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## **Two-Buck Chuck and Wine Quality: Hedonic Price Analysis of Cool Climate Wines**

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## **Introduction**

Despite the current economic conditions, annual total U.S. wine sales increased by four percent in 2009 reaching \$34.5 billion. U.S. wine production is expected to increase even further as especially the demand for less expensive wines continues to grow. New emerging varietal wines are making their way into the market providing an array of new wines to capture the tastes and preferences of a culturally diverse population. It is predicted that by 2012, the U.S. wine industry will overtake Italy as the world's largest wine consumer (Wine-USA Industry Report 2009). In order to meet the growing domestic wine demand, U.S. production of cool climate wines has expanded and contributed to the increasing U.S. wine supply. Wine is grown in each of the contiguous 48 states, and this has fuelled an interest in many cool climate wine varieties, most notably Riesling. From wine grape acreage to total sales, Riesling and Pinot Noir experienced the most growth in percent of total volume sales between 2004 and 2009 (Wine Institute 2009a and b). Additional grape varieties most suited to be grown in cool climate regions include Chardonnay, Sauvignon Blanc and Pinot Noir (Jackson and Schuster 1987).

Cool climate wine quality has continuously improved and many new medium-to small-scale wine producers are winning the attention of consumers with high *Wine Spectator* scores for their respective wines. Many of these producers are in California, but there is a growing number of cool climate wine producers in Oregon, Washington, and New York State. Furthermore, this is an area with very little research and there is a need to define and study the price-quality relationship.

With the economic uncertainty and increasing competitive pressures, it is important to understand for producers and marketers consumer purchasing decisions. Wine is consumed primarily for hedonic consumption utility (Neeley, Min and Kennett-Hensel 2010). Many factors influence a consumer's decision to purchase wine, but price remains a key determinant. Therefore, it is important to evaluate the factors that influence the price of wine. Price is one of the strongest indicators for quality, and is impacted primarily by brand name and country of origin (Heslop, Cray and Armenakyan 2010). In order to address the relationship between wine and its associated price, the development of a solid empirical framework to study prices for cool climate wines is needed.

The objectives of this study are to 1) analyze the market for cool climate wines in California, Washington, New York and Canada, 2) estimate a varietal-based pricing strategy for Riesling, Chardonnay, Sauvignon Blanc and Pinot Noir for the California region, and 3) estimate a region-based pricing strategy for cool climate wine varietal Riesling for California, Washington, New York and Canada.

### **Determinants of Wine Prices**

Many factors influence the quality of wine and the price consumer are willing to pay for wine, but the quality of a bottle of wine is not known with certainty until it is opened. The reputation of producers and regions greatly affects a consumers' willingness to pay, although those price premiums could be small (Schamel 2002; Troncoso and Aguirre 2006; Guillermo, Brummer, and Troncoso 2008). Many wine prices vary greatly despite having very similar attributes. For example, Napa Valley wines typically sell at higher prices than other wines of comparable sensory quality of other regions. Since consumers are uncertain or do not have sufficient information about the overall quality of

the wine they are purchasing, they are willing to pay a higher price for a reputable wine from a well-known region and/or producer. In particular, cool climate regions are preferred to other regions. However, Nerlove (1995) determined that the origin of wine had no significant influence on the price of wine. It has also been suggested that grape varieties are more important in the choice of New World wines, whereas regional origins are valued more in Old World wines (Steiner 2002).

Grape variety is an important factor determining the price of wine (Troncoso and Aguirre 2006; Guillermo, Brummer, and Troncoso 2008; Schamel 2009). Steiner (2002) found that when comparing the grape varieties to color, Riesling is valued higher than Chardonnay. Since Riesling is a classical grape from Germany and France, the high valuation is most likely associated with demand spurred by those countries. Most popular red varietals have a highly positive impact on the price for Pinot Noir (+25.7 percent) relative to Cabernet Sauvignon (+7.3 percent) (Steiner 2002).

Many hedonic price analysis studies incorporated vintage into their models because aging has been found to have a positive impact on price (Di Vittorio and Ginsburgh 1995; Steiner 2002; Schamel 2002, 2009; Troncoso and Aguirre 2006; Guillermo, Brummer, and Troncoso 2008;). Di Vittorio and Ginsburgh (1995) determined that vintage increased wine prices by approximately 3.7 percent per year of age, while Troncoso and Aguirre (2006) predicted 5.6 percent. Steiner (2002) claimed that the increasing valuation of older vintages reflects both interest rate differentials, as well as cost of storage. Two vintages stand out the most: 1986 valued at +52.4 percent and 1988 valued at +28.8 percent.

Guillermo, Brummer, and Troncoso (2008) found that the information on the label has a great influence on the price of wine. The study defines the quality categories that appear on the label of a bottle of wine as the special descriptors. These categories include: Selection, High, Reserve, and Gran Reserve. The word “consignment” is also added on the label indicating the quantity of cases made. Adding consignment to the bottle should add reputation to the wine, but may decrease price if higher quantities are placed in the market. This could be a result from excess supply situations. Consignment showed a negative relationship with price, although only slightly significant. With one additional case placed in the market, the price would decrease by 0.0005 percent. This would mean 10,000 cases of wine would be needed to reduce the price by 5 percent. Results indicate that labeling practices and the choice of the right wine attributes to put on the label might be more influential on price than expert opinions, medals awarded, and vintage. A good label indicating the consignment, the vineyard of origin, and the description of quality (Selection, High, Reserve, or Gran Reserve) of the wine can add as much as US \$15.60 to the retail price to the reference price of US \$21.49 per bottle.

### **Data, Methodology and Procedures**

In order to evaluate cool climate wine prices, two different data sets were used. The first data set was based on Wine Spectator data collected from the Digital Archives Database from *Wine Spectator Online*. It provided the 2011 release prices for selected wines in key wine-producing regions including California, Washington, New York and Canada from 1986 to 2009. Given the availability of the data, the different attributes describing each wine included region and sub-region, vintage, *Wine Spectator* score, and

number of cases produced. The sample size contained 1,133 different wines; in some cases the same wine from different vintages are included in our sample.

The study included an additional dataset to estimate a varietal-based pricing strategy for California. The second data set was collected at BevMo, a retail-chain store, in San Luis Obispo, California and it examined Riesling, Chardonnay, Sauvignon Blanc, and Pinot Noir. The data set contained more variables than the first data set since other characteristics, specifically label information, were accessible. The retail price was used instead of the release price, and no sales prices were included. Although the study was limited to the wines being sold in one retail location, these prices are representative of those across all retail outlets in California.

Attributes collected for each wine bottle included variety, region and sub-region, vintage, alcohol content, cork type (natural/synthetic or screw cap), and several label attributes. Label attributes include production method (organic or conventional), ownership structure (corporate or family), quality categories (Selection, High, Reserve, Gran Reserve and Consignment), and graphic label style (image or text). A sample size of 502 bottles was used to help validate any possible price fluctuations for the wine varieties chosen labeled with these regions. This dataset focused on California wine producing regions, as data for wines from Washington, New York and Canada were not available.

Table 1. Wine Spectator and BevMo Data Variables and Coding

<b>Variable Name</b>	<b>Wine Spectator</b>	<b>BevMo</b>
<b>Sonoma</b>	1=Sonoma, else=0	1=Sonoma, else=0
<b>Napa</b>	1=Napa, else=0	1=Napa, else=0
<b>Bay Area/Central Coast</b>	1=Bay Area/Central Coast,	1=Bay Area/Central Coast, else=0
<b>Mendocino</b>	1=Mendocino, else=0	1=Mendocino, else=0
<b>South Coast</b>	1=South Coast, else=0	1=South Coast, else=0
<b>Sierra Foothills</b>	1=Sierra Foothills else=0	1=Sierra Foothills else=0
<b>Finger Lakes</b>	1=Finger Lakes, else=0	1=Finger Lakes, else=0
<b>Long Island</b>	1=Long Island, else=0	1=Long Island, else=0
<b>Washington</b>	1=Washington, else=0	1=Washington, else=0
<b>Canada</b>	1=Canada, else=0	1=Canada, else=0
<b>Vintage</b>	Quantitative Variable	Quantitative Variable
<b>WS Score</b>	Quantitative Variable	Quantitative Variable
<b># Cases Produced</b>	Quantitative Variable	Quantitative Variable
<b>Riesling</b>		1=Riesling, else=0
<b>Sauvignon Blanc</b>		1=Sauvignon Blanc else=0
<b>Chardonnay</b>		1=Chardonnay, else=0
<b>Alcohol Content</b>		Quantitative Variable
<b>Cork Type</b>		1=Natural/Synthetic, 0=Screw
<b>Production Method</b>		1=Organic, 0=Conventional
<b>Ownership Structure</b>		1=Corporate, 0=Family-Owned
<b>Quality Descriptors</b>		1=Quality Descriptor indicated,
<b>Label Image</b>		1= image, 0=no image

There are the two data sets that will be evaluated in separate equations. Equation (1) is estimated using the full sample of 1,133 observations from the Wine Spectator data and includes 13 variables:

$$(1) \log P_i = \beta_0 + \beta_1 \text{Sonoma} + \beta_2 \text{Napa} + \beta_3 \text{BayArea} + \beta_4 \text{Mendocino} + \beta_5 \text{SouthCoast} + \beta_6 \text{Sierra} \\ + \beta_7 \text{FingerLakes} + \beta_8 \text{LongIsland} + \beta_9 \text{WA} + \beta_{10} \text{Canada} + \beta_{11} \text{Vintage} + \beta_{12} \text{WSscore} + \beta_{13} \text{\#CasesProd}$$

for  $i = 1, 2, 3, \dots, n$ , where  $n$  = the number of observations.

For the first dataset, the independent variables are region and sub-region (Sonoma, Napa, Bay Area, Mendocino, South Coast, Sierra Foothills, Finger Lakes, Long Island, Washington, and Canada), variety (Riesling), vintage, Wine Spectator score (WSscore), and number of cases produced (#CasesProd).



Equation (2) for the analysis of BevMo data is estimated using the full sample of 502 observations and includes 15 variables:

$$\log P_i = \beta_0 + \beta_1 \text{Riesling} + \beta_2 \text{Sauvignon} + \beta_3 \text{Chardonnay} + \beta_4 \text{Sonoma} + \beta_5 \text{Napa} + \beta_6 \text{BayArea} + \beta_7 \text{Mendocino} + \beta_8 \text{SouthCoast} + \beta_9 \text{Vintage} + \beta_{10} \text{AlcoholContent} + \beta_{11} \text{CorkType} + \beta_{12} \text{ProdMethod} + \beta_{13} \text{Ownership} + \beta_{14} \text{Quality} + \beta_{15} \text{LabelImage}$$

for  $i = 1, 2, 3, \dots, n$ , where  $n$  = the number of observations.

For the second, the variables are variety (Riesling, Chardonnay, Sauvignon Blanc and Pinot Noir), region and sub-region (Sonoma, Napa, Bay Area, Mendocino, South Coast), vintage, alcohol content (Alcohol %), cork type (synthetic/natural or screw), production method (organic or conventional), ownership (corporate or family), quality (Selection, High, Reserve, Gran Reserve or Consignment) and label image (graphic or text).

### Results and Discussions

In the *Wine Spectator* dataset, the majority of the wines examined came from New York, followed by Washington, Canada and California.

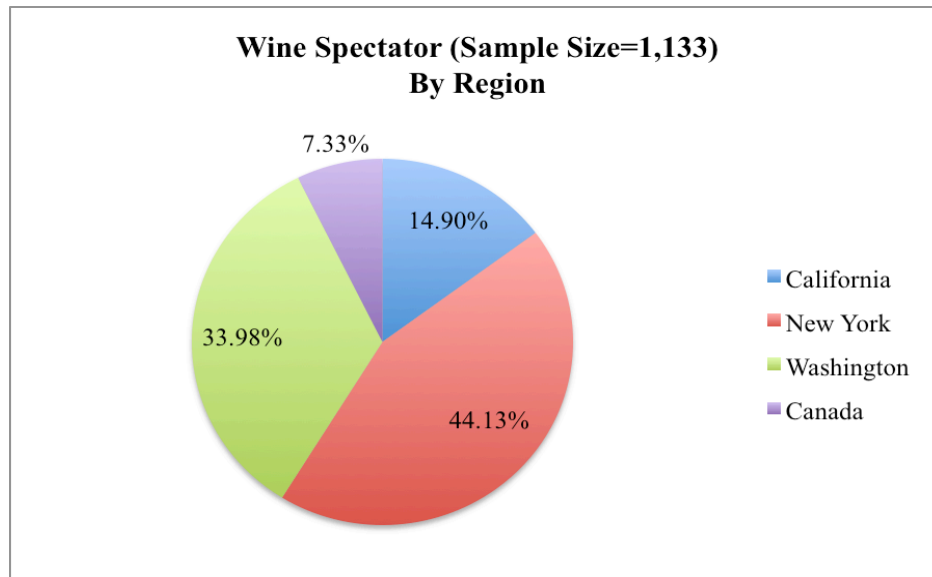


Figure 1. WS Results by Region

Table 2. Wine Spectator Frequency Table

	<b>Variable Name</b>	<b>Wine Spectator (Sample Size=1,133)</b>
Region	Sonoma	2.82%
	Napa	2.03%
	Bay Area/Central Coast	4.32%
	Mendocino	2.91%
	South Coast	2.03%
	Sierra Foothills	0.79%
	Finger Lakes	42.81%
	Long Island	1.32%
	Washington	33.98%
	Canada	7.33%
Age	Vintage	Quantitative Variable
Quality	WS Score	Quantitative Variable
Winery Size	# Cases Produced	Quantitative Variable

For Equation (1), results indicated that the variables Washington, Canada, Vintage, *Wine Spectator* score, and number of cases produced are all significant. Our results indicate that being a Riesling wine from Washington decreases price by 22.3%, but if from Canada, increases price by 22.9%. All California regions had no significance on the price of Riesling, which could in part be due to the small production of Riesling in California compared to the other regions. In this study, wines from 1986-2009 were included in the study.

Vintage effects were significant, and resulted in a decrease of 1% to the price of Riesling. In addition, *Wine Spectator* scores varied from 72 to 93. Each additional increase in the WS score resulted in a 4.2% increase in price indicating the importance of reputation. This confirms the results by Schamel (2002) who had found that reputation had significant, positive impacts on price. Thus, a wine's price is related to both its own quality, and to its producer's reputation for quality. These relationships depend on historical performance of both the producer and the producers in the region. As producer

reputation accumulates, consumers could pay more attention the individual producer-specific quality signals and become less reliant on regional quality indicators.

Lastly, the number of cases produced were proven to be significant but had a minuscule impact on price. ViTorrio and Ginsburgh (1995) as well as San Martin, Brummer and Troncoso (2008) found that the quantity of cases produced had a small, but statistically significant impact on price. It would require a large amount of cases to enter the market to reduce price, which makes sense in the huge American market.

Table 3. Wine Spectator LOG Price Regression Results (R-square=0.43)

	<b>Variable Name</b>	<b>Coefficients</b>	<b>t-Statistic</b>	<b>P-Value</b>	<b>Significance</b>
	Intercept	-2.188	-10.267	0.000	**
Region	Sonoma	-0.013	-0.159	0.873	
	Napa	0.074	0.921	0.357	
	Bay	-0.081	-1.075	0.283	
	Mendocino	0.008	0.101	0.920	
	South Coast	0.000	0.003	0.998	
	Sierra Foothills	-0.122	-1.293	0.196	
	Finger Lakes	-0.099	-1.356	0.175	
	Long Island	0.134	1.400	0.162	
	Washington	-0.223	-3.091	0.002	**
	Canada	0.229	2.985	0.003	**
Age	Vintage	-0.010	-6.196	0.000	**
Quality	WS Score	0.042	17.967	0.000	**
Winery	#Cases Produced	0.000	-3.906	0.000	**

\*\* Significant at the 0.05 level

\* Significant at the 0.10 level

The second dataset, based on wine data collected at BevMo, a local retail store examined not only Riesling, but also other cool climate varietals including Sauvignon Blanc, Chardonnay and Pinot Noir. Of the 502 wines collected, 51.2% were Chardonnay, 20.7% Pinot Noir, 20.5% Sauvignon Blanc, and 7.6% Riesling.

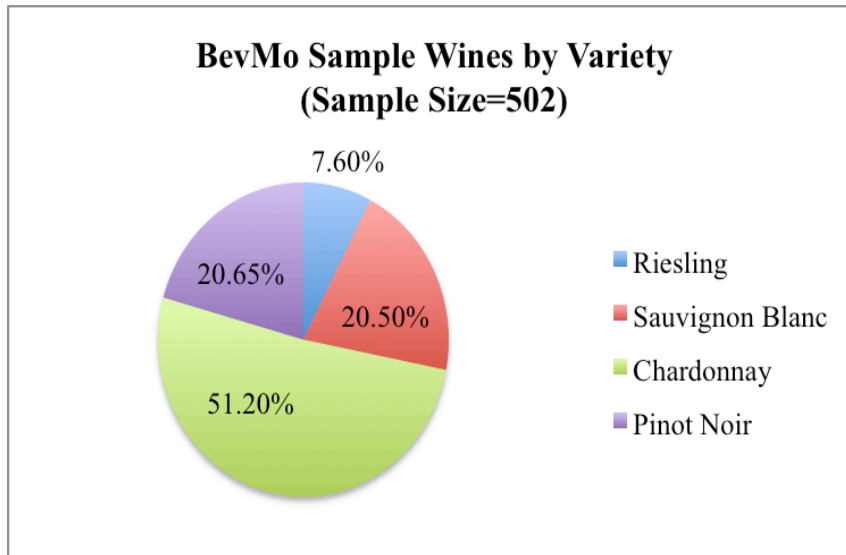


Figure 2. BevMo Sample Wines by Variety

In addition, 83.7% of the wines had a natural/synthetic cork, 2.4% were organic, 70.1% were corporate owned, 81.3% had an image on the label, and 9.9% had a quality descriptor indicated on the label (Selection, High, Reserve or Grand Reserve).

Table 4. BevMo Frequency Table

	<b>Variable Name</b>	<b>% of Sample Wines (Sample Size=502)</b>
Variety	Riesling	7.6%
	Sauvignon Blanc	20.5%
	Chardonnay	51.2%
Region	Sonoma	26.6%
	Napa	20.7%
	Bay Area/Central Coast	26.5%
	Mendocino	4.1%
	South Coast	1.6%
Age	Vintage	Quantitative Variable
Label Attributes	Alcohol Content	Quantitative Variable
	Cork Type	83.7% Natural/Synthetic
	Production Method	2.4% Organic
	Ownership Structure	70.1% Corporate Owned
	Quality Descriptors	9.9% Quality Descriptor Indicated
	Label Image	81.3% had a Image on the Label

Table 5. BevMo LOG Price Regression Results (R-square=0.41)

	Variable Name	Coefficients	t-Statistic	P-Value	Significance
	Intercept	0.075	0.425	0.671	
Variety	Riesling	0.006	0.168	0.867	
	Sauvignon Blanc	-0.153	-6.999	0.000	**
	Chardonnay	-0.108	-6.153	0.000	**
Region	Sonoma	0.169	7.854	0.000	**
	Napa	0.186	8.089	0.000	**
	Bay	0.095	4.458	0.000	**
	Mendocino	0.071	1.879	0.061	*
	South Coast	0.106	1.927	0.055	*
Age	Vintage	0.009	1.579	0.115	
Label Attributes	Alcohol Content	0.081	6.356	0.000	**
	Cork Type	0.005	0.266	0.790	
	Production	0.089	1.965	0.050	**
	Ownership	-0.019	-1.279	0.201	
	Quality	0.009	0.414	0.679	
	Label Image	-0.049	-2.857	0.004	**

\*\* Significant at the 0.05 level

\* Significant at the 0.10 level

Results indicate that Sauvignon Blanc, Chardonnay, Sonoma, Napa, Bay Area/Central Coast, Alcohol Content, Production Method and Label Image were significant at the 5% level. In addition, the regions Mendocino and South Coast were significant at the 10% level. Riesling may not have showed significance since only 7.6% of the wines collected were Riesling and since it is not as popular of a variety to be grown in California as it is in other cooler regions. Results indicate that Sauvignon Blanc varieties decrease the price by 15.3%; and Chardonnay varieties decrease the price by 10.8%.

Alcohol content increased price by 8.1%, production method increases price by 8.9%, and label image decreases price 4.9%. When including significant variables at the 0.10 level, wines from Mendocino increase price 7.1% and South Coast wines cause price to increase by 10.6%.

Results were congruent to those of the study by Martin, Brummer, Troncoso's (2008). Results indicated that quality descriptors indicated on the label were not proven to be significant. This suggests that the insignificant descriptors have no meaning for US consumers, or if there is a meaning associated with these descriptors, consumers are not willing to pay a higher price for them.

## **Conclusions**

The experience of purchasing, consuming or processing a quality wine should be viewed from a hedonic perspective. A decrease in wine consumption in parts of the Old World has resulted from consumers being less predictable and having more choices than they had in the past. Consumers used to be primarily driven by their loyalty to certain vintages, wine mixtures and grape varieties of brands. Research suggests wine consumption is as much as a social transmission as an economic transaction (Mora and Moscarola 2010), which indicates that consumer's wine purchases are not always directly related to its price.

This study employed hedonic price analysis to reveal the values which consumers place on various wine attributes. Estimation results deliver information on wine consumer preferences for attributes contained on the bottle, as well as the value they place on region, varietal, vintage, alcohol content, and amount of cases produced. Results indicated that variety, region, vintage, *Wine Spectator* score, number of cases produced, alcohol content, production method, and label graphic were all highly significant. In this study, price was responsive to all of these attributes. Consumers are willing to pay more for the variety they want, from a popular, well-known wine production area that has built

a strong reputation through receiving *Wine Spectator* scores, has an image on the label and is produced organically. Overall, the results confirm that consumers hold value to various wine attributes and are willing to pay more for a “good” wine.

However, several issues remain. The analysis may not be fully representative of the wines and regions due to the availability of data. The first dataset containing Riesling data of California, Washington, New York and Canada was collected from the *Wine Spectator* database. Although, the sample size is large with 1,133 observations, it may not be a fully representative sample of Riesling production. It fails to include Washington and Canada sub-regions of production, and the indicated amount of wines produced in each of the areas varies greatly. The second data set gathered from a local retail store, BevMo, examined California wines Riesling, Sauvignon Blanc, Chardonnay and Pinot Noir. However, the store had a much wider selection of Chardonnay than the other varieties, which could have influenced the results. Due to the nature of the data and the dummy variables used, limited functional flexibility may also limit the validity of the estimates. However, early studies have already shown that such constraints may not be as limiting.

The question remains as to whether the attributes included as variables in the regression are proxies for other attributes, which themselves are the true attributes in the consumers eyes. In future analysis, the hedonic framework, should be accompanied by further testing. Hedonic pricing allows the identification of consumer preferences in the proximity of observed choices, but tends to ignore the relation between part-worth utility and revealed preferences, in addition to consumers’ tradeoff behavior.

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