

# **Exploratory Data Analysis Using Tableau: The Impact of Discounting on Product Profitability**

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## **Executive Summary**

### **Identifying Context**

The dataset namely “*ST2187\_coursework\_dataset\_2024-25*” has variables of Row ID, Order ID, Order Date, Ship Date, Ship Mode, Customer ID, Customer Name, Segment, City, State, Country, Postal Code, Market, Region, Product ID, Category, Sub-Category, Product Name, Sales, Quantity, Discount, Profit, Shipping Cost and Order Priority. This dataset has a context of worldwide product sales per purchase order across all types of consumers.

### **Research Objective**

Profit will be treated as the response, with the objective of drawing inferences to maximize profit. All other features will be examined to determine their contribution to either profit gain or loss. The research will primarily focus on optimizing the factors that negatively impact profit, identifying the features that contribute negatively to profit.

### **Research Question**

This report will contain data analysis that answer these five questions:

1. How features correlate with each other affecting profit?
2. How crucial is the role of time?
3. Are there significant effects that caused by regional variations?
4. How to possibly optimize profit?
5. Is there any other underlying causes for valuable insight?

### **Constraint & Limitations**

This coursework will utilize “*Tableau*” software for data analysis, consciously constrained by a story of collection up to five dashboards in which each dashboard will answer each research questions respectively. Key insights will be reported up to 1500 words, not counting executive summary and table of content.

## Table of Contents

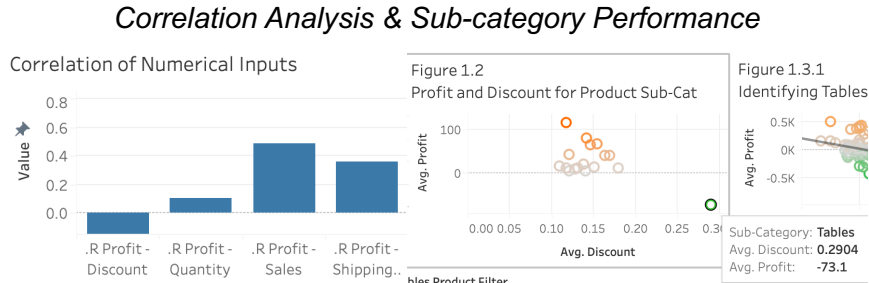
### *Exploratory Data Analysis Using Tableau: The Impact of Discounting on Product*

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# Data Analysis

## Impact of Discounting on Product Profitability

Figure 1

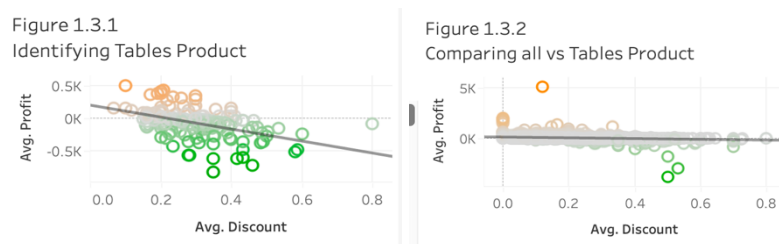


By conducting correlation analysis for variables, bar chart shows discount has - 0.3164 correlation with profit, inferring that discount impact profit adversely. This is consistent with the idea that excessive discount reduces profitability. Green circle in the right side of figure 1 represent product sub-category for “Tables”, it has an average discount of 0.2904 and average profit of -73.1.

Discounting is an important aspect that boost overall sales and gain customer loyalty. According to Soni (2024), discount gives the idea of winning the things that they buy, it also enables them to feel that they saved money and extend their budget. It is necessary to be wary of discounting because it might affect business inversely by providing a quick win, but in the long run, profitability and brand value could decline (IncentiveSmart, 2023). An example for negative impact of discounting is the sub-category “Tables”.

Figure 2

### *“Tables” and All Product Discount Comparison*



Data points in figure 2 is spread closely but mostly in negative response axis; showing that “Tables” negatively impact profit growth which is indeed a negative correlation. The trendline further emphasizes that “Tables” sub category negatively affect profit growth by the increase of discount. Comparing “Tables” with all products, the profit average will decrease by -544.897 for every point of discount average. It is usual for profit to decrease with increasing discount. University of Arkansas, Fayetteville (2017) reported that

discounting strategy should ultimately leads to a store traffic and overall profit increase not an illusion of high sales statistic.

**Figure 3**

### *“Tables” and Each Product Comparison*

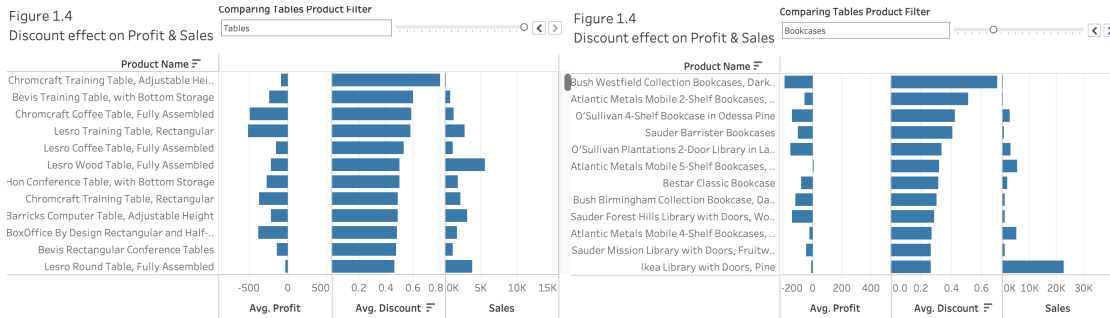
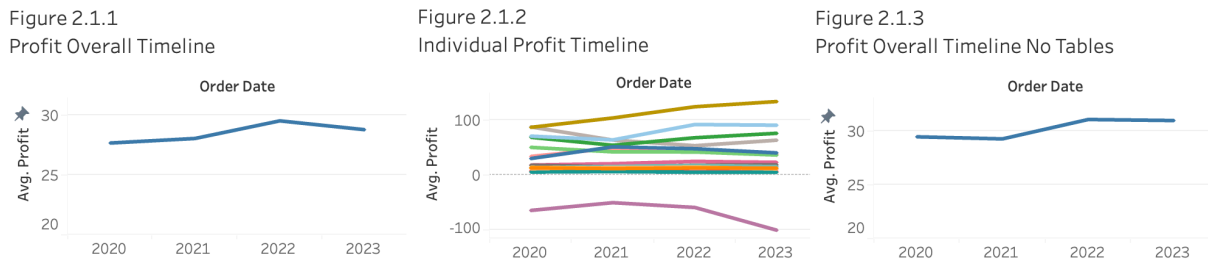


Figure 3 shows that high discount doesn't necessarily correlate with high sales, though a high discount mostly indicates a higher risk of profit loss. *“Tables”* have the worst overall profit, in which it the negative trend correspond with the increase of discount. The bar chart visualizes that *“Bookcases”* also displaying similar profit loss pattern. Meaning that not only *“Tables”* behave this way when it comes to the effect of discounting.

### ***“Tables” Profitability over Time***

**Figure 4**

### *Time Series Analysis for Sub-categories*



There is a slight increase in profit including the sub-category product *“Tables”* from 2020 to 2022 that decline afterward. By itself, *“Tables”* doesn't perform well compared to the others. *“Tables”* in figure 4 shows underperformance for 4 consecutive years, note that while different products also behaving differently over time, they still outperform table by staying on the positive average profit margin. The most profitability sub-category product is *“Copier”*, by identifying how sales is conducted for *“Copier”* and implementing those strategy on *“Tables”* might boost *“Tables”* profitability.

Additionally, there is a 5% annual profit increase by discontinuing the sale of *“Tables”*. *“Tables”* is the only major product that negatively affecting the overall profit, and discontinuing *“Tables”* might be an immediate answer for this problem. However, Kielburger

and Bailey (2024) mentioned that maintaining the balance of keeping product to sell and discontinuing it is a critical mission, as competitor might take this opportunity to gain market share. Therefore, it might be best to find a way to remove some non-profitable product from sub-category “Tables” rather than removing the whole sub-category.

**Figure 5**  
*Salvaging Profitable Product from “Tables”*

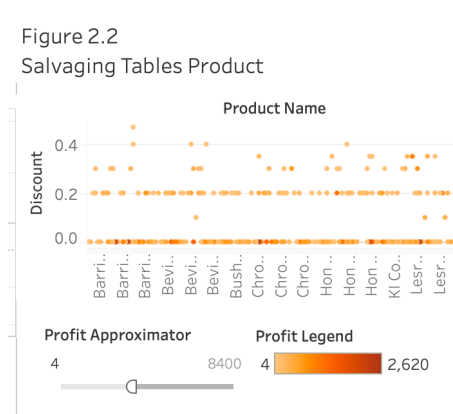
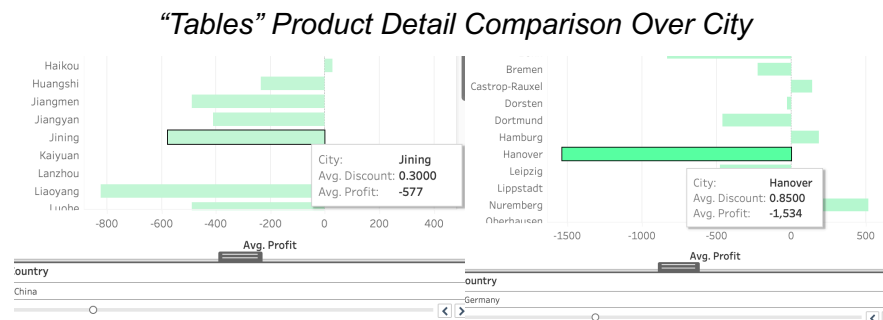


Figure 5 demonstrate which product is leading to profit. By setting profit approximator handler to 0, it is possible to estimate which product in “Tables” that can continue being sold. The maximum discounting for overall profit to be 0 is at 50%, in which this amount of discount only return break-even. This profit approximator is useful check which product should continue since they generated profit. Furthermore, Arenson (2022) added that eliminating product entirely might give an edge for competitors to fill the lost shelf space, substituting it with something more effective should be considered.

## “Tables” Profitability over Region

Figure 6



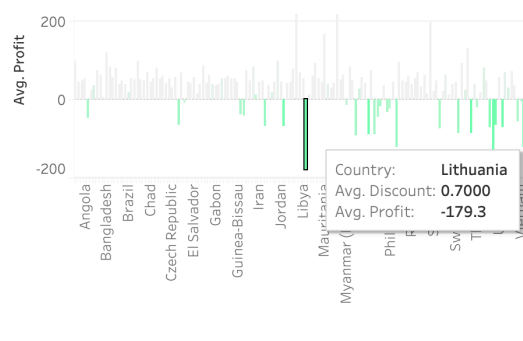
On average, “Tables” yield poor profit with discounting strategy of a fixed discount on all region indicating that fixed discount might be the cause of having poor profit. China’s “Tables” sales also have a fixed discount of 30% for its entire cities, subsequently leading to a negative average profit.

Another example is Germany having 85% discount on one of “Tables” product and 35% for the rest, and still resulting in negative profit. Meaning each region have already launched different discounting strategies, but it is still generating profit loss for “Tables”.

Argentina, Australia, Brazil, China, Dominican Republic, France, Germany, Haiti, and all other country that generate negative profits have same pattern of 40% discount and above. Indicating that not all regions depend on discount and higher discounts seem to be associated with larger losses for “Tables”, especially in regions where products have a low sales volume.

Figure 7

### *Countries With High and Steady Discount*



For all category, Lithuania shows a fixed 70% discount for all product purchase that has negative profit. This infers that the region mentioned at the beginning might have privilege over discount.

## Profitability Optimization

**Figure 8**

### *New Zealand's Profitability with Average Discount*

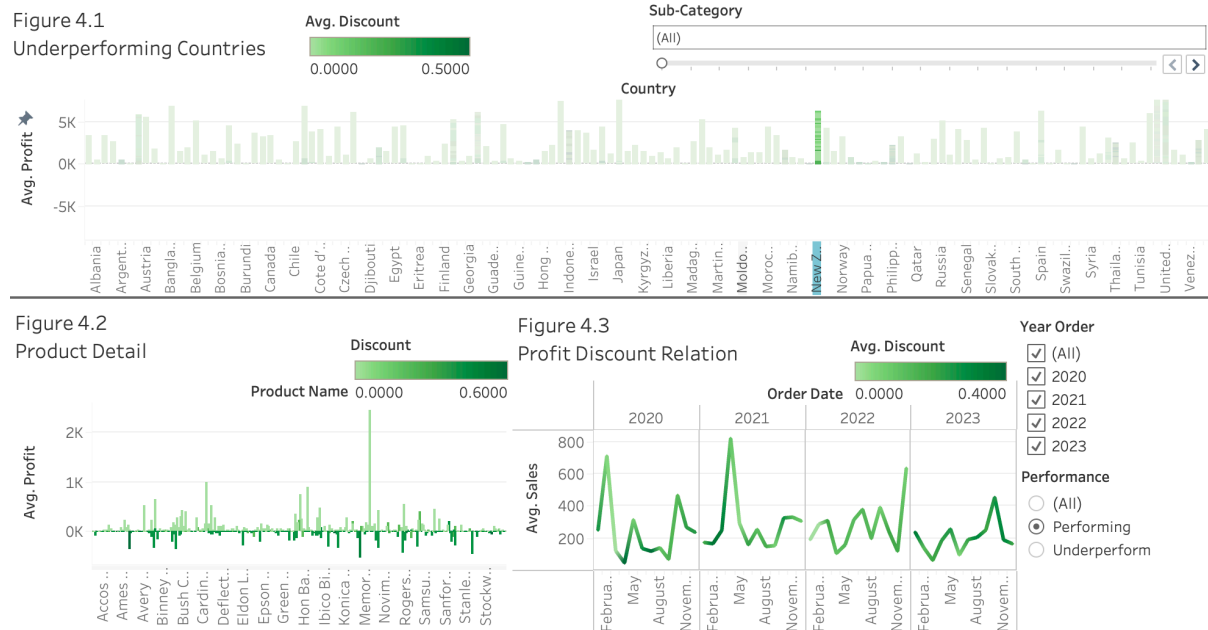
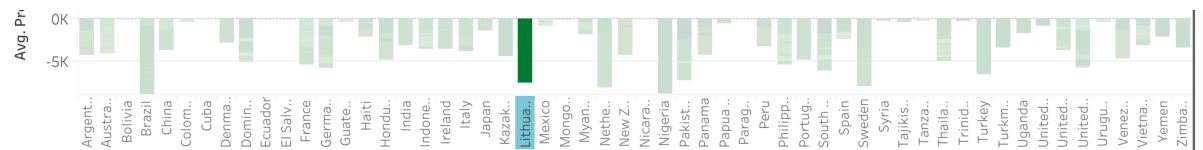


Figure 8 reveal interesting insights about sales and profitability for "Tables" across different countries. New Zealand, United Kingdom & India demonstrate high profit and sales of "Tables" even with a low average discount. In contrast, rare cases like El Salvador and Mexico manage to achieve profitability with a steady 20%-40% discounts, suggesting there might be some other factors that contribute to their success. If "Tables" sale should continue for underperforming countries, implementing strategy like El Salvador and Mexico is mandatory to ensure profitability.



**Figure 9**

*Lithuania with 70% Steady Discount*



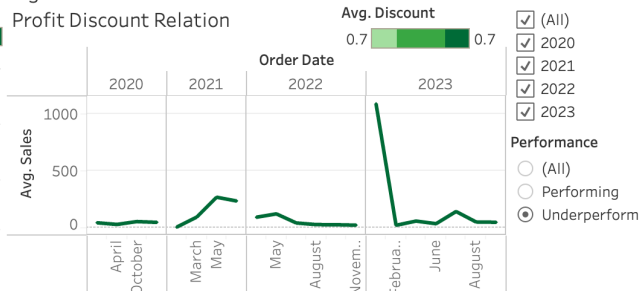
**Figure 4.2**

Product Detail



**Figure 4.3**

Profit Discount Relation



In common, increasing discount will also increase sales, but it is not always going that way for profit. Figure 9 indicating an over-reliance on discounting that generates negative profit. Additionally, it also reveals an important conclusion: high discounts don't guarantee high sales or profits. For instance, countries like New Zealand achieve consistent sales peaks with average discount below 10%. This means that there is a need to adjust for an optimal discount threshold, acknowledging that discounting beyond threshold will affect profit negatively. Identifying this threshold for each region can optimize sales strategy and subsequently reduce the profit loss.

The time-series analysis highlighting seasonal pattern in sales. The peaks in New Zealand during February 2020, April 2021, and December 2022 indicate time with high demand, could be holiday seasons. This insight proves the importance of discounting strategies with seasonal demands instead of relying on the same discount every year.

## Sensitivity Analysis on Discounting

The core issue lies with countries that disproportionately benefiting from consistently high and steady discounts, which often lead to poor profit margins.

**Table 1**  
*Countries with High and Steady Discount*

Country	Discount %	Profit	Sales
Denmark	50 to 60	(-538 to 0)	3 to 600+
Ireland	50 to 60	(-443.7 to 0)	6 to 600+
Kazakhstan	70	(-831.8 to -1.2)	1.4 to 300+
Lithuania	70	(-2750 to -2)	2 to 1500+
Nigeria	70	(-1577 to -2)	1 to 1669+
Portugal	50	(-3060 to 0)	7 to 3400+
Sweden	50 to 70	(-1981 to 0)	3 to 2830+
Tajikistan	70	(-251 to -3.8)	3 to 150+
Turkey	60	(-4088 to -1)	2 to 3085+
Turkmenistan	70	(-568.7 to -3.2)	3.3 to 321.9+
Uganda	70	(-485.2 to 1.9)	2.3 to 1500+
United Arab E	70	(-232.3 to 3.9)	3.2 to 150+
Yemen	70	(-727.8 to -5.1)	3.4 to 645.9+
Zimbabwe	70	(-1087 to -1)	1.2 to 627.2+

This investigation specifically target countries that in these 3 years never have a positive profit return for every observations. Referring to table, it is ideal to set threshold for discount up to at most 50%. While sales volumes vary, the consistent high discounts shows a significant issue in pricing strategy.

Key insight & recommendations :

- 1) Huge sales volume doesn't correlate with profit increase:

A high sale volume such as Portugal, Turkey and Lithuania with each respective discount range from 50% to 70% potentially leads to no positive profit. This highlights a critical imbalance between discounting strategy and profitability which suggest a review on discounting strategy to minimize profit loss.

- 2) Discount threshold of  $\geq 50\%$  obviously leads to profit loss:

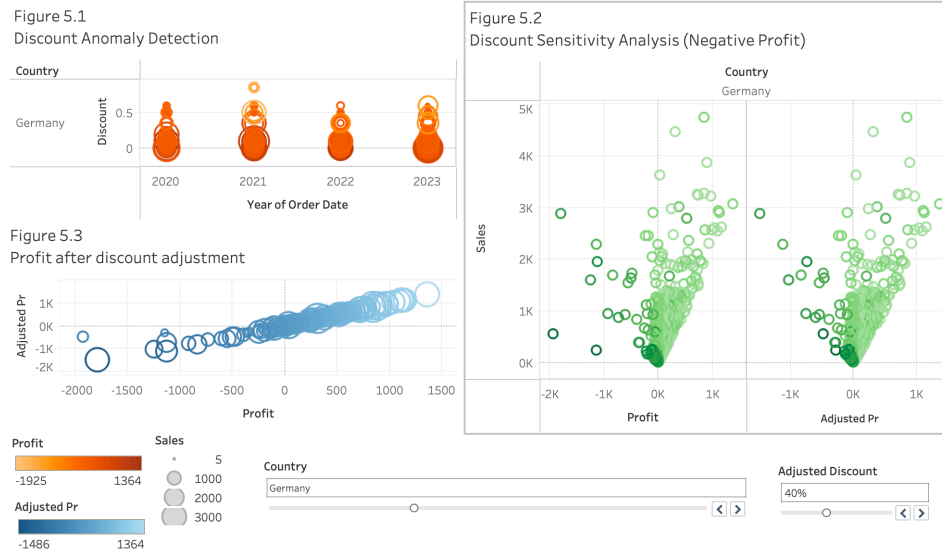
Countries with consistent discounts of 50% or more, such as Kazakhstan and Nigeria, exhibit significant profit losses, suggesting that such threshold guarantees a higher likelihood of negative profit. Setting additional constraint on discounting threshold should alleviate the issue.

- 3) Diversity in sales and profit ranges indicates regional variance:

The varying sales and profit ranges across countries in this analysis underscore the need for better strategies. For example, Uganda and Lithuania have similar sales and discount but different profit loss, pointing a need to identify factors beyond discounts such as purchase price and selling price ratio to find the optimal discount threshold.

**Figure 10**

*Discounting Threshold Simulation*



Figures 10 illustrates a simulation for sensitivity analysis of adjusting discount, how alternate discount changes could affect the profit loss of those countries in table. This scatter plot explores the sensitivity of sales and profit to the discount adjustments, specifically highlighting instances where negative profits are observed. By adjusting discount in Germany to 40%, the profit maximum loss changes from -1925 to -1486.

Given that the analysis shows little to no significant effect of discounting on sales, it may be strategically prudent to introduce a discounting threshold. By setting a limit on the discount percentage, the company can maintain profitability while still offering value to customers. It is essential to understand how discounting works, as Paul (2021) stated, the lack of skill to sell particular item on total value could result in focus on discounting rather than presenting product's compelling value.

## References

1. Soni, P. (2024, August 12). *The strategy behind markdowns and their impact on customers and businesses*. Medium. <https://medium.com/@priteshsoni03/why-do-companies-offer-discounts-and-how-does-it-help-them-generate-more-revenue-871a5d03fc72#:~:text=Markdowns%20can%20actually%20drive%20more,lower%20profit%20margins%20per%20item>
2. IncentiveSmart. (2023, October 19). *7 dangers of discounting*. IncentiveSmart. <https://www.incentivesmart.com/blog/7-dangers-of-discounting/>
3. University of Arkansas, Fayetteville. "Do deep promotional discounts work? New study sheds light on strategy." ScienceDaily. ScienceDaily, 26 September 2017. <https://www.sciencedaily.com/releases/2017/09/170926135348/>
4. Kielburger, M., & Bailey, M. (2024, December 17). Here are 3 key questions you need to ask to unlock longterm profitability. *Entrepreneur*. <https://www.entrepreneur.com/growing-a-business/is-it-time-to-stop-selling-a-product-here-are-3-key/483512>
5. Arenson, R. (2022, August 3). Should you remove a product if not profitable? *Proquo AI*. <https://www.proquoai.com/blog/should-you-remove-product-if-not-profitable>
6. Paul. (2021, October 25). *Why do sellers give discounts?* Q&A Sales Podcast. <https://www.theqandasalespodcast.com/podcast/why-do-sellers-give-discounts/>