



Northwind - Performance Assessment

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Overview

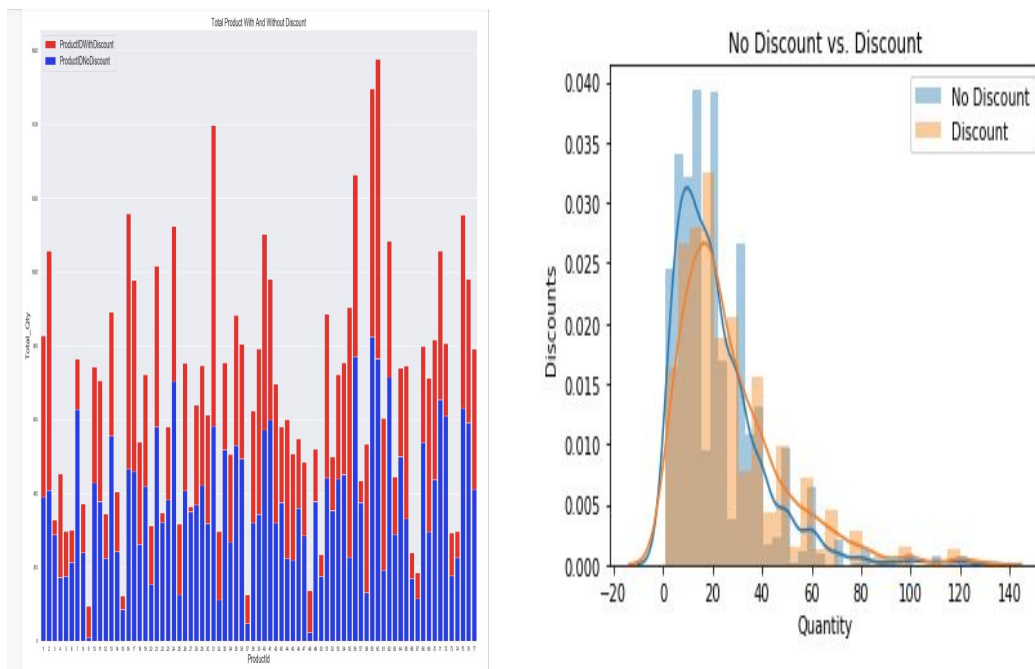
We have been tasked to perform a private analysis on the performance of the activities of the Northwind Company before its acquisition by Microsoft.

Goals

- Does Discount Affect Quantity Ordered , if so at what levels
- Does employee performance differ between UK and USA employees in terms of quantity of sales
- Measuring performance of between UK and USA employees in terms of total revenue.

First Investigation

- Does Discount Affect Quantity Ordered , if so at what levels
-



In the Above diagrams we first accessed the levels of discounts at total quantity of sales and total quantity sold at each level of discounts.

Our Findings

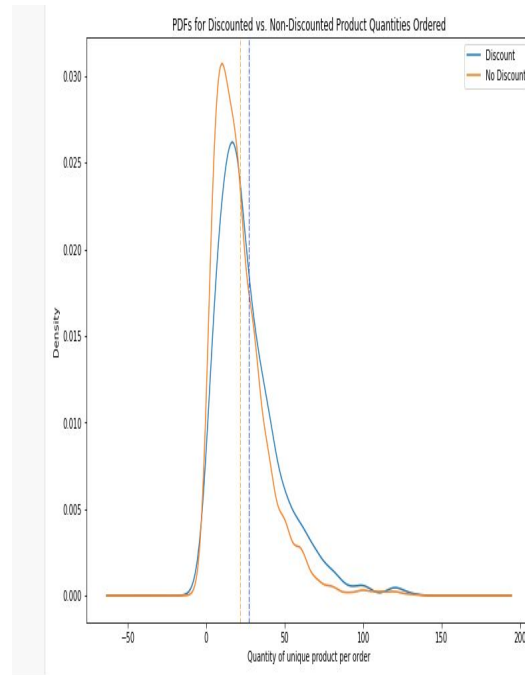
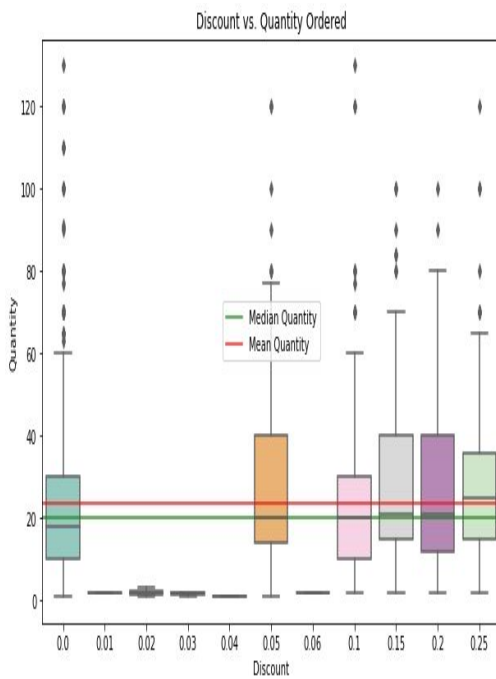
At first glance we can see that about 40% of the data has between 5% to 25% discount and 60% of the data has No discount with total orders of 2147. Thus 1 out of 3 orders has a discount.

Average Quantity orders at discount quantity is 30% more.

Average discount qty ordered when discount is applied is 27

Average quantity ordered when there is no discount is 21

Statistical Significance - Orders between 5% to 25% has an increase of 6 more orders than when there is no discount.



Summary

1) Discount increases quantity sold

- t-value = 7.52
- p-value = 1.4308992265460746e-13
- alpha = 0.05
- Cohen's d = 0.286

2) Level of discount doesn't matter

- $\alpha = 0.05$
- ANOVA F stat > 0.05

Recommendation:

Discount policy should be revised since it looked like there is no structured discount policy. Example discounts such as between 1 to 6% were rarely given and this did not really improve sales. However, discounts between 5% and 25% seemed to pull in the most sales. We recommend that discounts should be fixed at between 15% to 25%

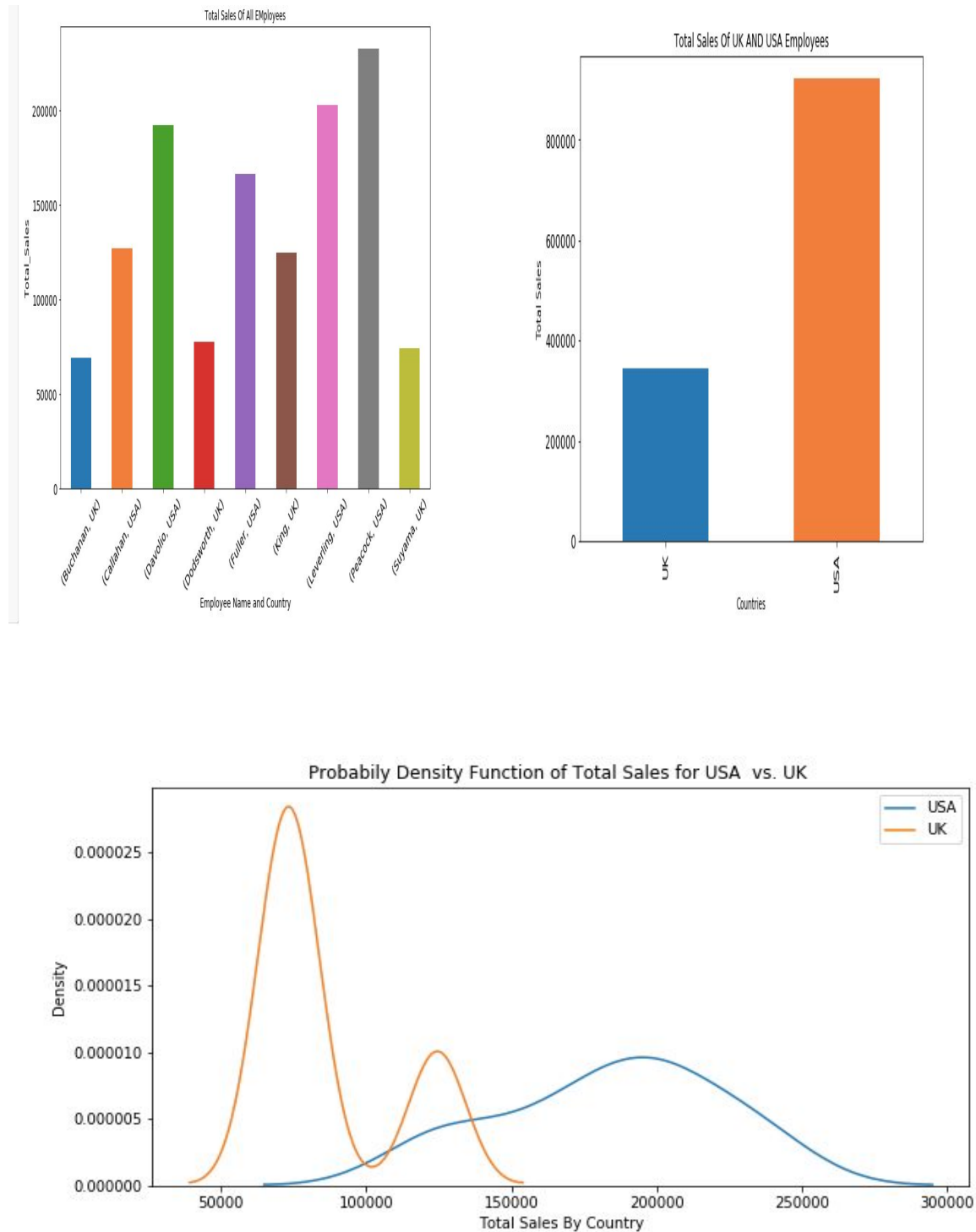
I. Second Investigations

Hypothesis :

Does Employee Performance Differ? Let's check and compare employee performance between UK AND USA EMPLOYEES

H_0 : UK Employees tend to have higher orders than employees from USA

H1 : USA Employees tend to have higher orders than employees from UK



We can see that both Mean(s) are pretty far apart, and the visualization shows a rather different distribution for our two samples. Another thing to point out is that the USA employees have a greater total number of orders compared to UK employees, which suggests that there is a good chance USA employees as a whole generate greater revenue than UK employees. Let's continue with hypothesis testing to determine if the Mean of the two sample are truly statistical significant and if so, see how meaningful that difference is.

With a low P-value of about 0.0016 ,confirms our initial confirmation that revenue generated by employees from USA is Significantly higher than revenue generated by UK employees.

Lets see how meaningful are the difference by using Cohen's D to analyse effect size

Before we interpret Cohen's D , Let's have a look at the Rules of Analysing Cohen's d

Interpreting Cohen's d

The result of Cohen's D means, use these general "rule of thumb" guidelines (which Cohen has advised should be used cautiously):

Small effect = 0.2

Medium Effect = 0.5

Large Effect = 0.8

2.85 indicates a very large effect size. Therefore, we can say that when looking at the total revenue for each employee, employees in the USA generate a very significantly higher amount of revenue than do employees in the UK.

Since Our Cohen's d result is 2.85 , it means there is a very Large Effect size . Thus we can say that employees in the USA generate a very significant amount of revenue than their fellow colleagues in the UK.

Hence , we reject the Null Hypothesis

H_0 : UK Employees tend to have higher orders than employees from USA

and Accept our Alternative Hypothesis

H_1 : USA Employees tend to have higher orders than employees from UK

II. Last Investigations

Is there a difference in order processing time (from OrderDate to ShipDate) across the 3 different Shipping companies?

We will test this hypothesis out with the recognition that processing time may not be fully attributable to the Shipping company, meaning it might be the employee that acts as an intermediary between the order date and notifying the Shipping company. Given this, should there be a major difference in processing time for one or multiple shipping companies, we should dig deeper to understand the processes behind placing an order and when the shipping company is notified of the order details. We may also want to run this same processing-time-analysis against the employees responsible for each order.

H_0 : The average time from order date to ship date between the three different shipping companies is the same.

H_1 : The average time from order date to ship date between the three different shipping companies is not the same.

α : $0.05/3 = 0.01667$ (see below)

Given the fact that we have three different shipping companies (3 samples) we must address the Multiple Comparisons Problem. We will use the Bonferroni Correction to correct for this, in an effort to minimize Type I errors.

