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Project: A/B Test a New Launch Menu

Project: Analyzing a Market Test

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?**

   As a business analyst for Round Roasters, a coffee restaurant in the US, I have been asked by the executive team to analyze the results of an experiment they conducted to determine if a new menu should be applied to all stores. Menu changes were tested in two cities, Denver and Chicago, with new television advertising. These cities were chosen to participate in this test because the stores in these two cities perform similarly to all stores across the entire chain of stores. Performance in these two markets (**Central** and **West**) would be a good proxy to predict how well the updated menu performs.

   I need to determine if:

   - The new menu can drive enough sales to offset the cost of marketing the new menu.

   - If the predicted impact to profitability is enough justify the increased marketing budget. There needs to be **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.

   For this project I will:

   - Create a week variable, **week_begin**. For week 1, this would be the test start date (April 29, 2016).

   - Create **trend** and **seasonality** variables to use as control variables in the trend tool. I need at least 52 weeks of data, plus the number of weeks you select in the tool to calculate trend, before the beginning of the test start date.

   - I will use 12 weeks to calculate trend, so I will need 64 weeks of data prior to the test start date. Since the test lasts for 12 weeks, this means you'll need a total 76 weeks of data. **Filter: [Invoice Date] > = "2015-02-06" and [Invoice Date] < "2016-07-22"**

- The **performance metric** for the **AB Trend Tool** is the **invoice count per week** which represent weekly foot traffic. This variable will be created with a summarize tool.

- Three (3) **numeric measures** will be used in the **AB Control Tool** to match treatment and control stores: **Trend, Seasonality,** and **AvgMonthSales.**

- **Weekly_gross_margin** per store will be used in all lift calculations and not total sales. The data has gross margin in it, but I will use a summarize tool to get weekly gross margin per store.

2. **What is the test period?**

   The test ran for a period of 12 weeks, April 29,2016 to July 21, 2016, 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, April 29,2015 to July 21, 2015.

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

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.

For this project, I will:

1. Prepare Data from three raw data files

   ✓ *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.csv* - This file contains transaction level information for

      all of Round Roaster's stores

2. Create three data files:

   Use these two raw data files to create 3 files. These files are:

- ✓ **Weekly store traffic** data for A/B Trend Tool -> Produces our seasonality and trend indices to help us match our treatment and control stores. Test start date is 2016-April-29.
- ✓ **Store list data** for A/B Controls tool -> Produces which control stores to match with our treatment stores along with results from the A/B Trend Tool. The 3 numeric measures that will be used to match treatment and control stores are: Trend, Seasonality, and AvgMonthSales.
- ✓ **Sales data for A/B Analysis tool** -> Produces the final results. Weekly gross margin per store will be used in all lift calculations, not total sales.

3. Use the three data files to match our treatment and control stores to calculate the sales lift.
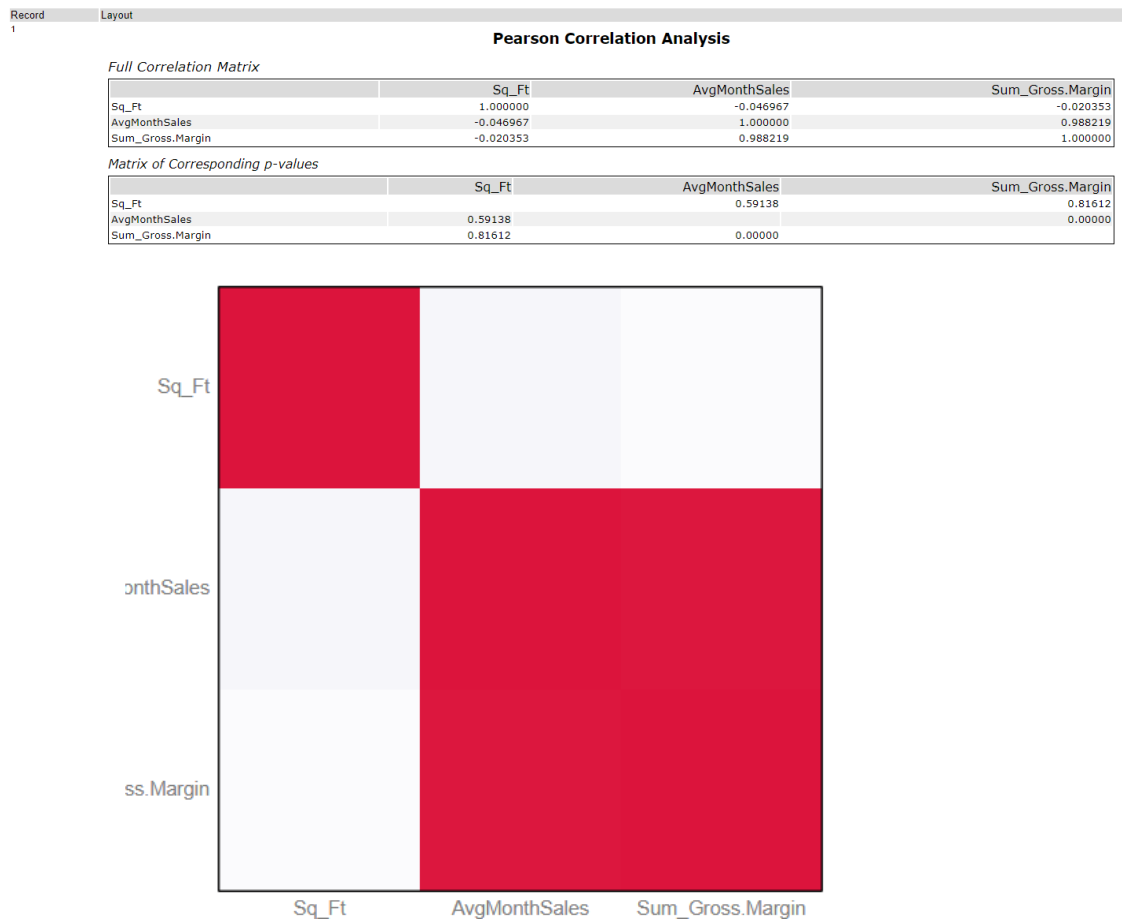
Step 3: Match Treatment and Control Units

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.
   - ✓ AvgMonthSales
   - ✓ Sq. Ft
   - ✓ Location/Region – Two cities/markets were already chosen to test menu changes.

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

   - ✓ I performed an association analysis using the Pearson product-moment correlation measure of association. I selected the following fields: Sq. ft., AvgMonthSales, and Gross margin. The gross margin variable was aggregated by store before running the association analysis tool.

Results: We can see that AvgMonthSales is highly correlated to Sum_Gross_Margin (.988219, P-Value – 0.00000). AvgMonthSales will be controlled for in this experiment.

Pearson Correlation Analysis

Full Correlation Matrix

	Sq_Ft	AvgMonthSales	Sum_Gross.Margin
Sq_Ft	1.000000	-0.046967	-0.020353
AvgMonthSales	-0.046967	1.000000	0.988219
Sum_Gross.Margin	-0.020353	0.988219	1.000000

Matrix of Corresponding p-values

	Sq_Ft	AvgMonthSales	Sum_Gross.Margin
Sq_Ft		0.59138	0.81612
AvgMonthSales	0.59138		0.00000
Sum_Gross.Margin	0.81612	0.00000	

- ✓ Only three states in the RoundRoastersStore file had 15 or more stores. These were CA, CO, and IL. The two markets (**Central** and **West**) are a good proxy to predict how well the updated menu performs. Since there is a linear relationship between region and gross margin, a correlation exist between these two variables.

Plot of Means for Sum_Gross.Margin by Region Levels
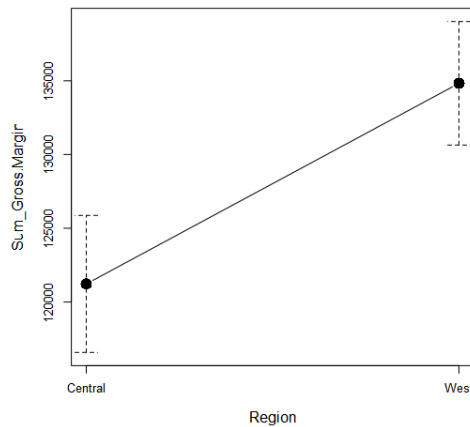
3. **What control variables will you use to match treatment and control stores**? Trend, Seasonality, and AvgMonthSales were used to match treatment and control stores.

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
2341	12536	2383

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:

1. **What is your recommendation - Should the company roll out the updated menu to all stores?**
   I recommend that the company should roll out the new menu to all stores since there is an overall 40.7% lift, which is more than a **18%** incremental lift.

2. **What is the lift from the new menu for West and Central regions (include statistical significance)?** The lift from the new menu for the Central region is 43.5%. The significance level is 99.6%. The average lift as a result the new menu would be 43.5%

per store per week in the Central region or approximately $836 per store per week.

AB Test Analysis for Gross_Margin_Sum

Time: 2019-01-15 16:14:24

	43.5		835.9	⭐	99.6
	Average Lift, %		Expected Impact, Gross_Margin_Sum		Significance Level, %
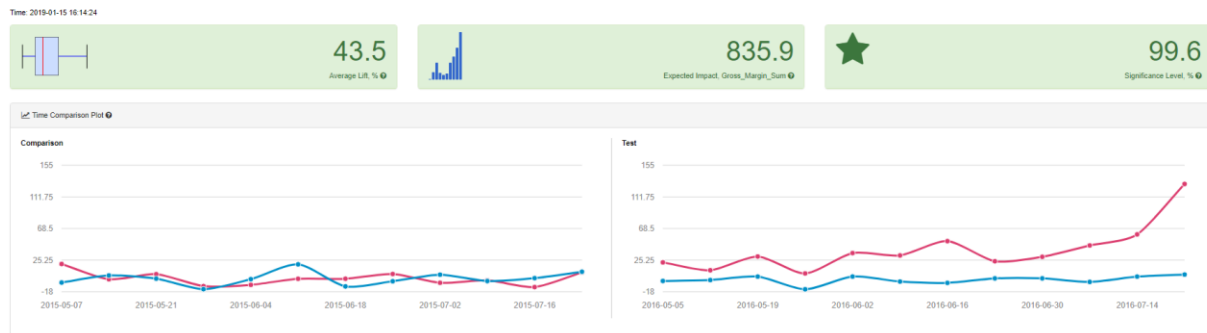
The lift from the new menu for the West region is 37.9%. The significance level is 99.5%. The average lift as a result the new menu would be 37.9% per store per week in the West region or approximately $836 per store per week.

AB Test Analysis for Gross_Margin_Sum

Time: 2019-01-15 16:14:52

	37.9		526.5	⭐	99.5
	Average Lift, %		Expected Impact, Gross_Margin_Sum		Significance Level, %
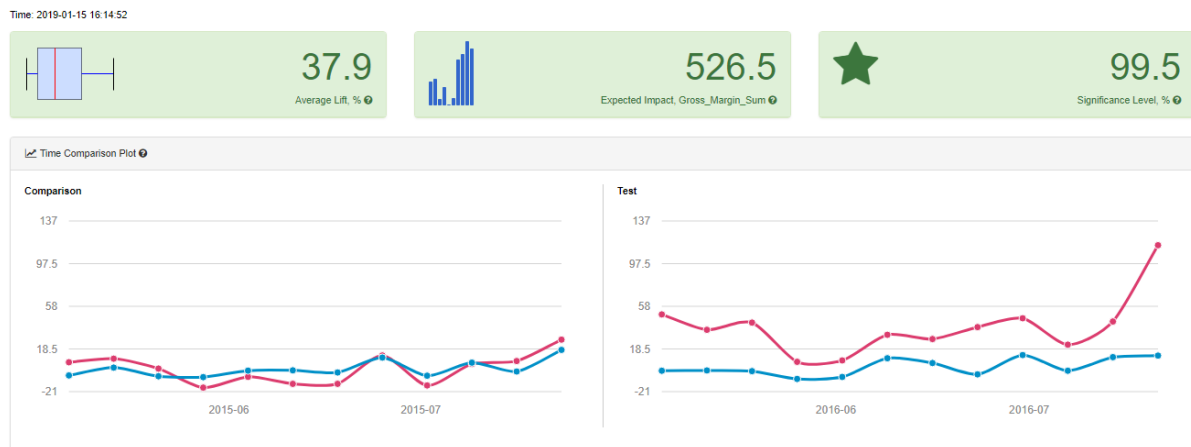
3. What is the lift from the new menu overall?

The lift from the new menu for the new menu overall is 40.7%. The significance level is 100%. The average lift as a result the new menu overall would be 40.7% per store per week or approximately $681 per store per week.

AB Test Analysis for Gross_Margin_Sum

Time: 2019-01-16 10:35:33

	40.7
	Average Lift, %

	681.2
	Expected Impact, Gross_Margin_Sum

★	100
	Significance Level, %

📈 Time Comparison Plot ❓

Comparison

Test