Wine Characteristics and their Influence on the Demand of Wine in the Market

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Team: 11 - Section 2

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INTRODUCTION & BACKGROUND INFORMATION:

An in-depth analysis of the complex interactions between wine attributes, customer demand, and market prices is necessary to comprehend the dynamics of the wine market. Our goal in this research is to examine the complex interactions among various wine characteristics and how these relationships affect wine demand and pricing. This project is summed up by our research question: How do different wine characteristics influence the demand for wine?

We addressed this question using an empirical analysis to draw insights from comprehensive datasets sourced from consumer surveys, industry reports, and expert reviews. These systems of analysis provide a wide range of data that is crucial for gaining insight into the wine market. Various graphs and numerical data allow for better visual analysis and easier comparison of the data set, from which a greater understanding of the wine market can be drawn.

To sum up, our research will empirically investigate the relationship between the characteristics of wine and its demand in its market. The effect of the price using the data from consumer surveys and reports, and consumer reviews on demand will be taken into consideration when analyzing and comprehending the data, including feedback, rating, and reviews from wine experts, consumers, and consultants. By acknowledging this information, we will be able to determine the rank and understand the meaning of wine reviews and production choices of wine manufacturers.

The motivation behind our research question stems from the critical need to comprehend the variables influencing consumer preferences and market dynamics in the wine sector. It is well established that wine attributes, such as “grape variety, vintage, and place of origin, have a big impact on the decisions and opinions of consumers.”(Martinez, 2023) However, “Perhaps most directly, high ratings often correlate with increased consumer demand. The perceived quality of highly-rated wines encourages purchases, contributing to higher sales and potentially allowing the winery to command premium prices.” (Wine Cellars, n.d.) Additionally, “Household income affects wine consumption. About 53 percent of consumers earning more than $100,000 a year drink wine, according to the survey. By comparison, only 15 percent of consumers earning less than $50,000 annually drink wine” (Wine Business, 2024)

Furthermore, the complicated interplay among wine qualities, pricing, and market demand highlights how difficult it is for producers and consumers to make decisions.

Our study aims to provide useful insights for different stakeholders in the wine market by clarifying the relationship between wine attributes, consumer demand, and market prices throughout our data analysis. Wine retailers can enhance their product positioning and marketing efforts by gaining a more profound comprehension of consumer preferences. Likewise, wine buyers can choose their purchases with more knowledge if they have a deeper understanding of how various wine characteristics relate to perceived quality and value. We hope that our analysis can assist with product innovation, pricing strategies, and portfolio management for wine producers and merchants.

Research Question: How do different wine characteristics influence the demand for wine?

DATA:

Source of Data: Our data includes information about different types of wine and how their characteristics, sales price and other components affect their demand in the wine market. We obtained our Winedata_Average spreadsheet and codebook from a research called 'Do Expert Reviews Affect the Demand for Wine?' by Richard Friberg and Erik Grönqvist in 2012.

Type of data set: ***Cross-Sectional Data*** → As we collected data on numerous dependent and independent variables such as Wine Name, Country, Region, Year, etc, we understood the relationship between wine characteristics and their effects on wine demand and corresponding price in the market. The data was captured as a snapshot for just one specific period of time and contains wine sales and wine reviews at all distribution levels in the wine market. This allows us to make inferences and identify patterns within the demand and supply of various types of wine.

***Table #1*: Codebook**

Variable Name	Description
Country	Country
Litre	Weekly sales in liters
Price	Price in SEK
taste_segment	Taste segment of wine (16 groups)
Segment	Color segment of wine
v10_aomm	Mean normalized review during the weeks the wine is distributed: Allt om Mat

***Table #2:* Type and level of measurement of each variable**

Variable Name	Variable Type	Level of Measurement
country	Categorical	Nominal
taste segment	Categorical	Nominal
segment	Categorical	Nominal
v10_aomm	Continuous	Ratio
litre	Continuous	Ratio
price	Continuous	Ratio

Limitations of the data: Price fluctuations in wine can be influenced by factors external to wine characteristics, such as income levels, seasonal fluctuations, and the availability of substitutes. Additionally, the data relies on only one source of ratings, Allt om Mat, making the "ratings" portion susceptible to biases. These biases include geographic focus, where there may be a preference for wine from one region over another. Another bias is positive outcome bias, where the review source may have an incentive to publish positive ratings to maintain good relationships with certain wine manufacturers or to attract more readers. Lastly, there is time-specific bias, where the ratings may be influenced by trends in the wine industry at the time of the review.

Univariate analysis of the data

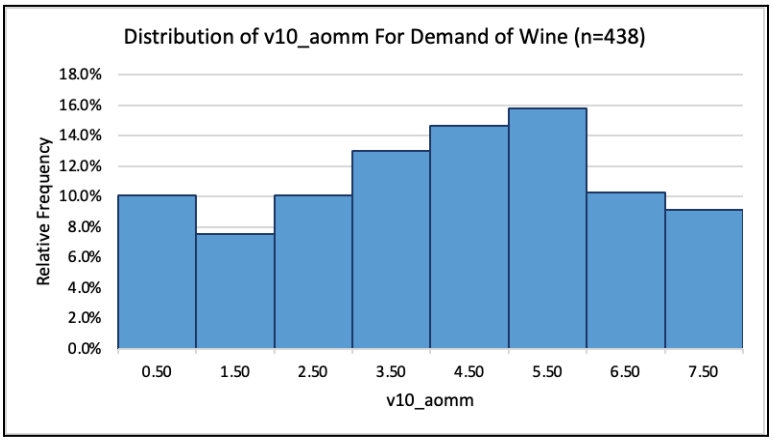
Table #3: **Univariate Descriptive Statistics**

Variable								
	Description	***Mean***	***St.Dev***	***Minimum***	***Quartile 1***	***Median***	***Quartile 3***	***Maximum***
country	The data for the country of the wine cannot be determined because it is categorical. There is no mean or standard deviation for the names of countries.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Taste segment	The data for the taste segment of the wine cannot be determined because it is categorical. There is no mean or standard deviation for the taste segment of wine.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
segment	The data for the segment of the wine cannot be determined because it is categorical. There is no mean or standard deviation for the types of wine: red, spa, and white.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
v10_aomm	There is an equal amount of lower values to higher values for the rating	4.62	2.47	0.00	2.86	4.69	6.33	10

	of the wine. However, there are not many ratings of 8 or higher. The median is slightly higher than the mean which shows the normalness of the data and the uniformness of the graph. We would expect this in the data of ratings as some people really enjoy the wine, while others do not.							
litre	There is a higher frequency of lower values compared to higher values of litres sold weekly. This is because not many people are buying large quantities of wine in a span of a week. The mean is much larger than the median which shows the skewness to the right in the graph.	6054.63	9539.70	27	1361	2773	7348.92	94907
price	There is a higher frequency of lower values compared to higher values of prices of wine. This is because only so many bottles of wine can be sold for hundreds and hundreds of dollars. Most wine bottles are cheaper, under 100 dollars, while there are a few outliers that cost over 100 dollars. Most people aren't looking to spend a fortune on wine. The mean is higher than the median which	95.26	58.16	39.72	59.45	70.70	106.69	371.20

	tells us that the graph is skewed to the right.							

Table #4: **Univariate Visual Displays**

Visual Displays	Description
 ***Figure #1***	The histogram in Figure 1 illustrates the v10_aomn or the mean rating of the wine during the weeks the wine was distributed. The distribution is normal with multiple average ratings from 0.5-7.5. The graph highlights the characteristics of the rating. This will be a good determinant of the association we are researching because we can see if the higher average of rating increases or decreases the price or demand for wine.
 ***Figure #2***	The histogram in Figure 2 illustrates the price distribution for the demand for wine, showing that the distribution is skewed to the right. It means that a relatively small amount of wine was sold at a high price, while most wines were sold for less than $122.59. This directly relates to the research question as it shows the price of wine with different characteristics.

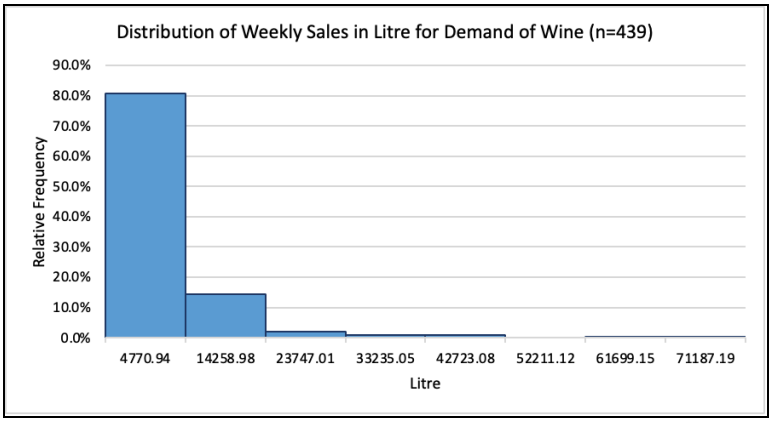


Figure #3

The histogram in Figure 3 illustrates the distribution of weekly sales in litres. The distribution is skewed to the right showing that the weekly sales of wine rarely exceed 14,258.98 litres. This is crucial to our research question because it gives us insight into the demand for wine.

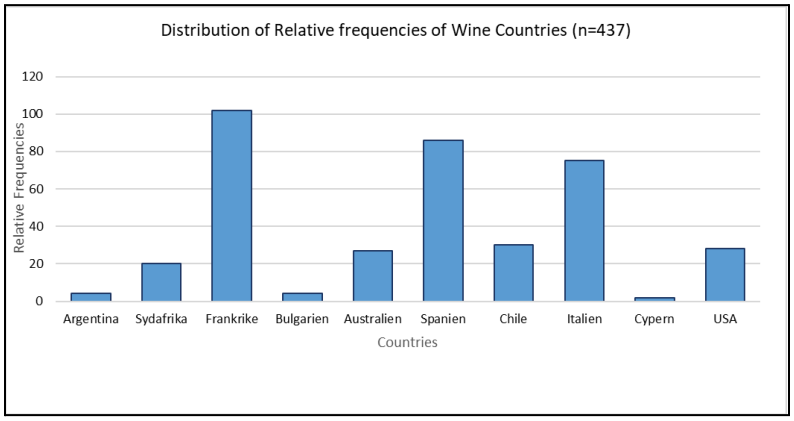


Figure #4

The bar chart in Figure 4 illustrates the distribution of the countries each wine comes from. It shows that "Frankrike" is the most popular country selling a little over 100 units of wine, while "Cyperm" was the least popular. The chart helps us determine whether or not a country of origin is associated with the demand or price of wine.

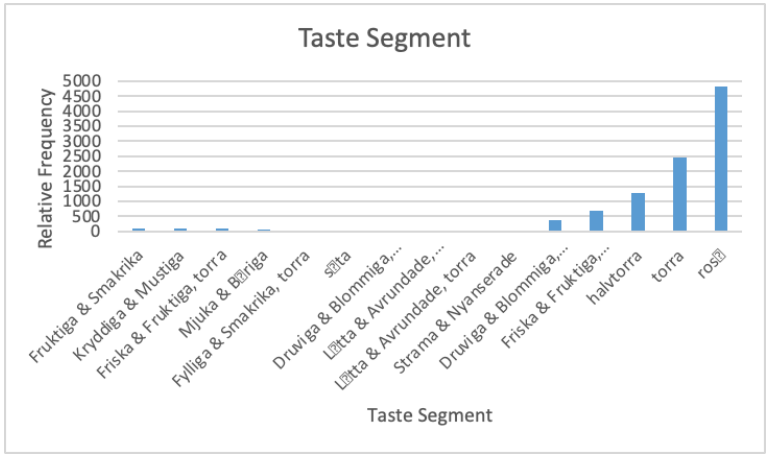


Figure #5

The bar chart in Figure 5 illustrates the distribution of relative frequencies in the taste of wine segments. It shows that "Rose" has the best taste segment overall while other test segments have fewer frequencies. By showing us the most popular wines based on taste, we can determine if taste is strongly associated with the demand and price of the wine. We predict that the taste of wine will strongly be associated with the increase in demand and price of the wine.

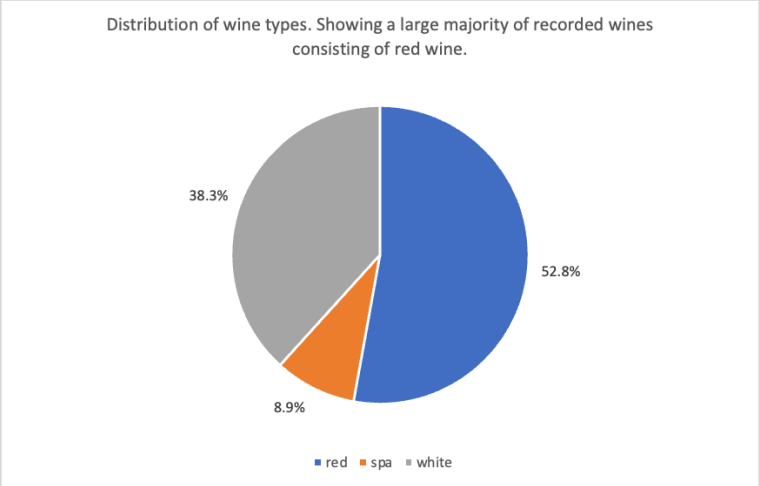


Figure #6

The pie chart in Figure 6 illustrates the distribution of wine types: red, spa, and white. It shows that the majority of wine users prefer red and white over spa. The chart provides data on whether the type of wine determines the demand or price of the wine by showing the most preferred types.

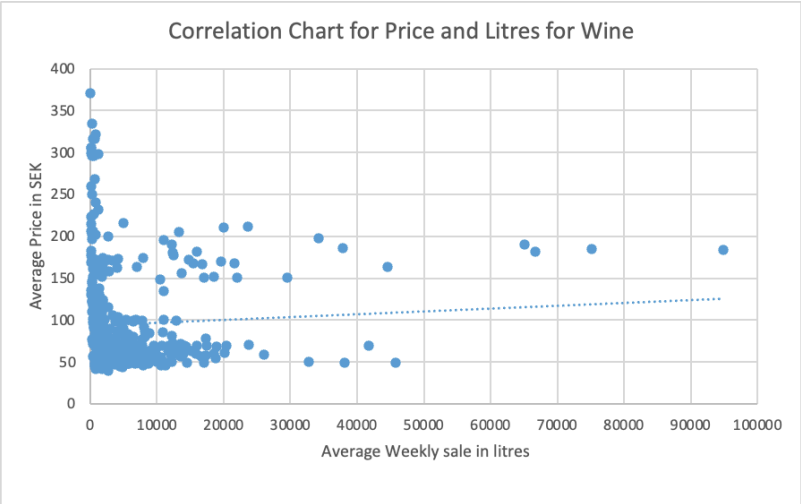
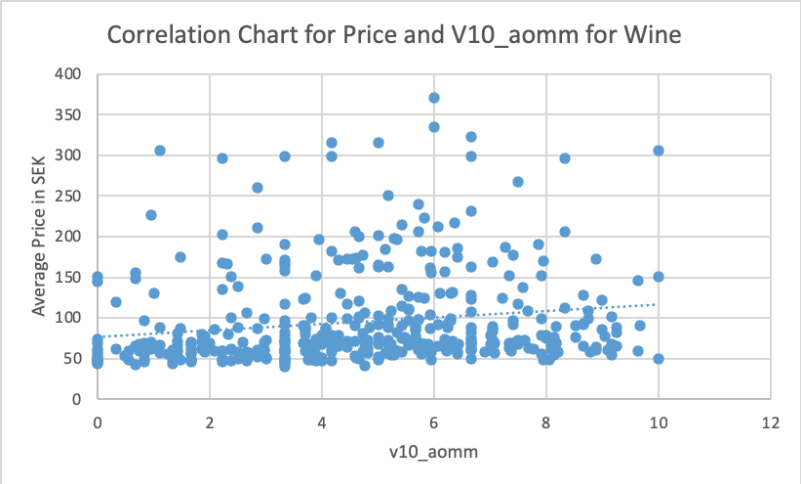
Bivariate analysis of the data

Bivariate Descriptive Statistics: Price, v10_aomm (overall rating), and taste segment (taste rating) are all associated with each other. As taste and overall rating increase, the price of the wine should also increase. Segment (type) and country are also associated with each other. Some countries might be better known for making a specific type of wine and might focus solely on that type. The amount of wine sold weekly in litres is not significantly associated with any of the other variables, but it indicates the demand for wine, which directly relates to our research question. Therefore, better taste and overall rating of wine should lead to increased demand (litres of wine sold) and price.

Table # 5: **Correlation Table for Continuous Variables From the Wine Statistics**

	v10_aomm	***litre***	***price***
v10_aomm	1.000		
litre	0.079	1.000	
price	0.166	0.056	1.000

Table # 6: **Visual Displays of Association**

Visual Displays	Description
 ***Figure #7***	Figure 7 shows the correlation between the Average price of wines against the average weekly sales in litres. The extrapolated trend line indicates that there is a positive correlation between the 2 variables, however, the visual representation of the data shows that it is weakly correlated. The majority of the wines are biased towards the relatively cheaper and lower weekly sales volume, with wine exhibiting the highest weekly sales having a price of around 180 SEK.
 ***Figure #8***	Figure 8 is a scatter graph showing the association between wine expert reviews and the respective wine prices. Indicating that there is no relatively strong correlation between wine prices and subsequent expert reviews on sed wines. Only 6 wines achieved a score of 10, consisting of the majority being red wines, 1 white, and one “spa”.

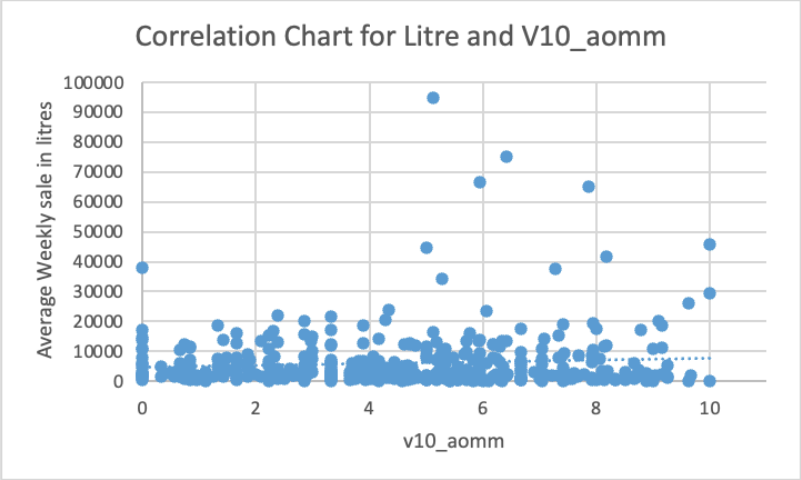


Figure #9

Figure 9 shows the relationship between wine expert reviews and average weekly sales in litres. The calculated trend line shows an extremely minute positive correlation between the 2 variables. The data representation exhibits a relatively even distribution of similar wine sales across the range of scores giving by the wine experts. With the highest weekly sales volume wine being given a 5 by wine experts.

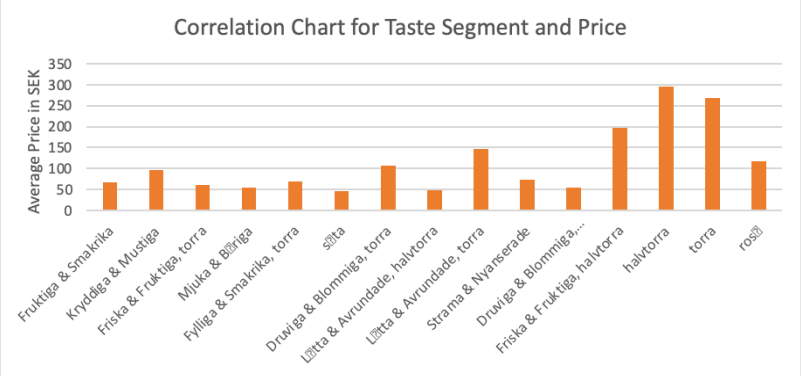


Figure #10

Figure 10 is a bar chart showing the distribution of wine segments and their respective prices. The graph shows “Halvtorra” having the highest average price, followed by “Torra”, and subsequently “Latta & Avurundade, torra”, for 2nd and third highest average wine costs. Most other wine segments then hover around the 50 - 100 SEK price bracket.

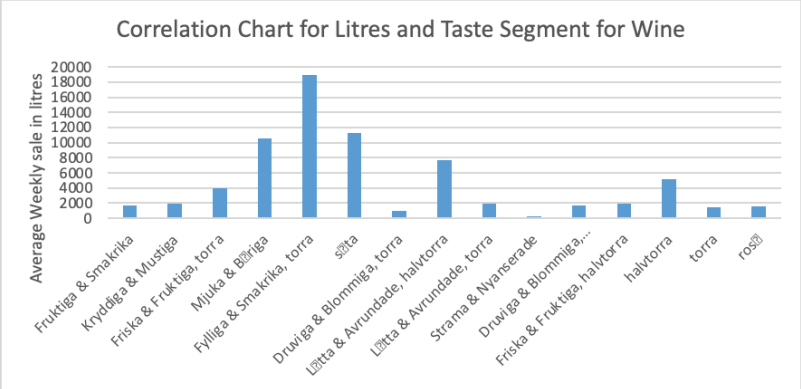


Figure #11

Figure 11 is a bar chart showing the distribution of wine segments and their respective weekly sales in litres. The graph shows “Fylliga & Smakrika, torra” has the highest weekly sales volume, followed by “Mjuka & Bariga” and “Sata” for a close second and third highest average weekly sales however, only being slightly higher than half of the weekly sales in litres of rank 1. The segment with the least volume was “Strama & Nyanserade”.

Proper Interpretations of Bivariate Stats: The interpretation of the bivariate numeric measures and visual displays for our variables helps us determine if the different characteristics of wine affect the demand. The scatter plots and bar charts above show the correlation between the following variables: v10_aomn, taste segment, price, and litres. The correlation coefficient between the # of litres sold weekly and the overall rating of the wine is 0.079, which is a very weak correlation. We can determine that the overall rating of the wine does not affect the demand for the wine. The correlation coefficient between the price and the overall rating of wine is 0.166, which is a very weak correlation. This shows that the price of the wine does not affect the overall rating of the wine. The correlation coefficient between the litres and the price of wine is 0.056, which is a very weak correlation. As a result, we can conclude that these three continuous variables weakly correlate with the demand for wine, and do not largely affect the demand for wine. Overall, it is clear from the visual displays above that the average weekly sales in litres of wine, expert wine ratings, and taste of the segment of wine do not affect the demand for wine.

INFERENCE METHODOLOGY:

To characterize the impact of prices, expert review (v10_aomm), and weekly sales in litre on the demand for wine, we conducted confidence intervals and right-tail hypothesis test to determine if there are statistically significant differences in those characteristics and the level of wine demanded, allowing us to infer the relationship between the price charging and the expert rating. We used a level of significance of 0.05 based on our sample size.

Conducting these tests on how those three characteristics of wine in the market will reveal how different characteristics of wine influence the level of demand. We used different approaches to identify the relation between those variables to ensure the appropriateness of inferences between different relations between our variables. We conducted a hypothesis test on whether the population means the number of wine prices with expert reviews scoring at most 5 is no larger than the population mean of wine prices purchased with expert reviews more than 5. Besides, we conducted a statistical test comparing the mean weekly sales with expert ratings of 5 or less to those rated higher than 5. The last hypothesis test states that there is no statistically significant association between higher wine prices and weekly sales in liters based on the data analyzed.

RESULTS:

Table #7: **Confidence Intervals**

	Lower Limit	**Upper Limit**
v10_aomm	4.357	4.883
litre	5039.123	7070.137
price	89.069	101.451

V10_aomn → We are 95% confident that the mean normalized review during the weeks the wine is between 4.357 and 4.883. Our point estimate for review ratings is 4.620.

Litre → We are 95% confident that the mean weekly sales in litres are between 5039.123 and 7070.137. Our point estimate for review ratings is 6054.630.

Price → We are 95% confident that the mean wine price is between 89.069 and 101.451. Our point estimate for review ratings is 95.260.

Point and Interval Estimates and Hypothesis Tests → *Figure #12: Relationship between Wine Prices and Expert Review Ratings*

	Difference in Means Test		
	Group 1		**Group 2**
n =	339		339
Sample mean =	104.511		87.805
Sample std. dev. =	61.013		1.574
Squared standard error =	10.981		0.007
		Difference	
Level of significance =		0.05	
Diff in sample means (mean 1 - mean 2) =		16.705	
SE of diff in sample means =		3.315	
Degree of Freedom =		338.450	
	Left Tail	**Right Tail**	**Two Tail**
	H1: μ1 - μ2 < 0	**H1: μ1 - μ2 > 0**	**H1: μ1 - μ2 <> 0**
Critical Value =	-1.649	1.649	1.967
Test Statistic =	5.039	5.039	5.039
p - value =	1.000	0.000	0.000
Decision	FTR H0	Reject H0	Reject H0

Interpretations of Point and Interval Estimates: We investigated the effect of wine prices on the effects of expert review ratings for the respected wines. We hypothesized that higher wine prices receive higher expert reviews. To test this conjecture, we performed a difference in means hypothesis test of the null that the population mean quantity of wine prices with expert reviews scoring at most 5 is no larger than the population mean of wine price purchased with expert reviews more than 5. We fail to reject this null at the 5% level of significance (see Table below). Therefore, we find evidence that higher wine prices do not correlate to a high wine expert review to a statistically significant extent.

Point and Interval Estimates and Hypothesis Tests → *Figure #13: Relationship between Weekly Sales Volume in Liters and Expert Review Ratings*

	Difference in Means Test		
	Group 1		**Group 2**
n =	207		232
Sample mean =	7058.431		5158.988
Sample std. dev. =	12473.253		5666.034
Squared standard error =	751604.071		138379.060
		Difference	
Level of significance =		0.05	
Diff in sample means (mean 1 - mean 2) =		1899.444	
SE of diff in sample means =		943.389	
Degree of Freedom =		280.362	
	Left Tail	**Right Tail**	**Two Tail**
	H1: μ1 - μ2 < 0	**H1: μ1 - μ2 > 0**	**H1: μ1 - μ2 <> 0**
Critical Value =	-1.650	1.650	1.968
Test Statistic =	2.013	2.013	2.013
p - value =	0.977	0.023	0.045
Decision	FTR H0	Reject H0	Reject H0

Interpretations of Point and Interval Estimates: We examined how weekly sales in litres correlate with expert review ratings for specific wines, hypothesizing that wines with higher expert reviews would lead to more weekly sales in litres. To test this hypothesis, we conducted a statistical test comparing the mean weekly sales with expert ratings of 5 or less to those rated higher than 5. With a significance level of 5% (indicated in the table), our analysis did not yield sufficient evidence to reject the null hypothesis. Therefore, we conclude that there is no statistically significant association between the level of weekly sales and better expert reviews.

Point and Interval Estimates and Hypothesis Tests → *Figure #14: Relationship between Weekly Sales Volume in Liters and Price*

	Difference in Means Test		
	Group 1		**Group 2**
n =	132		307
Sample mean =	7103.734		5603.543
Sample std. dev. =	14652.010		6138.270
Squared standard error =	1626374.285		122730.820
		Difference	
Level of significance =		0.05	
Diff in sample means (mean 1 - mean 2) =		1500.191	
SE of diff in sample means =		1322.537	
Degree of Freedom =		151.149	
	Left Tail	**Right Tail**	**Two Tail**
	H1: μ1 - μ2 < 0	**H1: μ1 - μ2 > 0**	**H1: μ1 - μ2 <> 0**
Critical Value =	-1.655	1.655	1.976
Test Statistic =	1.134	1.134	1.134
p - value =	0.871	0.129	0.258
Decision	FTR H0	FTR H0	FTR H0

Interpretations of Point and Interval Estimates: Our study examined how weekly sales in litres correlates with the price of the respective wines, predicting that higher-priced wines would achieve lower weekly sales in litres. To test this hypothesis, we conducted a statistical test comparing the mean weekly

sales of the wines with prices of 209.252 SEK or less to those rated higher than 209.252 SEK. With a significance level of 5% (as indicated in the table), our analysis did not provide enough evidence to reject the null hypothesis. Therefore, we conclude that there is no statistically significant association between higher wine prices and weekly sales in liters based on the data analyzed.

Policy Implications:

Before doing the investigation, the common conception was that wine expert review played a large part in dictating consumer demands, wine sales, and overall brand pricing decisions. Having a strong impact on the level of demand for wine in the market, with weekly sales volume in litres specifically and wine prices. However, from the results and analysis, there is ***no statistically significant correlation*** between wine characteristics and consumer demand in the form of weekly sales. We found little to no statistically significant correlation between expert reviews and weekly sales volume in litres.

As a result, we recommend wine manufacturers who utilize the opinions of wine experts to put ***less emphasis*** on those opinions and pivot more toward consumer market research. Possibly investing less money on expert reviews, expert peer groups, and redirecting funding to more effectively accommodate consumer preferences or better marketing. Furthermore, brands should investigate the option of entering the 150-200 SEK price bracket, if they do not already have something equivalent price in their portfolio, as the wine exhibiting the highest relative weekly sales has a price of around 180 SEK. However, based on visual data representation, indicates that lower wine prices resulted in more weekly sales.

On the consumer end, people should put ***less weight behind wine expert reviews*** as the wines which ***achieved the highest scores did not indicate strong consumer demand*** via weekly sales. More importantly, people should prioritize the price, type of wine, and market segment the wine is in to match their personal preference.

SUMMARY AND CONCLUSION:

In this paper, we empirically investigate the relationship between different wine characteristics and their demand for wine using data from wine sales and wine reviews at all distribution levels in the span of two years. From the data taken, we can conclude that wine characteristics do not have a statistically significant correlation to the demand for wine. However, we can conclude that wine demand does correlate with consumer preference and we noted that there is an increase in the weekly sale in litres of wine when the average price in SEK of wine is lower. This makes sense because consumers prefer spending money on wine that is affordable and is not too expensive.

However, in terms of the lack of a statistically significant correlation between wine characteristics and demand in the form of weekly sales, we have found multiple reasons as to why this is the case. For one, some consumers are price sensitive, meaning that they prioritize price over the quality of wine. This caused there to be an increase in the weekly sale in litres of wine when the average price of SEK of wine was lower. Another reason could be consumer preferences, where consumers can be highly subjective and varied. This can be dependent on brand loyalty, packaging, and marketing, which play a significant role when consumers purchase wine. In order to fully understand the lack of significant correlation, additional variables such as loyalty, packaging, and marketing must be considered. It is also important to note that

wine sales and demand can be influenced by seasonal factors and holidays. Although this may not directly correlate with the type of wine, it can affect external factors like social events and celebrations, where one wine type may be favored over the other. Overall, all that is guaranteed is that there is no statistically significant correlation between the demand for wine.

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Appendix:

CONTRIBUTION LIST:

Contributors:

Upashana Suresh Kumar - worked on TBL activities, and wrote the written background/explanation for some graphs. Created Excel charts, bar graphs, and histograms. Organized the document for the rough draft and edited the background information. Helped complete and start the data section, fixed all the mistakes that were suggested by the TA. Edited the tables so they related back to our research questions. Completed the proper interpretations of bivariate stats and the methods of inference. Prepared histograms and organized the correlational table. Helped write the summary and conclusions and completed the appendix. Finalized the rough draft and final draft.

Linh Nguyen - contributed to the TBL by creating graphs (histogram, scatter plot), descriptive sections, and formatted citations. Prepared the table for data correlation, and Code Book. Participated in conducting

the background information and assisting in other sections. Conducting the introduction part for the first draft based on group discussion. Constructing the correlation, preparing summary and analysis for different datasets and methodology. Contributing to policies part.

Bao Nguyen - Completed all TBL activities by creating graphs and writing detailed descriptions. Wrote most of the descriptive visual data representations, background information with in-text citations as well as a bibliography. Helped with creating histograms and scatter plots for variable correlations, as well as writing all the descriptions for sed data representations. Help reword the introduction and research question. Calculating and constructing confidence interval tables, Point and Interval Estimates and Hypothesis Test tables, differences in the mean hypothesis tests table as well as concluding the results from the given data. And gave recommendations to the policy implications with the statistical analyses.

Marginal Contributors:

Samantha Hagan - worked on TBL activities 2, 4, and 5 with the tables and the variables in Excel. Did some descriptions for TBL 3 and 4. Was a contributor to the choosing of the topic and the motivation behind the topic. Integrated a source into background information. Got work checked for the group during the lab.

Sam Moellman - Worked on TBL 2, 4, 5. Contributed to definitions of terms as well as background explanations, rewrote passages for clarity, discovered and formatted sources, and helped in the creation of graphs by working collaboratively in a group setting. Re-wrote the “Proper Bivariate Analysis,” “Introduction,”

Non-contributors:

Braeden Archambault- Did work on one graph

Yanni Loyack- Inserted some graphs based on the TBL activities, which were already completed