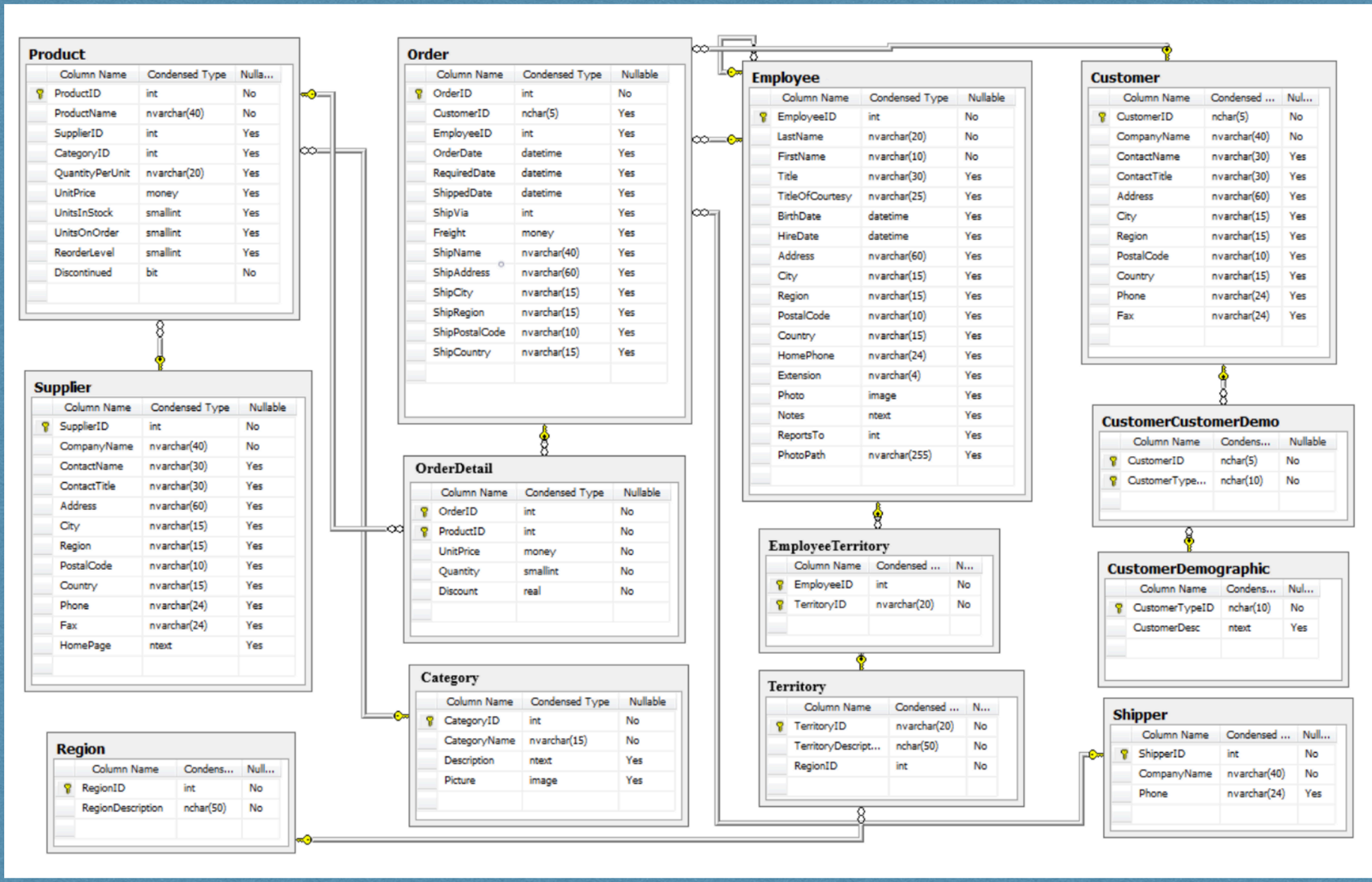
# Hypothesis Testing
# Northwind database




Stacy Shingleton

Module 3 (V2) Project

# Objective

**Answer the following questions:**

1. Do discounts have a statistically significant effect on the quantity of a product sold? And if so, at what levels of discount?
2. Is there a statistically significant increase in revenue for discounted items?
3. Does the region of Northwind customers have a statistically significant effect on quantities ordered?
4. Does the region of the Northwind sales representatives have a statistically significant effect on quantities ordered?

# Methodology

1. Compose null and alternative hypothesis
2. Set alpha value/significance level: 0.05
3. Check for normality, independence and randomness
4. Calculate p-value using Welch's t-test
5. Calculate effect size using Cohen's d
6. Reject or fail to reject the null hypothesis

**null hypothesis:**

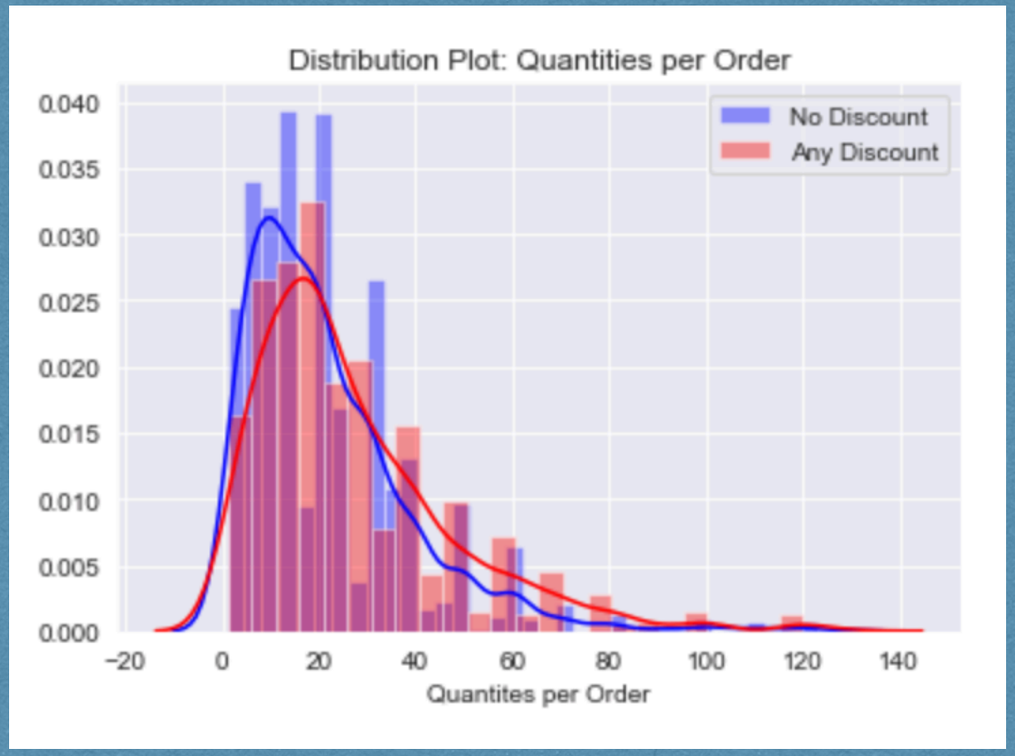
There is not a significant increase in quantities sold when items are discounted.

**alternative hypothesis:**

There is a significant increase in quantities sold when items are discounted.

**Result:**

There is enough evidence to reject the null hypothesis given an alpha of 0.05 for discounts of 5%, 10%, 15%, 20% and 25%




| | 5% | 10% | 15% | 20% | 25% |
|---|---|---|---|---|---|
| **P-value** | 1.36E-04 | 1.87E-02 | 8.6E-05 | 4.06E-04 | 7.96E-05 |
| **Cohen's d** | 0.35 | 0.20 | 0.37 | 0.30 | 0.37 |

**null hypothesis:**

There is not a significant difference in sales revenue per item when discounted.

**alternative hypothesis:**

There is a significant difference in sales revenue per item when discounted.

**Result:**

There is not enough evidence to reject the null hypothesis given an alpha of 0.05.


| | |
|---|---|
| **P-value** | 0.73 |
| **Cohen's d** | 0.10 |

**null hypothesis:**

The region of the customer has no significant effect on quantities per order.

**alternative hypothesis:**

The region of the customer has a significant effect on quantities per order.

**Result:**

There is not enough evidence to reject the null hypothesis given an alpha of 0.05.


| | |
|---|---|
| **P-value** | 0.27 |
| **Cohen's d** | 0.05 |

**null hypothesis:**

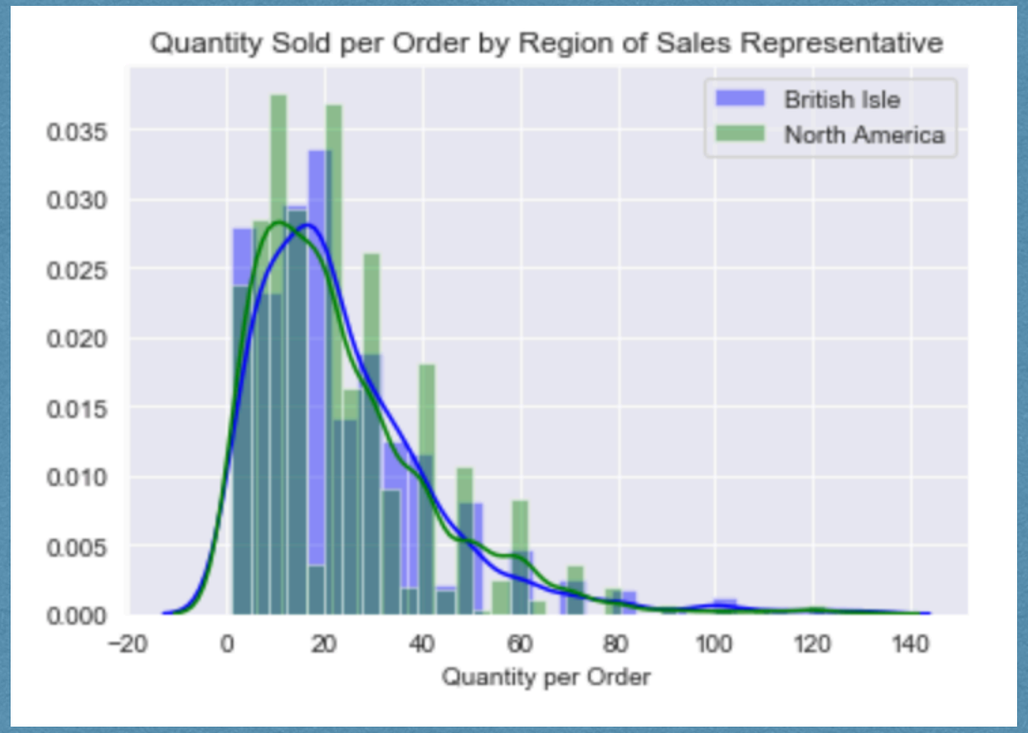
The region of the sales representative has no significant effect on quantities per order.

**alternative hypothesis:**

The region of the sales representative has a significant effect on quantities per order.

**Result:**

There is not enough evidence to reject the null hypothesis given an alpha of 0.05.




| | |
|---|---|
| **P-value** | 0.56 |
| **Cohen's d** | 0.03 |

# Outcomes

1. Discounts, of percents 5%, 10%, 15%, 20% and 25%, do result in higher quantities sold per order.
2. Discounts do not have an effect on overall revenue per item, meaning the higher quantities sold equalizes the revenue lost per discount.
3. Customers from Europe versus the Americas are purchasing equal quantities per order, meaning each region should be targeted equally.
4. Sales representatives from different regions, British Isles and North America, are selling equal quantities per order, meaning Northwind can grow their sales representative team in either region.