

# Northwind Traders

MODULE 3 FINAL PROJECT

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# Problem Statement

Northwind Traders is looking to move sales figures and one of the strategies considered is to offer discounts. To help the Northwind Marketing Department set discount pricing strategically, a study of the Northwind's sales will be conducted to see if the discount pricing has a significant effect in the volume of products ordered.

- ▶ Does discount amount have a statistically significant effect on the quantity of a product in an order? If so, at what level(s) of discount?

To understand discounts further, we would like to get a baseline understanding of the sales volume by product, customers, and salesperson in order to implement strategic discount pricing.

- ▶ Is there a difference in the average quantity of order between product categories and whether discounts are applied.
- ▶ Is there a difference in the average quantity of order between salespersons and granted discount frequencies?
- ▶ Is there a difference in the average total sales of order between customers?

# Data Science Framework

## Hypothesis Testing Steps

- ▶ Obtain the data from the Northwind database
- ▶ Data Scrubbing
- ▶ Data Exploration – business question transformed into data science question; compute descriptive statistics to extract features and test significant variables
  - ▶ State the Hypothesis; Business Questions
  - ▶ Significance level – is set at 0.05 indicating a 5% risk of concluding that a difference exists when there is no actual difference.
  - ▶ Sampling
  - ▶ Calculate the test statistic
- ▶ Perform the hypothesis test
- ▶ Interpret the results



# Northwind Discount Pricing Exploration

# Why is statistical testing important for our discount pricing strategy?

Error Types	NULL Hypothesis is <b>Mean Quantity with Discounts = Mean Quantity without Discounts</b>	
	H0 is TRUE	H0 is FALSE
Reject NULL Hypothesis	Type I Error - False Positive (Reject H0 & H0 is True)  Cons: Offer discounts when it has no effect in increasing volume of sales or might end up damaging your brand or cutting into your profits	Correct Inference - True Positive (Reject H0 & H1 is True)  Discount has a significant effect on quantity ordered
Fail to Reject NULL Hypothesis	Correct Inference - True Negative (Failed to reject H0 & H1 is True)	Type II Error - False Negative (Failed to reject H0 & H1 is False)  Fail to strategically use discount pricing when it has an effect in boosting sales volume and profit

# Does discount amount have a statistically significant effect on the quantity of a product in an order? If so, at what level(s) of discount?



$H_0$ : There is no difference in the average quantity of orders between discounted and undiscounted orders.  
 $H_A$ : Average quantity will not be the same.

Alpha = .05

The 1000 experimental sample that received discounts (Mean = 27.11 Std = 0.88 ) compared to the 1000 control sample that received no discounts (Mean = 21.7 Std = 0.75 ) demonstrated higher mean quantity of product ordered.

**Findings: Discount has a significant effect on quantity ordered**

# What levels of discounts have a statistically significant effect on the quantity of a product in an order?

$H_0$ : There is no difference in the average quantity of orders between discount levels

$H_A$ : Average quantity will not be the same between discount levels

Alpha = .05

There is enough evidence to support the claim that there is a difference in mean quantity of orders between discount levels.



**Findings:** 5%, 15%, 20% & 25% Discount levels have a significant effect on quantity of product ordered

# Is there a difference in the mean quantity of order between product categories?

Is there a difference in the mean quantity of order between product categories and discounts?

There is NOT enough evidence to support the claim that there is a difference in mean quantity between product categories.

There is NOT enough evidence to support the claim that there is a difference in mean quantity between product categories and whether or not a discount is applied.



# Is there a difference in the mean quantity of order between Salespersons?

$H_0$ : There is no difference in average quantity of product sold by salespersons & discounts

$H_A$ : There is a difference in average quantity of product sold by salespersons & discounts

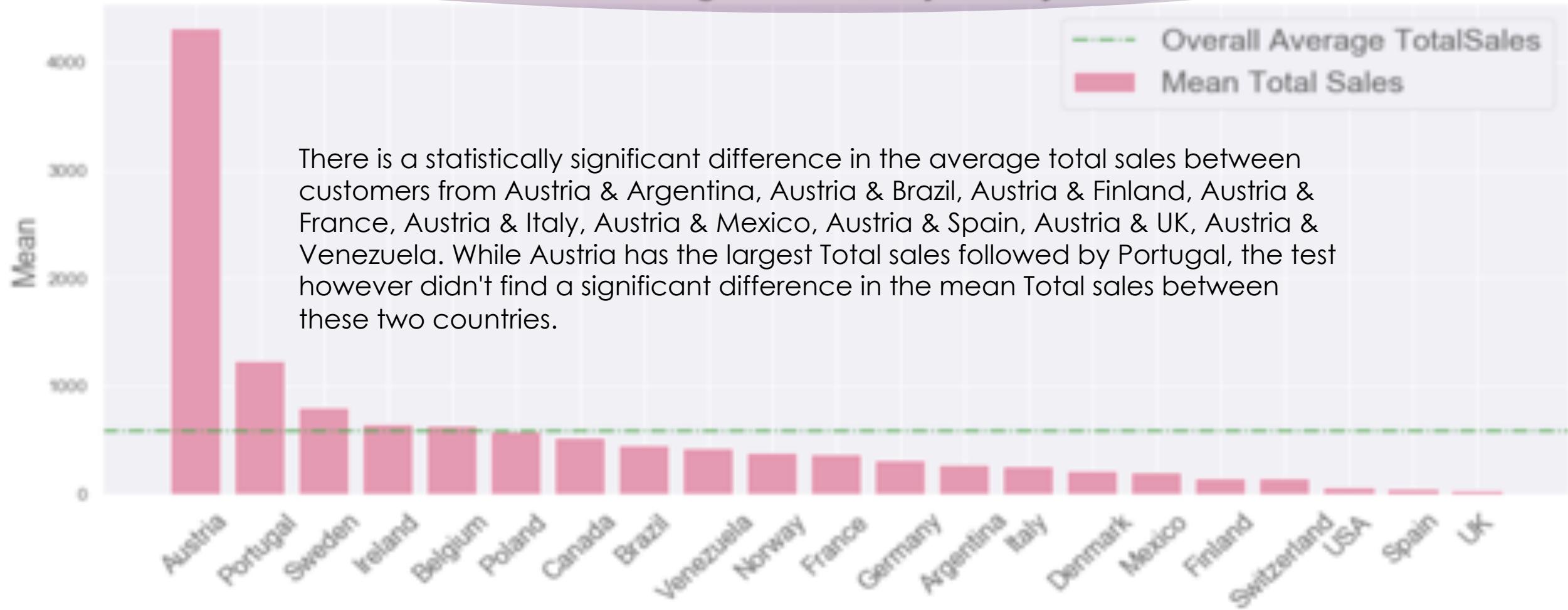
There is NOT enough evidence to support the claim that there is statistically significant difference in average quantity of product ordered between salespersons.



*Recommendation for future study is to test the profit in addition to volume of sales by Salesperson.*

# Is there a difference in the Average Total Sales/Order between Countries?

Average Total Sales by Country



# Summary of Findings

- ▶ There is a difference in mean quantity of orders between discount levels. 5%, 15%, 20%, and 25% discount levels have a significant effect on quantity of product ordered
- ▶ There is NOT enough evidence to support the claim that there is a difference in mean quantity between product categories.
- ▶ There is NOT enough evidence to support the claim that there is a difference in mean quantity between product categories and whether or not a discount is applied.
- ▶ There is NOT enough evidence to support the claim that there is a difference in mean quantity between product categories.
- ▶ There is a statistically significant difference between the Average Total Sales between Customers from Austria and Argentina, Brazil, Finland, Italy, Mexico, UK, Spain & Venezuela.

# Future Discounts Study: True Costs of Discounts

While discounts significantly impact the quantity of products ordered and increase overall sales volume, it would be advantageous to understand the true impact of giving a discount to ensure profitability when offering discount pricing. We recommend that other metrics impacting discount pricing methods be considered for future research.

- ▶ How can we identify customers with below-average margins? How could we segment discount offers to different types of customers (first-time, dormant, repeat) to entice new sales without losing out on the margins of sales?
- ▶ What type of discount (e.g. volume discount, event or seasonal discount, free shipping) has a higher impact on the volume of sales?
- ▶ Analyze granted discount frequencies and how the Sales Team is using the full range of percentages to understand how to link discounts with sales incentives. In addition to analyzing which salesperson sells the most, further focus on profit analysis is equally important.
- ▶ Does giving a 20% discount mean the company has to sell 20% more product to make up for what the company gave away? How much more will Northwind need in sales volume to generate the same amount of gross profit dollars as before?
- ▶ Is there enough market demand to generate 20 percent more sales with a 10% drop in price. Is the discount really necessary?