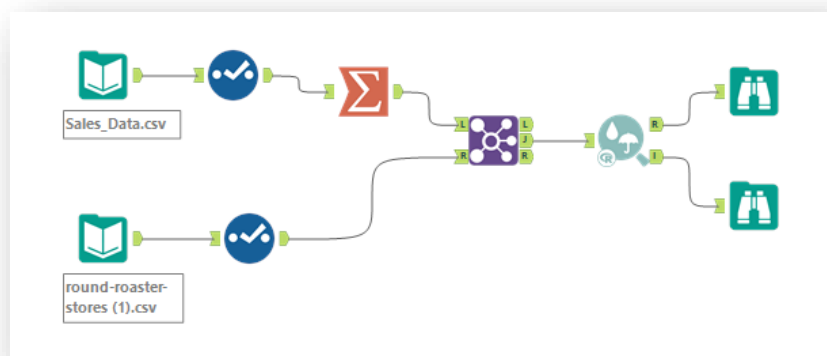
## Step 3: Match Treatment and Control Units

*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.*

We can now take a closer look at the correlation between our target variable (gross\_margin) and the control variables (Sq\_ft and Avg. Monthly Sales) to assess whether they should be considered to build treatment and control pairs. By attaching the Association Tool to the joined Sales\_Data and Round-Roaster-Stores files, we can observe the following results:



## Pearson Correlation Analysis

*Focused Analysis on Field Sum\_Sum\_Sum\_Gross.Margin*

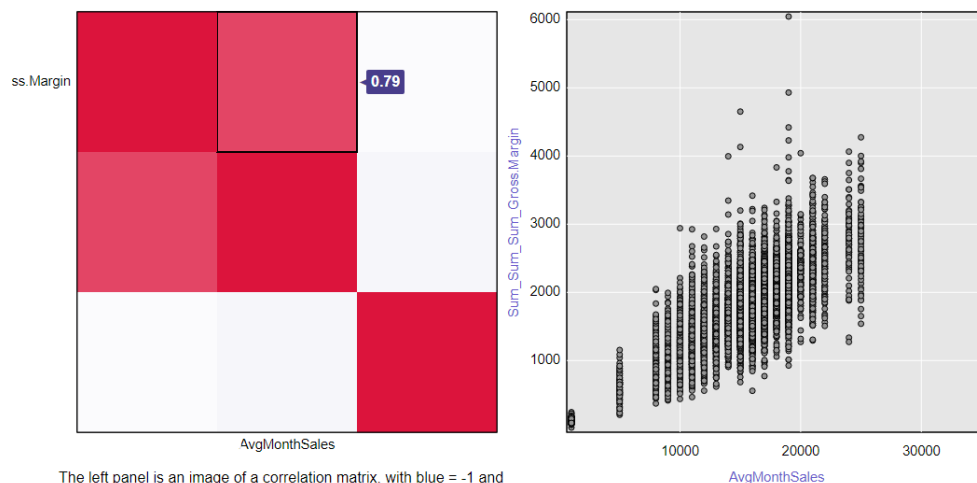
	Association Measure	p-value
AvgMonthSales	0.790358	0.000000 ***
Sq_Ft	-0.019345	0.051796 .

*Full Correlation Matrix*

	Sum_Sum_Sum_Gross.Margin	Sq_Ft	AvgMonthSales
Sum_Sum_Sum_Gross.Margin	1.000000	-	0.790358
Sq_Ft	0.019345	1.000000	-0.046967
AvgMonthSales	-0.019345	0.046967	1.000000

*Matrix of Corresponding p-values*

	Sum_Sum_Sum_Gross.Margin	Sq_Ft	AvgMonthSales
Sum_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	



The left panel is an image of a correlation matrix, with blue = -1 and red = +1. Hover over pixels in the correlation matrix on the left to see the values; click to see the corresponding scatterplot on the right. The variables have been clustered based on degree of correlation, so that highly correlated variables appear adjacent to each other.

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

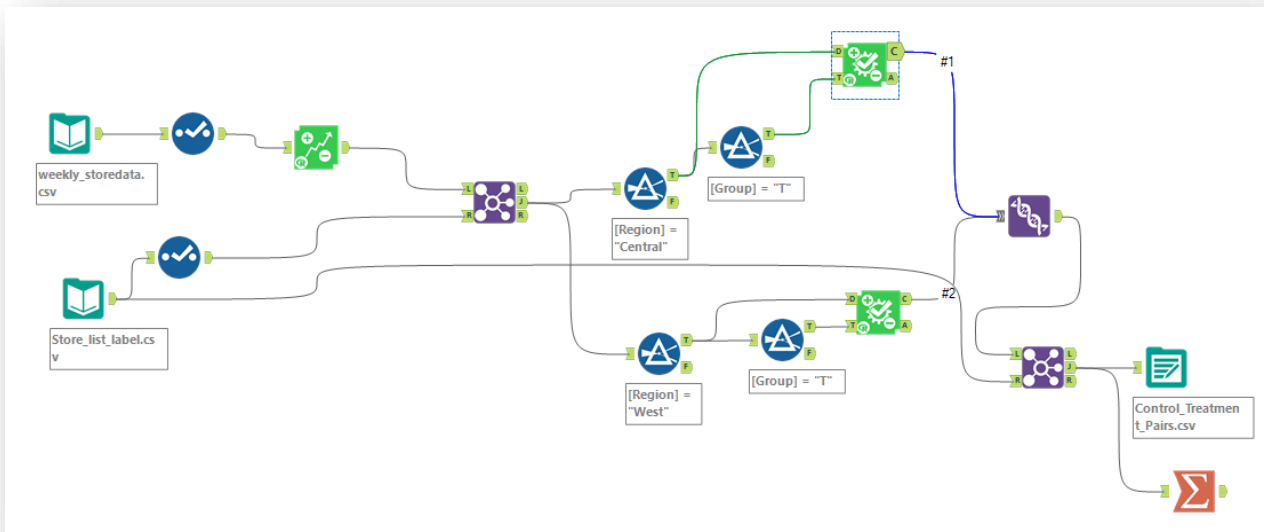
AvgMonthSales is positively correlated with gross margin ( $R^2 = 0.79$ ) and is statistically significant as shown by its p value and significance code. Sq\_ft is negatively and weakly correlated with profit, therefore we are going to include AvgMonthSales as control variable to match control and unit pairs for the time being.

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

We are going to use AvgMonthSales, Trend and Seasonality to perform the matching process.

Moreover, the dataset contains categorical variables such as the regions West and Central, hence we need to match pairs that share this discrete characteristic first by matching treatments to controls for each region separately and by unioning them in a later step.

Here below you may find the pairs-matching workflow:



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

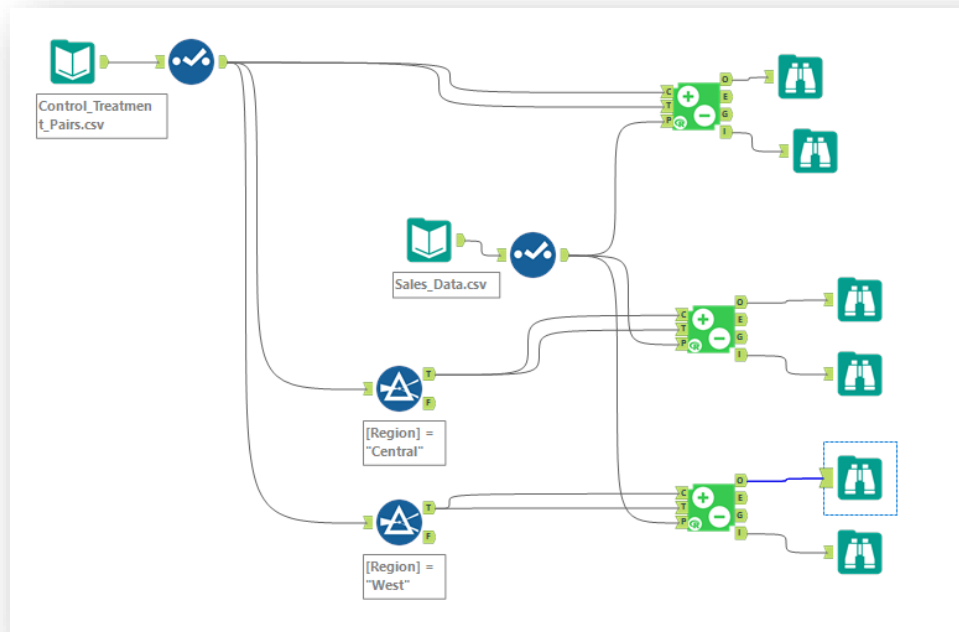
Treatment Store	Control Store 1	Control Store 2
1664	7162	8112
1675	1580	1807
1696	1863	1964
1700	1630	2014
1712	7434	8162
2288	2568	9081
2293	12219	9524
2301	3102	9238
2322	2409	3235
2341	12536	2383

## Step 4: Analysis and Writeup

Conduct your A/B analysis and create a short report outlining your results and recommendations.

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

Here below you may find the analysis workflow:



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

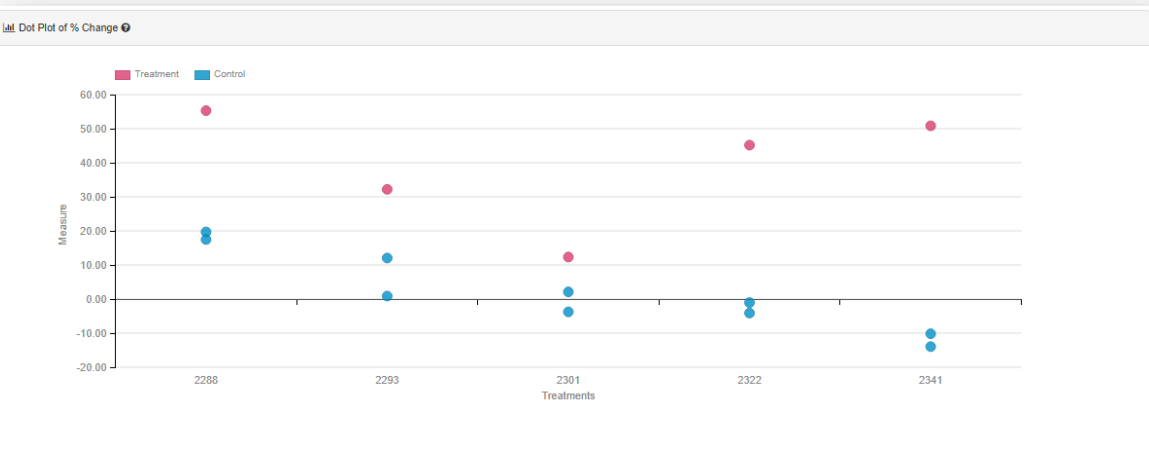
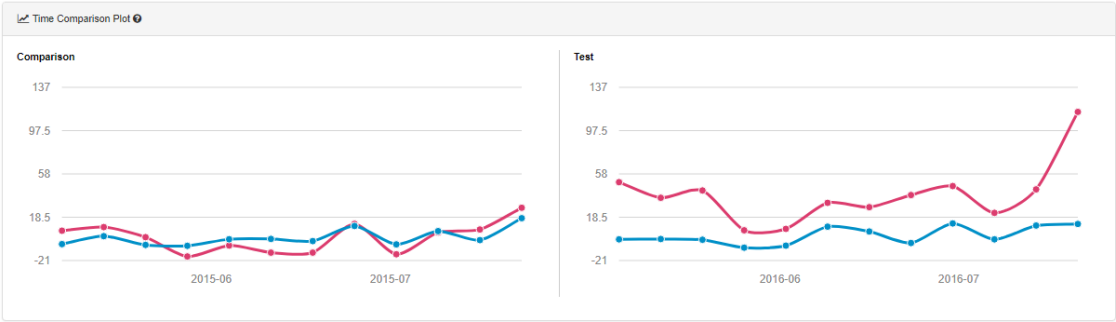
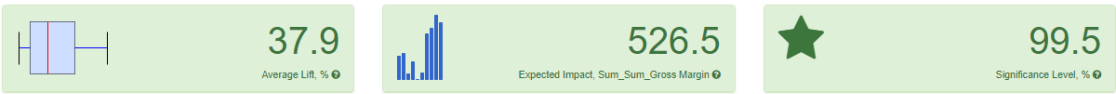
Yes, the company should roll out the updated menu to all stores since the expected incremental lift exceeds the criterium of 18% profit growth. This consideration applies to both the overall lift and to the individual lift per region.

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

As shown on the graph in the next page, the avg. lift from the new menu for the West region is 37.9% per store per week at a significance level of 99.5% while for the Central region is 43.5% per store per week at a significance level of 99.6%. This means that the gross margin exhibits a positive lift and equals, respectively, on average, approximately \$526.5 and \$835.9 per store per week.

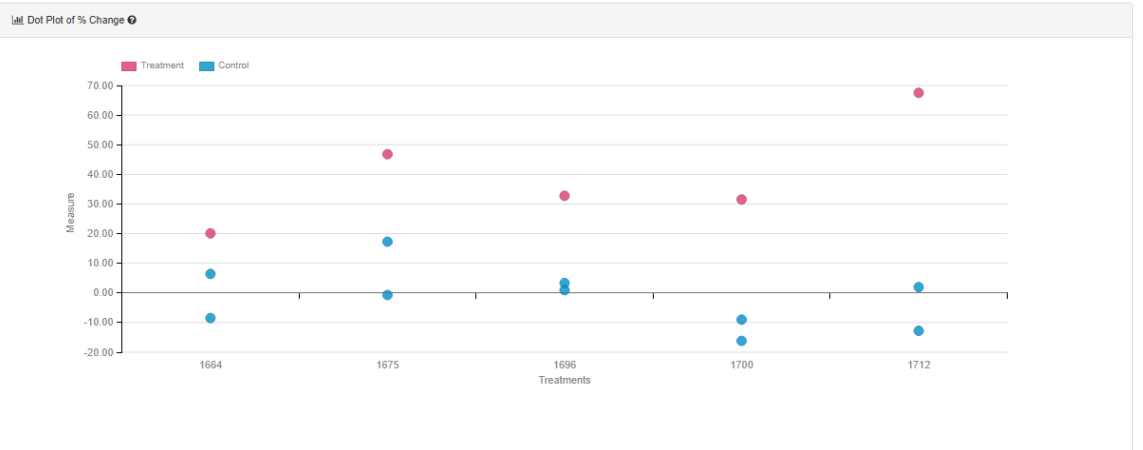
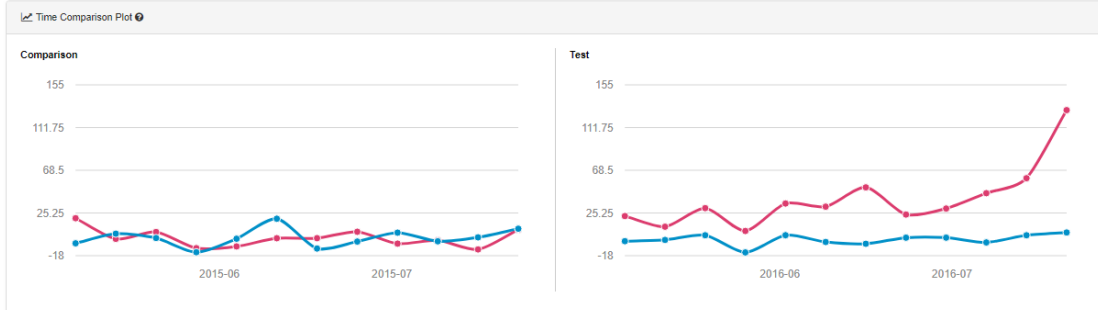
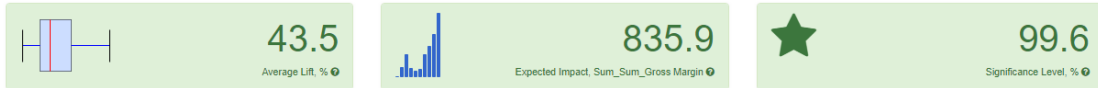
# AB Test Analysis for Sum\_Sum\_Gross Margin

Time: 2021-02-07 15:01:02



## AB Test Analysis for Sum\_Sum\_Gross Margin

Time: 2021-02-07 15:00:36



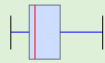
### 3. What is the lift from the new menu overall?

The avg. lift for both regions (West and Central) is also promising: the impact is estimated to be 40.7% at a 100% significance level, meaning a lift of approx. \$681.2 per store per week. Below you may find the analysis extract for further reference.



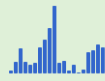
## AB Test Analysis for Sum\_Sum\_Gross Margin

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40.7

Average Lift, %



681.2

Expected Impact, Sum\_Sum\_Gross Margin

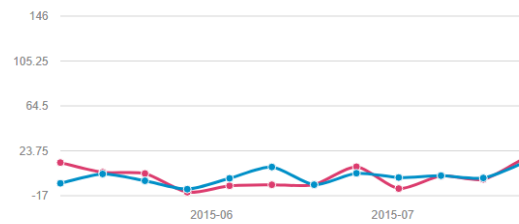


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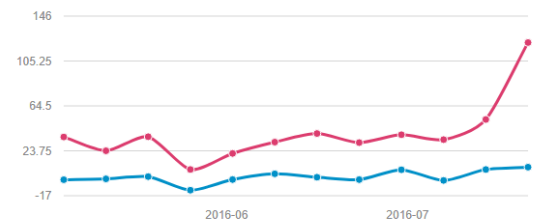
Significance Level, %

Time Comparison Plot

Comparison



Test



Dot Plot of % Change

