Optimizing Profit: Strategic Consideration of Discounts and Sales Trends

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Data Understanding

The data contains 9,994 transactions that occurred between 2016 and 2019 in the United States.

- The mean of Sales : 229.86
- The mean of Profit : 28.66
- The top sales and profit region : West
- The top product category : Office Supplies

Project

Data Understanding

Defining the key question, analyze the data set's structure

Data Visualization

To visualize the trend of transactions based on several variables

Business Requirement

Data Analysis

Data Preparation

Handle outliers, missing values, and duplicates to clean the dataset

Statistical Test

Prove significance of hypotheses

Problem

The store doesn't make a good profit, with mean profit for 2016-2019 sales just only $28.7. We realized that the company only care about the sales, so they give a lot of discount to attract more sales.

Key Questions

To optimize profit, it is essential to analyze key factors such as:

➔ Which variable has the strongest correlation with profit?

➔ In which month was the highest profit recorded based on sales trends?

➔ Which region generates the highest profit?

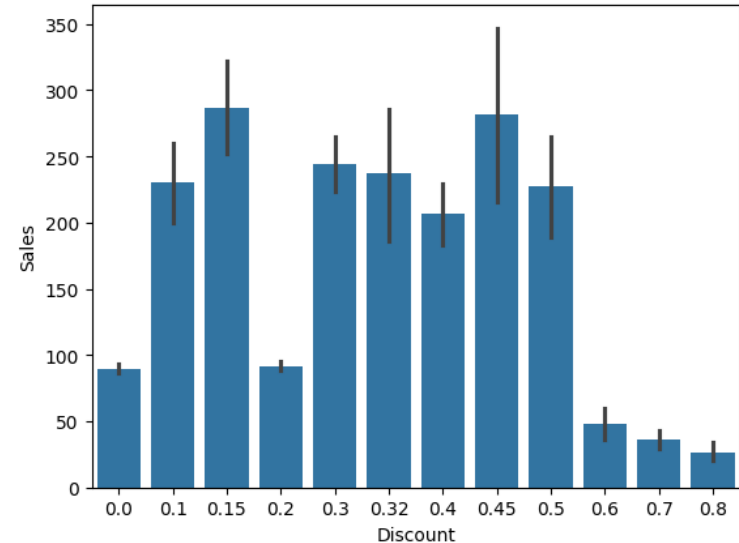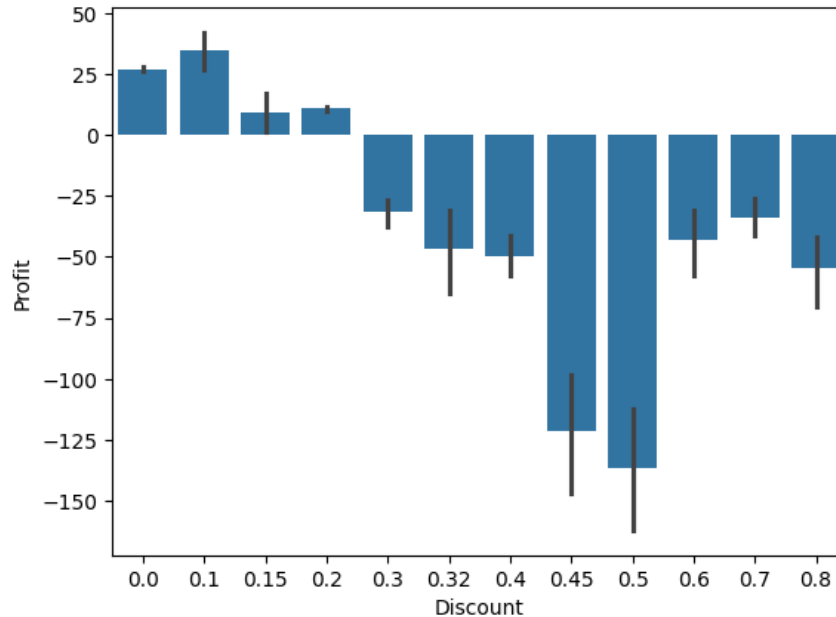➔ Which product category generates the highest profit?

Variables relationships

- **Discount** variable negatively impact the Profit (46% correlation). So, the more discount that they give the more loss profit that they got
- **Sales** variable slightly positively impact the profit (20% correlation)

# Discount effects on Sales & Profit

1. Discounts bigger than 20% leads to losses
2. Discounts over 20% leads to high sales, but isn't much different with 10/15% discount

Missed Target Marketing Strategy

We realized that the company only care about the sales, so they give a lot of discount. Based on the data, bigger discount give bigger sales, but also contribute to the bigger loss profit. If the discount more than 20%, they started to loss profit. So, more discount isn't balance with the profit that they make and will ruin their business sustainability.

Discount Trends


Discount Trend as per Month
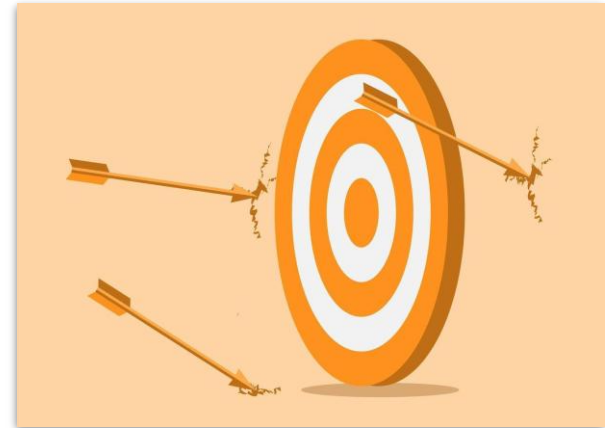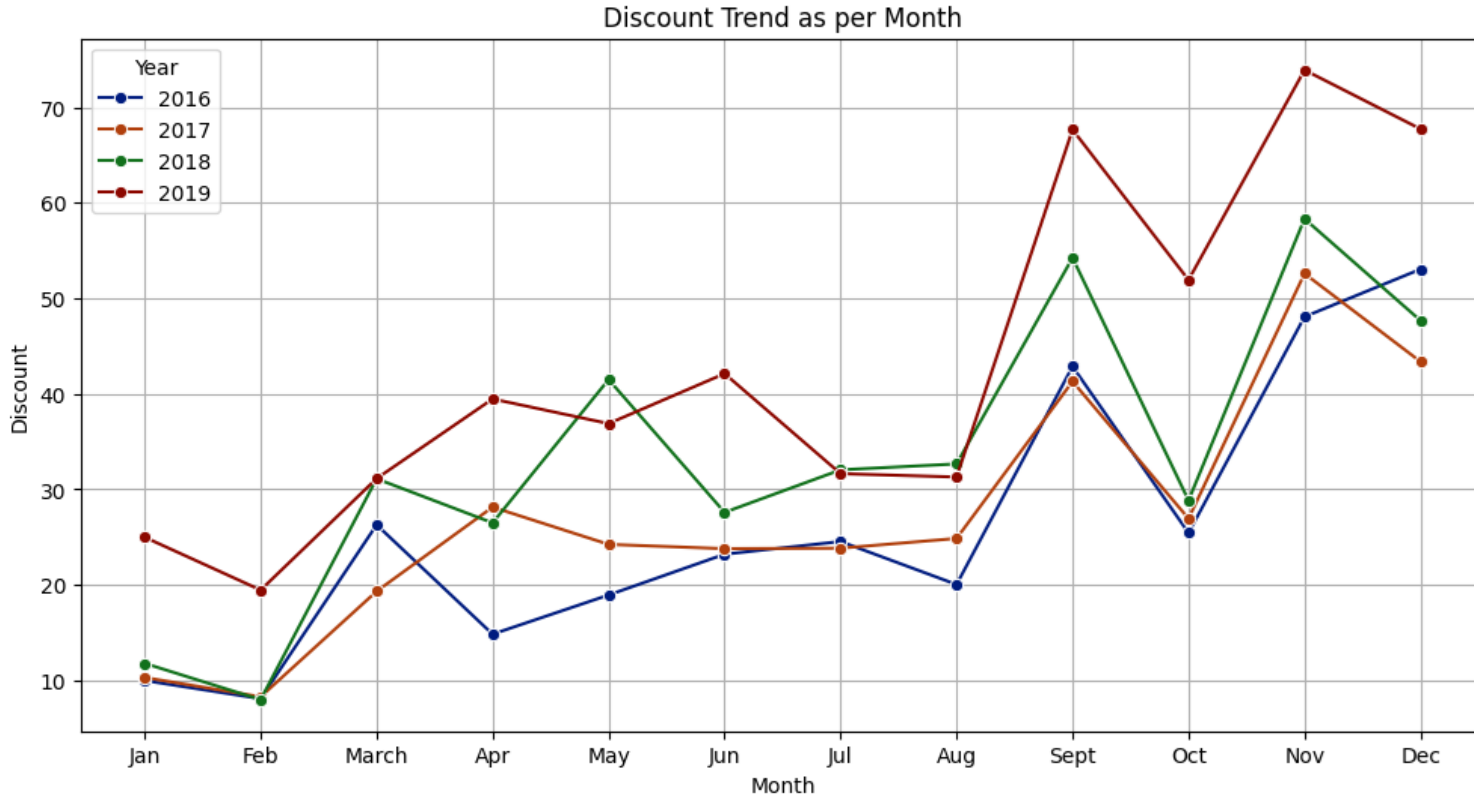
In September, November, December, **discounts increase significantly** as follow the sales trend, which coincides with a sharp rise in sales and profit (as seen in the profit trend graph later).

Why?

The company trying to boost sales by giving more discount in the end of the year for many holidays season happen in the end of year. So, the discount, sales, and profit trends throughout the year is increasing with the peak of all trends is on September.

Sales Trends

Total Sales per Month (2016-2019)
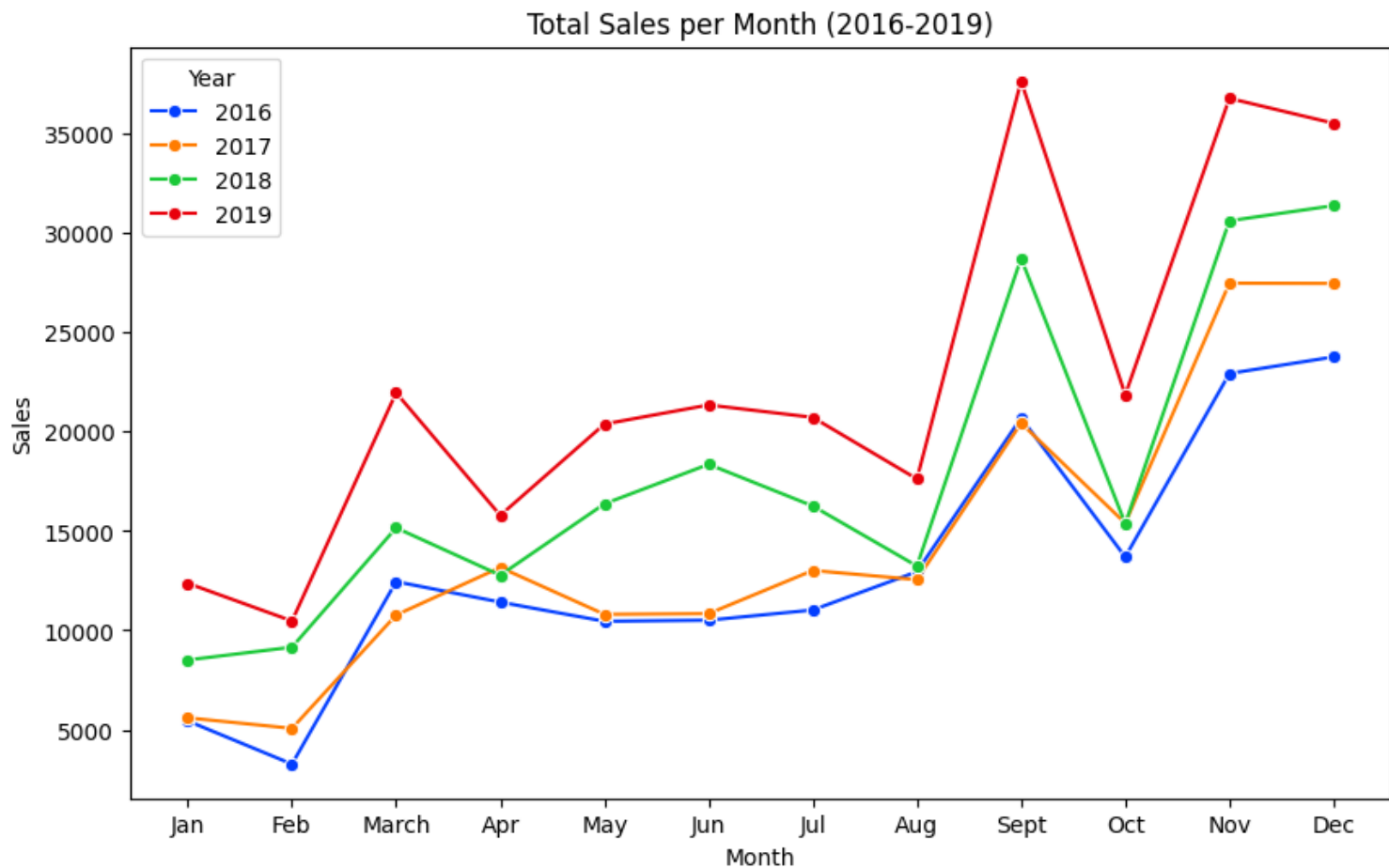
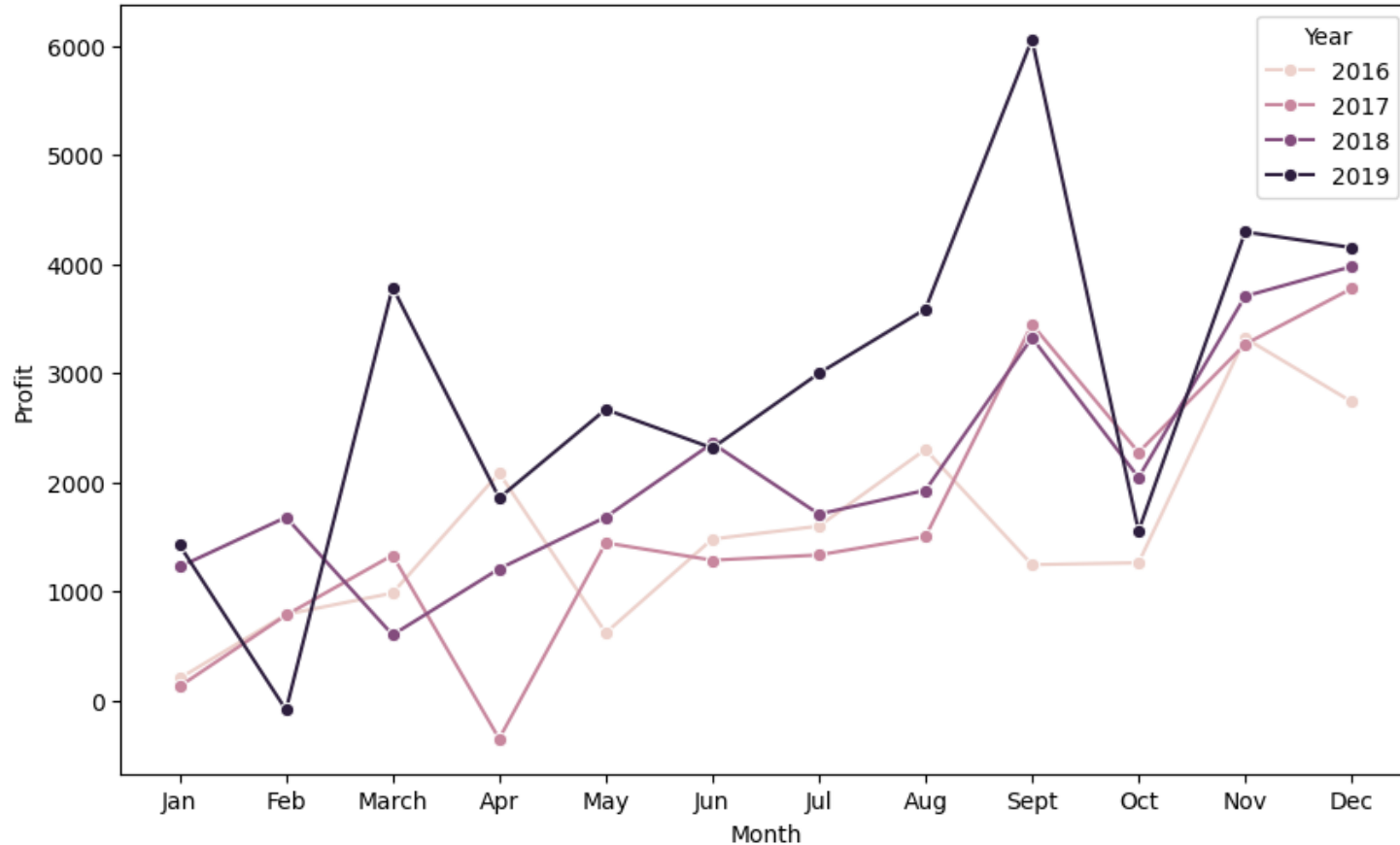- The peak season or highest sales period occurs in September, November, and December
- Possible Factors:
    1) Year-end holiday season (Christmas & New Year)
    2) Major discounts and promotions like Black Friday
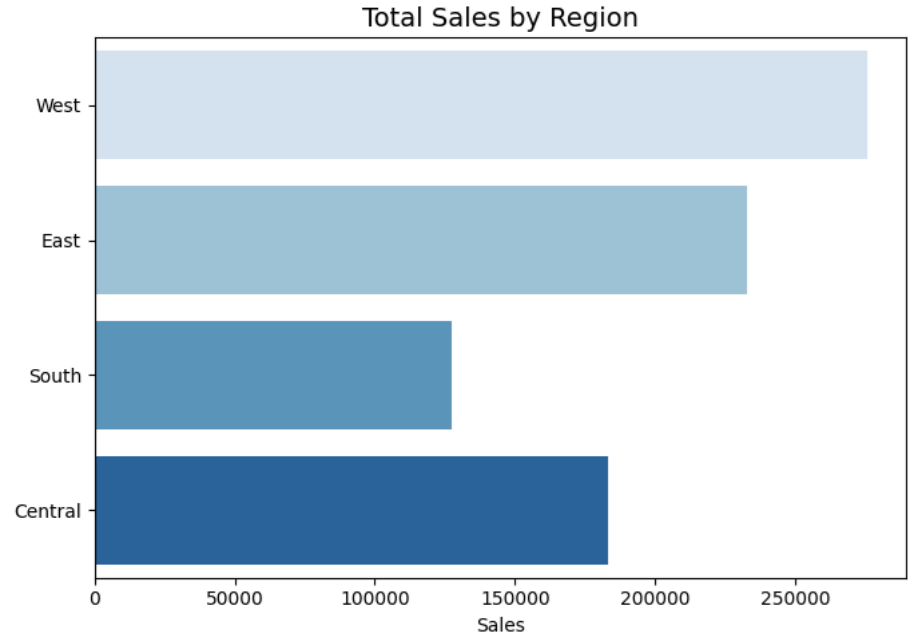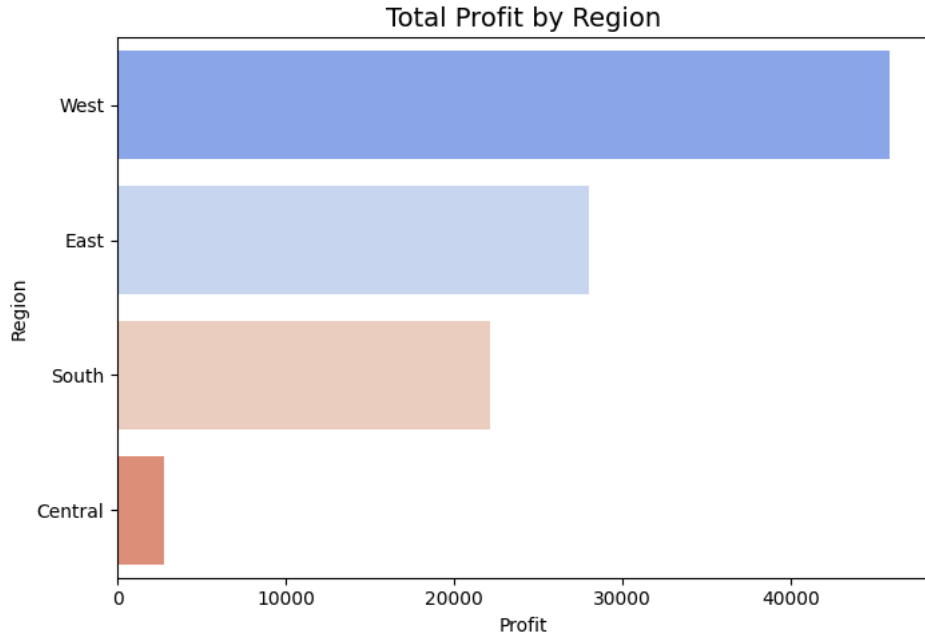   3) Changes in business trends

Profit Trends

Total Profit per Month (2016-2019)

The peak profit season occurs in September, November, and December, similar to the sales trend.
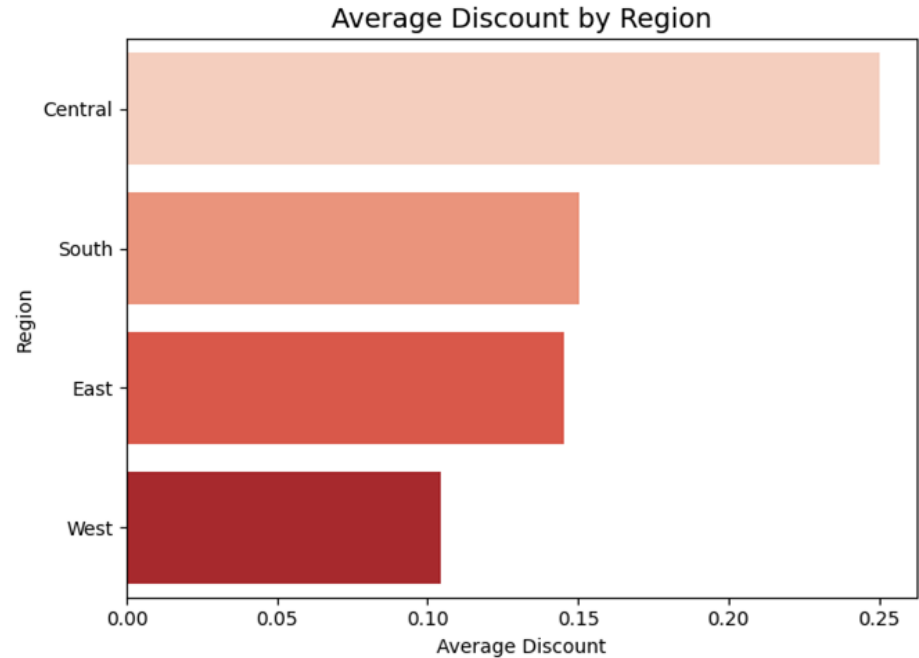
Region sales analysis

1. West region gives highest contribution to Profit
2. Central region lead to least Profit even with a high number of Sales

Why?

- Central USA customers mostly buy products when the discount is high (25% on average).
- West USA customers bought products even when there are little to no discount (10% on average).

This is probably due to demographic factors (such as significantly different spending power in each region).

This is consistent with the finding that bigger discount = less profits.
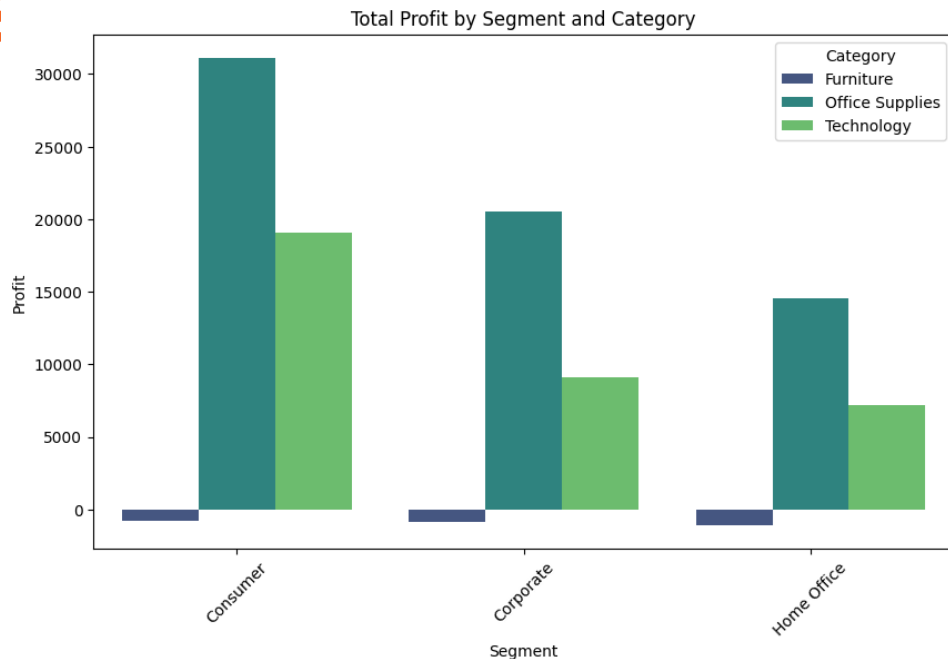

Average Discount by Region

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--- ANOVA Test for Discounts Across Regions ---
F-statistic: 207.8555
P-value: 2.8206e-130
Conclusion: There is a significant difference in discounts between regions.
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Category sales analysis

Total Sales by Segment and Category
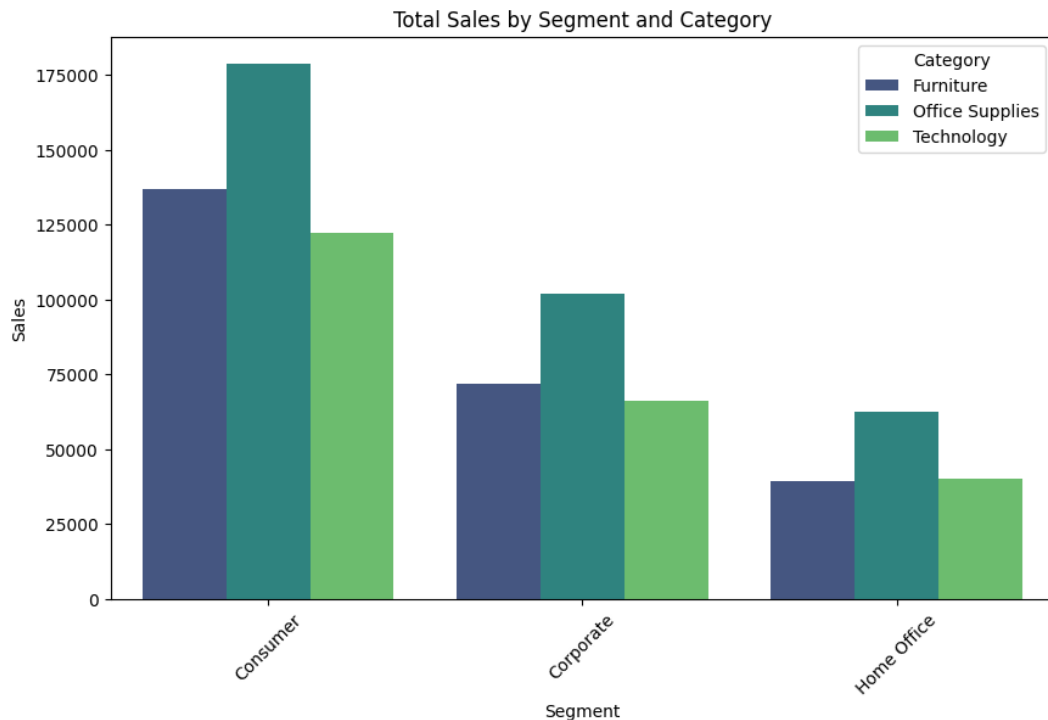
The best seller category is Office Supplies, with Furniture as a close second.

Category profit analysis



Total Profit by Segment and Category

However, it turns out that Furniture sales lead to losses

Why?

- Furniture has the highest average discount (around 17.5%)
- The T-Test proves the difference is significant

Although significant, the discount difference between Office Supplies & Furniture is less than 5%.

The store might need to reconsider the profit margin on Furniture products

Average Discount by Category
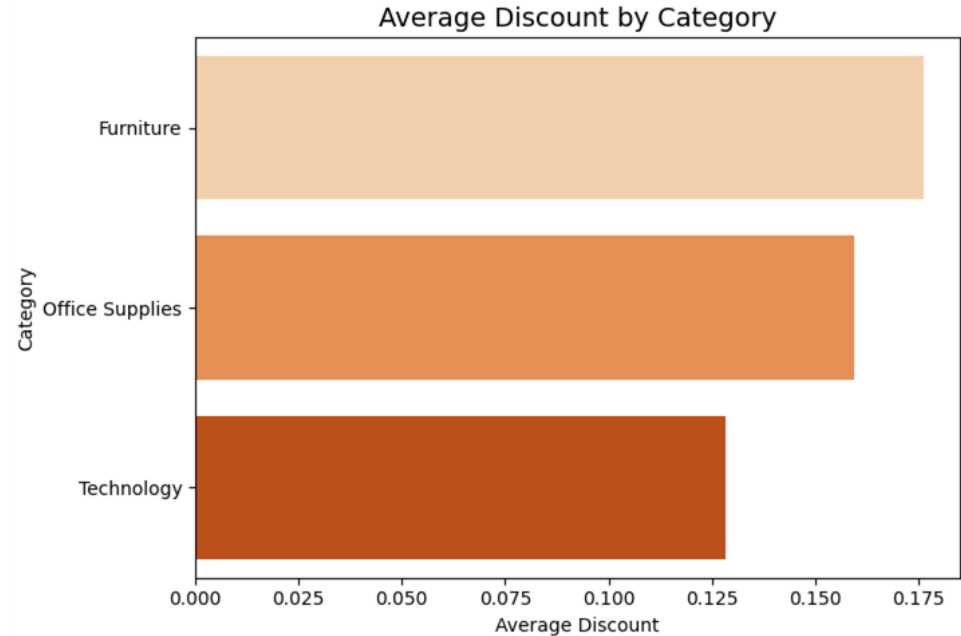
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--- T-Test for Discounts Between Negative Profit Category (Furniture) and Others ---
T-statistic: 4.3059
P-value: 1.7224e-05
Conclusion: The Furniture category has significantly different discount rates compared to other categories.
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Conclusion

1. The **peak sales & profit season**, occurring in September, November, and December, is often driven by several key factors
2. The strongest correlation with profit is discount (-0.46). **Discounts bigger than 20% leads to losses.**
3. West USA customers contributed the most to profit, while Central USA customers contributed the least even with a high number of sales.
4. Central USA customers buys when there's a huge discount
5. Office Supplies is the best seller and contributed to most profit, while Furniture sales lead to losses.
6. Furniture products often offers bigger discounts.

Actionable Recommendation

To optimize profit, limit discounts to 20%, avoid pushing sales in the Central region, reconsider discounts & profit margins on the furniture category, and ensure sufficient product availability during the peak season to prevent stockouts.

Thank You

Notes

Unlock Hidden Opportunities—Analyze, Strategize, and Maximize Your Profit Margins