Before and After Analysis to Study The effect of Requisition Approval Limit Change on the Number of Requisition

In 2015 one of the Neocortex clients decided to change the requisition limit. Early 2017 it is time to review the impact of this change. Neocortex was tasked with the job of studying the change.

Numerous factors need to be analyzed to understand the impact due to Approval limit change. First and foremost was, to explore the data and understand the change. All the requisition are divided into three groups.

a. All the requisitions below the old approval limit, say **Group1**
b. All the requisitions around the new approval limit, say **Group2**
c. All the requisition at two times the new approval limit, say **Group3**

This study of the change across various grouping of the data would allow to understand if the change was only exclusively due to the approval limit change or due to other business attributes. Further it is important to pay attention to the fact that a change in a sereis of data is not only due to bussiness decision like approval changes but inherently it can be due to an inherent trend and also due to seasonal variation. To address these aspects 2015 series was used and using trend analysis we estimated the 2016 which would have followed the same trend. To consider the seasonal variation 2015 was used to esitmate the 2016 data. A sample of such data would look like the following

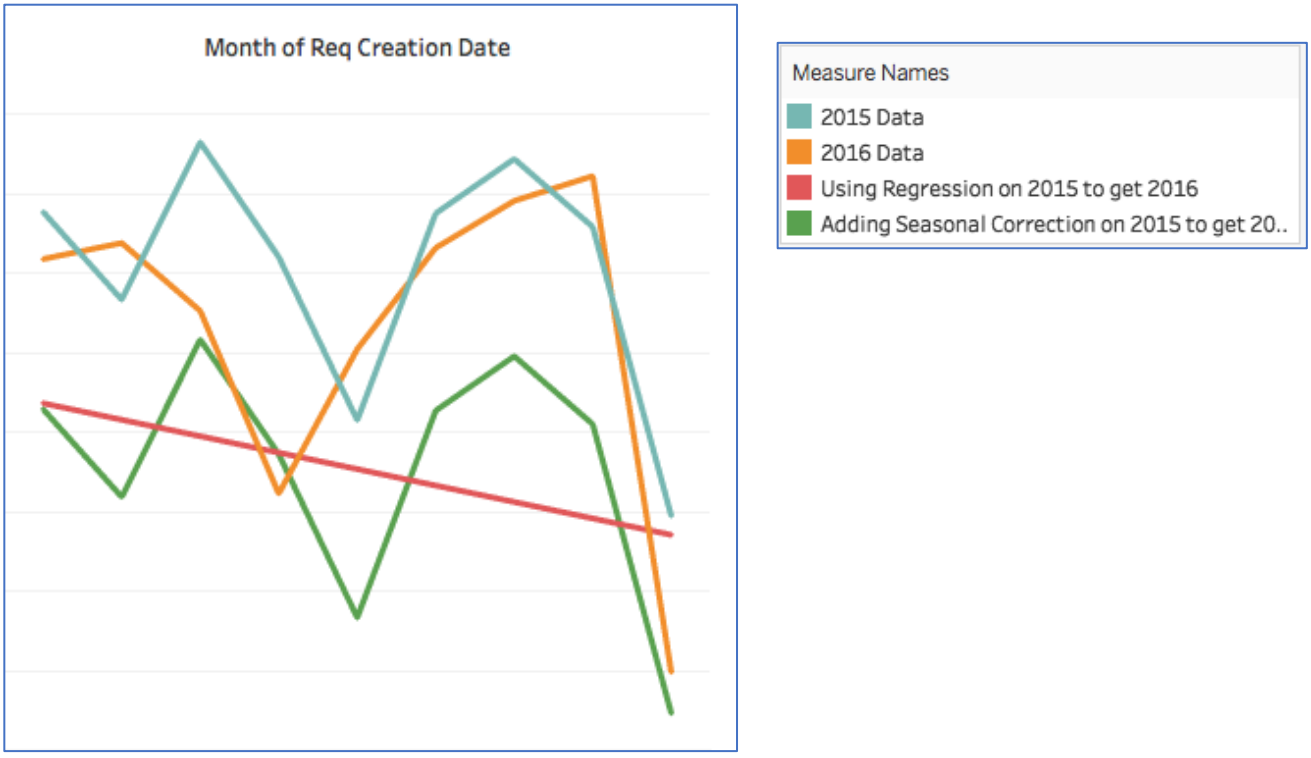


Fig 1 – Data for Group1.

Four series of data for Group 1. Visual inspection showed some postive change for few months and some negative change for few months when 2016 data was compared with 2015 data, or with either the data

obtained due to regression or seasonal correction on 2015 data. One challenge when comparing these series was is the observated change significant statistically and does it make practical sense for the business. Below are similar visuals for Group2 and Group3. A similar challenge exists for them also.

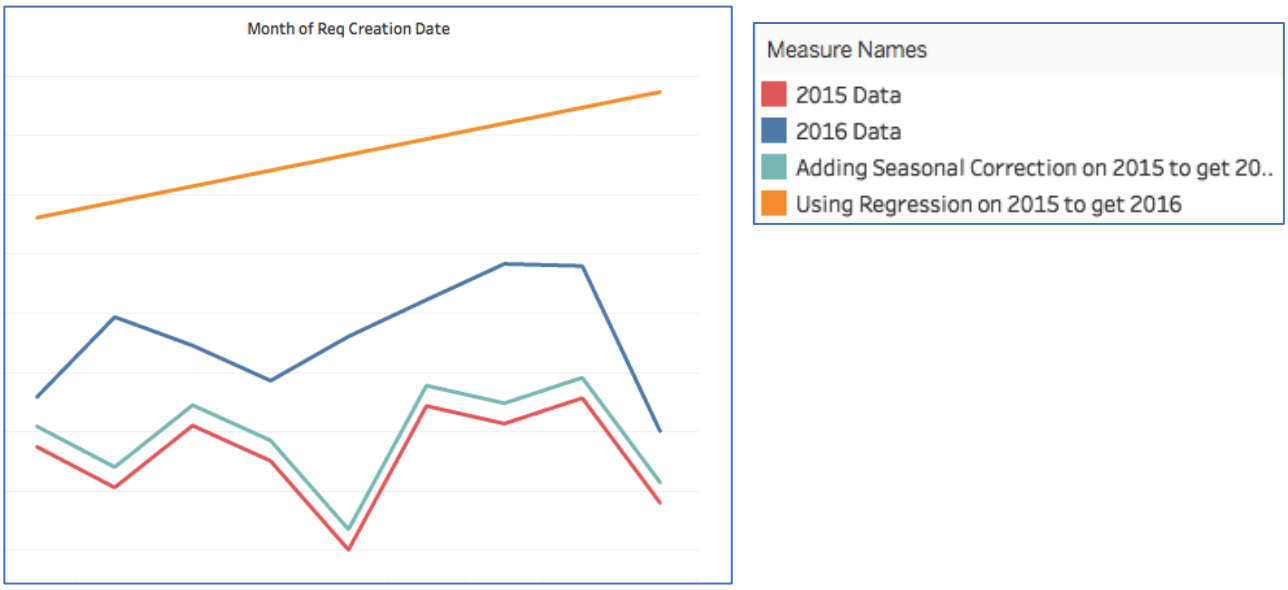


Fig 2 – Data for Group2

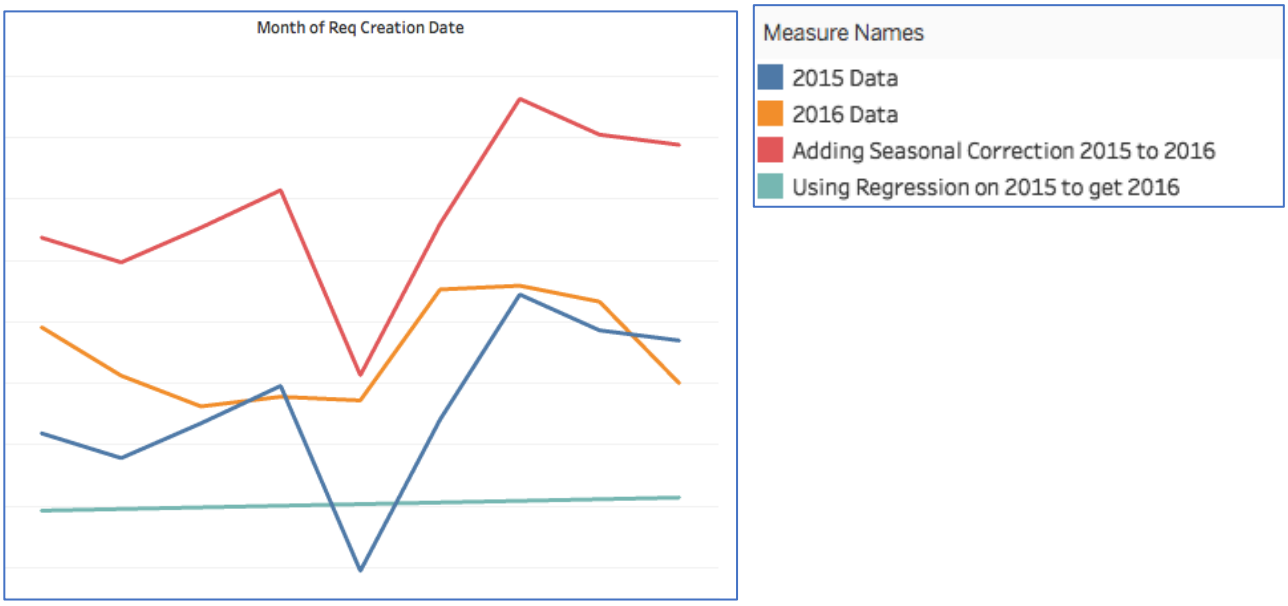


Fig3 – Data for Group3

Often while interpreting graphs like these a subject decision is made by just visual examination or a broad aggregation measure is used. At Neocortex we belive that evey interpretation should be objective. Every number should be have statistical foundation and should have pratical business interpretation. Target user should be able to drill-down to the transaction level for every aggregate point estimate or aggregate range estimate.

To sovle the above problem we prefromed the initial exploratory analysis using traditional descriptive analytical techiniques, smart heuristics firmed grouned in extensive domiain expertise in Oracle EBS. This analysis would help us develop a strong intution. Next, we apply statistical techniques to derive a point estimate and standard error estimate for choosen confidence interval. Every statistical point estimate is then studies in the context of the business problem under consideration, to arrive at a pratical interpreration of the analysis. In this case we used paired samples t-test to understand the mean difference between any two groups of Requisition data.

With a p-value greater than 0.05 and the mean differnce along with the stand error for Group1 show no statistically or pratically significant change, Group2 showed Statistically significant change. Interestingly Group3 showed no significant change with respect to the actual data but showed difference w.r.t the regression esitimate and sesonal change estimate.

When an approval limit is changed following movement was expected

i. More requisition lines could be combined to create fewer requisitions. As a result, there would be a movement of some of the requisitions from Group1 to Group2.
ii. With access to higher approval limit, the Requestor would seek more expensive items hence some movement from Group1 to Group2
iii. Some Requisitions in Group3 would be split up into multiple Requisition to avoid approval. It is expected to see some movement from Group3 to Group4.
iv. There should not be much change in Group4. This would act as a control group.

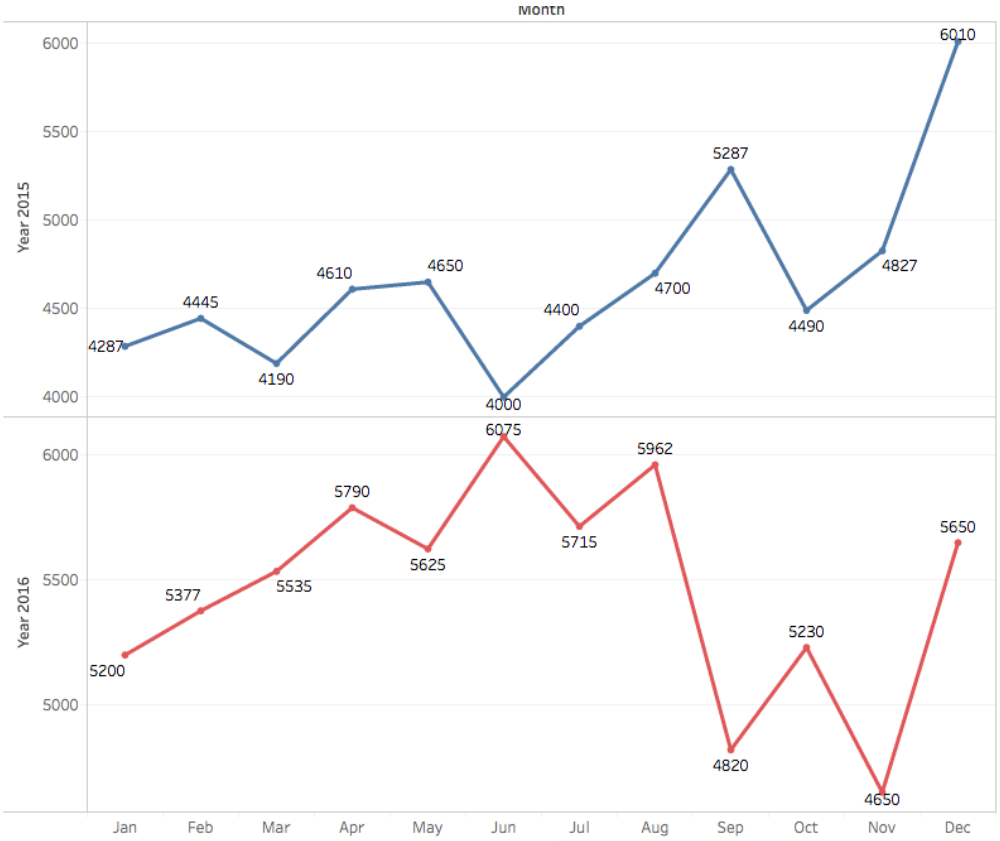
In our study, we found evidence for such a movement as described above. Various interactions were studied to understand the root cause of such a change in the behavior. Some of them are

1. How is the change w.r.t to the Natual Account – Natural account segment is used to classify the transaction and describes its nature. It helps to understand what kind of change in spend pattern occurred as a result of the Requisition Approval limit. How would this impact the bottom line of the business?
2. Effect of the change on the spend per vendor – Is it possible for Requestors to prefer certain Vendors due to higher approval limit?
3. Observed change, how is it w.r.t each OU?
4. All the combinations of segments of a Purchase Category and Item Description were studied in each group, to understand the changes in the number of Requisitions at a fine grain.
5. There might be some department effectively using or misusing this approval limit change. The analysis was performed to understand the pattern w.r.t Department of both the Requestor and Preparer.
6. Cost center wise change was also studied to get an understanding of the impact of this change.
7. Finally, it was of paramount importance to understand the change w.r.t to Requestor, Requestor Supervisor, and Preparer.

The core part of the analysis was carried out using traditional descriptive analytics techniques on different kinds of grouping and aggregates based on smart Heuristics and Oracle EBS Domain expertise. In addition to this, statistical analysis based on hypothesis testing were leveraged to understand the statistical and practical significance of the observed change. In this paper, we would like to describe the use of paired-samples t-test to understand the mean difference between two groups of changes in the Requisitions.

Let us assume the number of Requisitions in 2015 from Jan to Dec for Group2 were 4287.00, 4445.00, 4190.00, 4610.00, 4650.00, 4000.00 ,4400.00 ,4700.00 ,5287.00 ,4490.00 ,4827.00, 6010.00. and The number of Requisitions in 2016 from Jan to Dec were 4287.00, 4445.00 ,4190.00 ,4610.00 ,4650.00 ,4000.00 ,4400.00 ,4700.00 ,5287.00 ,4490.00 ,4827.00 ,6010.00. Do you know what the change was? Is it statistically significant? Is it practically significant from a business standpoint?

A visual inspection would definitely reveal the fact that there was a change. But did it answer your question?



Few months saw an increase and few months saw a decrease. We need a better way to know what does this mean for business. The best way to do this using paired sampled t-test.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Number of Requisition for 2016 - Number of Requisition for 2015	811.08333	769.53829	222.14657	322.14203	1300.02463	3.651	11	0.004

A significance value 0.004 is an indication that the difference is statistically significant. The mean difference between the two sets of Requisitions is 811 with a standard deviation of 770 and a standard error of 222 with 95% confidence interval the upper bound, and lower bounds are 322 and 1300.

The bottom line is there is a change of 811 requisitions with bounds of 322 and 1300 at 95% confidence level. Business has to make a decision if this kind of change in a particular group would be acceptable.

At Neocortex, we strongly believe that the most important thing of analysis is to get the answers business needs and have confidence in the numbers. It makes sense to start the analysis with a strong visual exploration followed by a reliable point estimate and a range estimate with a confidence interval which is interpretable practically.