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## **A Hedonic Price Analysis for the New Zealand Wine Industry: Preliminary Results**

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# **A Hedonic Price Analysis for the New Zealand Wine Industry: Preliminary Results**

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## **Abstract**

This paper presents preliminary results from a hedonic price analysis of premium wines in New Zealand over the vintages 1994 – 2003. Implicit prices are presented for a sensory quality rating, as well as wine variety and regional reputation. Results show that the price premium associated with Michael Cooper's five-star quality rating is highly significant and increasing in magnitude over the study period. Trends in regional and varietal preferences are also explored.

Keywords: Hedonic pricing, New Zealand wine, quality

## **1. Introduction**

Wine is a differentiated product for which information about its true quality is limited until the time of consumption. As a consequence, buyers must use other indicators of a wine's value in order to make purchase decisions. Some potential indicators of a wine's quality such as the vintage, the region and the varietal are easily obtained from the wine's label prior to purchase.<sup>2</sup> Other, more subjective, indicators of quality come in the form of quality rankings or recommendations from wine experts, and the receipt of various wine awards.

A consumer's perception of wine quality will, in part, influence the amount they are willing to pay for a particular wine. Which information is most pertinent in affecting consumer perceptions of wine quality? Evidence from a number of studies using hedonic price functions to estimate the relationship between the price of wine and its various characteristics generally supports the belief that the price of wine is influenced by objective and subjective characteristics that are available to consumers prior to purchase (see for example Combris et al. 2000 and Landon and Smith 1997 for the Bordeaux market, Nerlove 1995 for the Swedish market, Roberts and Reagans 2001 for the US market, and Oczkowski 1994, 2001 and Schamel and Anderson 2003 for the Australian market) but this research also shows that there are significant differences between countries. With the exception of Schamel and

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<sup>2</sup> By law, labels on New Zealand wines must provide information on the brand, region of origin, principle grape variety, vintage, winery, alcohol content by volume and presence of any preservatives or additives.

Anderson (2003) there has been no study of the New Zealand wine market and so this research aims to fill this void.

In this paper we estimate a hedonic pricing model for each year in the period 1994 to 2003 based on New Zealand data for grape variety, growing region and quality. The number of observations in each year ranges between 696 and 1518. Our analysis differs from Schamel and Anderson (2003) in a number of ways. Firstly, we focus exclusively on New Zealand wines. Secondly, we use individual wine quality ratings from New Zealand's pre-eminent wine expert Michael Cooper, (rather than Halliday who is based in Australia). Cooper focuses exclusively on evaluating New Zealand wines. As a result our data set covers a much broader range of wines. Arguably local consumers may pay more attention to a local wine expert than one based overseas.

The preliminary results show that Cooper's quality rating is a highly significant determinant of wine price in all years, however in contrast to Schamel and Anderson (2003) we find that the size of this effect is trending up over time. Such a trend may reflect the increased credibility of Cooper as a wine critic (his first rankings came out in 1992). It could also be argued that the rapid proliferation of wines in recent years, combined with increasing access via supermarket sales, may have increased the value of the information in his guides. In addition, while Schamel and Anderson (2003) found little evidence that regional or varietal variations affect price, we find increasingly significant differences across regions over time and highly significant differences across grape varieties for the entire period of study. The size and direction of these varietal differences are consistent with our expectations.

The remainder of the paper is as follows: Section 2 provides a brief description of the New Zealand wine industry, Section 3 describes the data and hedonic price model, Section 4 presents the empirical results and Section 5 concludes.

## **2. The New Zealand Wine Industry**

Grapes have been grown in New Zealand since the time of the first European settlers, but only recently has New Zealand wine received worldwide recognition. The number of wineries has more than doubled in the last fifteen years and now totals in excess of 450. Production of premium grape varieties such as Chardonnay, Sauvignon Blanc, Pinot Noir and Merlot has also increased significantly to satisfy domestic and export demand for higher quality New Zealand wines. While exports of New Zealand wine have grown rapidly in recent years, with projections that during this current year export sales will exceed domestic sales for the first time, the domestic market remains of primary importance to New Zealand wine producers.

Geographically New Zealand lies between 34°S to 47°S latitude and therefore has a predominantly cool viticultural climate. There are, however, three distinct climatic growing zones spanning from Northland to Hawke's Bay (warm and sunny), Wairarapa to Waipara (cool but very sunny) and Canterbury to Central Otago (cold with significant risks of frost) and these climatic differences have resulted in emergence of clearly identified regional strengths. Hawke's Bay excels at the production of Bordeaux variety red wines, Marlborough is best known for its Sauvignon Blanc and Riesling wines and the southern regions (from Wairarapa

south) for their Pinot Noir. Table 1 shows the current percentage of production broken down by grape variety and Table 2 shows each region's main grape varieties along with their percentage of New Zealand's total production.

Table 1: Percentage of Total Production by Grape Variety<sup>a</sup>

Grape	% of Total Production
Sauvignon Blanc	37.8
Chardonnay	20.8
Pinot Noir	12.6
Merlot	6.6
Riesling	4.5
Cabernet Sauvignon	4.3
Semillon	2.9
Pinot Gris	1.1
Cabernet Franc	.8
Pinotage	.8
Gewurztraminer	.7
Syrah	.4
Other	6.7

<sup>a</sup> Source: Wine Institute of New Zealand (2004)

Table 2: Percentage of Total Production by Region<sup>a</sup>

Region	Main Grape Varieties	% of Total Production
Northland/Auckland	Chardonnay, Merlot, Cabernet Sauvignon	1.2
Gisborne	Chardonnay, Muller-Thurgau	19.2
Hawke's Bay	Chardonnay, Merlot, Cabernet Sauvignon	14.5
Wairarapa	Pinot Noir, Sauvignon Blanc, Chardonnay	1.8
Nelson	Chardonnay, Sauvignon Blanc, Pinot Noir	4.2
Marlborough	Sauvignon Blanc, Pinot Noir, Chardonnay	54.1
Canterbury	Pinot Noir, Chardonnay, Riesling	1.9
Otago	Pinot Noir, Pinot Gris, Riesling	2.4

<sup>a</sup> Source: Wine Institute of New Zealand (2004)

### 3. The Data and Hedonic Price Model

#### 3.1 The Data

The data set is constructed from Michael Cooper's annual series of *Buyer's Guide to New Zealand Wines* for the years 1994 to 2003. Cooper uses a five-star rating to judge the overall quality of a wine relative to other New Zealand wines of the same variety in each vintage. Each additional half-star represents an increase in quality ranging from 'to be avoided' (zero stars) to 'outstanding' (five stars). The number of different wines Cooper rates in each year varies from 696 in 1994 to 1518 in 2003, with a total number of observations over the 10 years of 10558. More detailed statistical information regarding average price and rating, number of wines of each variety and number of wines from each region for the bookend years of 1994 and 2003 is provided in Tables 3 and 4. To distinguish differences in consumers' willingness to pay for different grape varieties, we have identified seven distinct varieties of both red and white wines. We have also identified eight different growing regions so that we can assess regional variations in wine prices. The endogenous variable is the average New Zealand dollar retail price (including taxes) per 750 mL bottle.

**Table 3 – Description of Data for 1994 and 2003 - by Grape Variety**

Grape Variety	Number	1994		Number	2003	
		Average Price	Average Rating		Average Price	Average Rating
Chardonnay	148	19.91	3.32	405	23.51	3.61
Blended White	32	9.59	2.10	10	15.80	2.90
Gewurztraminer	63	14.25	3.03	51	20.92	3.72
Pinot Gris	5	15.80	3.30	72	22.56	3.74
Riesling	73	13.41	3.22	166	18.22	3.54
Sauvignon Blanc	124	15.12	3.21	211	18.74	3.61
Semillon	13	13.38	2.85	16	19.19	3.22
Cabernet Franc	7	16.86	2.93	16	30.56	3.60
Cab. Sauvignon	121	20.39	3.18	125	29.26	3.54
Blended Red	33	14.00	2.55	47	31.72	3.68
Merlot	21	21.52	3.57	128	27.40	3.58
Pinotage	7	11.86	2.72	13	19.38	3.39
Pinot Noir	42	20.31	2.98	220	33.08	3.64
Syrah	5	23.60	3.40	35	33.06	3.89
Average		17.05	3.12		25.11	3.62
Standard Deviation		6.30	.96		11.50	.73

**Table 4 – Description of Data for 1994 and 2003 - by Region**

Region	Number	1994		Number	2003	
		Average Price	Average Rating		Average Price	Average Rating
Auckland	76	17.66	2.90	143	29.66	3.44
Gisborne	73	15.82	2.88	82	20.70	3.36
Hawke's Bay	236	16.96	3.11	419	25.68	3.68
Wairarapa	48	20.67	3.50	147	28.11	3.68
Nelson	29	15.62	3.12	100	22.91	3.55
Marlborough	165	16.68	3.40	415	22.98	3.70
Canterbury	38	16.42	2.81	97	24.28	3.58
Otago	29	17.69	2.61	112	26.96	3.50
Average		17.05	3.12		25.11	3.62
Standard Deviation		6.30	.96		11.50	.73

### 3.2 The Model

Hedonic price analysis involves the specification of an implicit or hedonic price function that relates the price of a good to all of the attributes that theoretically affect its value. Rosen (1974) provides the theoretical foundation for this approach in a paper which suggested that individuals value goods on the basis of their utility-generating attributes. Within the current context, one could hypothesize that the price of a bottle of wine depends upon varietal characteristics of the wine, the region where the wine was produced, and the specific winery that produced the wine. Schamel and Anderson (2003) further speculated that a consumer's willingness to

pay for a bottle of wine might also depend upon expert ratings of wine quality that are available in published guidebooks and magazines. Such guidelines may be particularly valuable to individuals who are relatively infrequent purchasers of wine, or those who are looking for a bottle of wine to suit a special occasion. In New Zealand, where the size and the sophistication of the wine industry has been increasing at such a rapid rate the expert ratings may be an increasingly valuable source of information.

In this study, we assume that a consumer's willingness to pay for a particular wine is a function of that wine's quality rating (QR), varietal (V) and region (R) of origin. The implicit price for each attribute is derived by differentiating the hedonic price equation with respect to the variable of interest. In a well-functioning market, utility maximizing consumers will purchase wine so that their willingness-to-pay for a marginal increase in a particular attribute equals its hedonic price. Consequently, in equilibrium, the hedonic price for an attribute can be interpreted as the willingness-to-pay for a marginal increase in that attribute.

Following Schamel and Anderson (2003), we estimate the hedonic price function using a log-linear functional form:

$$\ln(P) = \beta_0 + \beta_1 QR + \beta_2 V + \beta_3 R + \varepsilon$$

Using this specification, the coefficients can be interpreted as the percentage increase in price for each one-unit increase in the dependent variable.

#### **4. The Results**

Table 5 presents the empirical results for each year from 1994 to 2003. By looking at each year separately rather than pooling the series we avoid any problems that might arise due to price inflation, inconsistency in rating from one year to the next or general variations in vintages. Gisborne and 'other white' are chosen as the comparator region and variety, so that all other dummy coefficients are representative of the percentage premium for a wine relative to Gisborne other white. The coefficient for the quality rating variable measures the percentage price premium for a ½-star increase in the five star rating scale.

The quality rating parameter is significant for each year of the study and indicates a price premium of 8.1 percent to 13.6 percent (with an average value of 10.6 percent) for each ½-star. That amounts to between a \$1.36 and \$3.41 increase on the average-priced bottle of wine for each ½-star increase. Moreover, it appears that the quality rating parameter is trending upwards over time suggesting that consumers are becoming more confident in using these rankings as an indicator of actual wine quality.

The parameter values for the white variety dummy variables are significant in almost all cases, and indicate an average price premium of 24.6 percent compared with blended white wines. Chardonnay and Sauvignon Blanc, with price premia of more than 40 percent and 20 percent respectively, are the most preferred white varieties, although the premium for both types has declined in recent years.

With the exception of Pinotage, the parameter values for the red variety dummy variables are significant across all years, and indicate an average price premium of 46.3 percent for reds. Pinot Noir, with a price premium in excess of 55 percent, is the most preferred red variety. Over the past few years however, the Blended Red category has begun to command a similar price premium to Pinot Noir. It is important to note, however, that rather than capturing generic low-priced wines, the blended reds category includes some of the best Bordeaux-style wines produced in New Zealand. For example, both Providence (\$185 per bottle) and Montana's Tom (\$100 per bottle) are included in this category. The quality of blended reds has also increased dramatically over the period of study as illustrated by the more than one-star increase in average quality and more than doubling in average price of these wines between 1994 and 2003.

The significance of the regional dummy variables is varied. Only Wairarapa and Otago are significant for the entire period, while Northland/Auckland is significant for the last eight years. The Wairarapa premium has averaged 16.6 percent over the period of the study and the premium for Otago has been slightly higher at 20.3 percent. Both Hawke's Bay and Canterbury have been significant for about half of the years. There does not appear to be any discernable trend in the magnitude of the regional dummies but they do seem to be increasing in their significance (15 of 21 are significant in the last three years of the study as compared to 9 of 21 in the first three years) which suggests that consumers are becoming more keenly aware of regional quality differences over time. The lack of significance for some of these regions might also be a result of pooling across varieties. That is to say, regional variations might be variety specific and a result of variations in growing conditions. If this is true, a region's reputation might be tied to specific wine varieties (e.g. Otago and Pinot Noir, Marlborough and Sauvignon Blanc).

## **5. Conclusions and Areas of Further Research**

There are two main conclusions that can be drawn from this research. First, consumers appear to rely heavily on objective information that is provided by wine labels and wine experts when determining their willingness to pay for wine. What is more, in the face of an ever increasing proliferation of new wines and new wineries consumers appear to be placing more weight on the opinion of wine experts and in regional differences. Second, there is evidence that consumers' willingness to pay for quality has been growing over the last decade as indicated by the increasing magnitude in the premium consumers pay for higher rated wines.

Nevertheless pooling observations together for all varieties may mask some important differences. For instance, consumers may give greater credence to an expert's opinion when purchasing wines for special occasions. As a result, quality ratings may have a greater impact for red wines than for white wines, especially for premium varieties. In addition, the relative insignificance of many of the regions may also be a result of this pooling of varieties. Regional effects may be associated with specific wines, and by pooling together these effects may be masked. To explore these potential differences we plan to estimate separate equations for the four most prolific varieties: Sauvignon Blanc, Chardonnay, Pinot Noir, and Merlot.

Table 5 - Regression Results

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Constant	1.8427**	1.8065**	1.8905**	1.791**	1.6896**	1.8194**	1.8319**	1.6492**	1.746**	1.825**
Quality Rating	0.0946**	0.095**	0.0805**	0.0935**	0.1166**	0.1034**	0.0895**	0.1203**	0.1356**	0.1332**
White Dummies										
Chardonnay	0.4799**	0.4659**	0.5094**	0.4922**	0.3841**	0.4029**	0.4754**	0.4912**	0.2946**	0.2733**
Gewurztraminer	0.1912**	0.2237**	0.2759**	0.2475**	0.158**	0.2333**	0.3541**	0.3747**	0.1709*	0.1504*
Pinot Gris	0.1294	0.1142	0.1949**	0.272**	0.1811**	0.3503**	0.4187**	0.3991**	0.2414**	0.2038**
Riesling	0.1071*	0.1226**	0.162**	0.1465**	0.0586	0.13**	0.2349**	0.24**	0.0575	0.0709
Sauvignon Blanc	0.2398**	0.2782**	0.2919**	0.2696**	0.1534**	0.1975**	0.2666**	0.2688**	0.0753	0.087
Semillon	0.1855**	0.1996**	0.2181**	0.1885**	0.1363*	0.2553**	0.3221**	0.3549**	0.1388	0.1756*
Red Dummies										
Cabernet Franc	0.4195**	0.3739**	0.3791**	0.3263**	0.0924	0.3826**	0.5046**	0.5853**	0.4389**	0.4937**
Cabernet Sauvignon	0.5043**	0.5099**	0.5384**	0.5594**	0.4244**	0.446**	0.5303**	0.5619**	0.4139**	0.4473**
Blended Red	0.2079**	0.3106**	0.3818**	0.4189**	0.3463**	0.4387**	0.7108**	0.7395**	0.5784**	0.6066**
Merlot	0.5211**	0.5166**	0.551**	0.5262**	0.4367**	0.4565**	0.5712**	0.6324**	0.4273**	0.423**
Pinotage	0.0253	-0.0088	0.1423*	0.2462**	0.2714**	0.26**	0.2822**	0.3298**	0.0536	0.1429
Pinot Noir	0.4837**	0.5161**	0.5845**	0.5682**	0.4851**	0.5428**	0.6633**	0.7152**	0.5804**	0.5819**
Syrah	0.672**	0.5521**	0.6706**	0.6765**	0.4306**	0.6291**	0.7207**	0.7332**	0.5814**	0.5307**
Regional Dummies										
Northland/Auckland	0.0144	0.0243	0.0567*	0.0813**	0.1561**	0.1291**	0.208**	0.1508**	0.1767**	0.1407**
Hawke's Bay	-0.0139	0.0144	0.0109	0.0275	0.056*	0.0498*	0.0638*	0.0234	0.0502*	0.0455*
Wairarapa	0.1427**	0.1746**	0.1533**	0.1636**	0.1817**	0.1799**	0.1751**	0.1638**	0.1809**	0.1429**
Nelson	0.0028	0.0149	-0.0038	0.0647	0.1021*	0.0516	0.0572	0.0796*	0.058*	0.0252
Marlborough	-0.0287	-0.002	0.0274	0.0457*	0.0375	0.0088	0.0569*	0.01	0.0434	0.0288
Canterbury	0.076*	0.1617**	0.0542	0.0683*	0.1101**	0.0766*	0.0762*	0.0727*	0.0593*	0.0192
Otago	0.2394**	0.2571**	0.2188**	0.2255**	0.2073**	0.1954**	0.197**	0.1494**	0.1824**	0.1568**
No. of Observations	696	633	763	894	959	1094	1183	1385	1433	1518
Adj. R-Squared	0.6404	0.7094	0.6158	0.6149	0.612	0.5654	0.5422	0.598	0.6412	0.6425

Note: \*\* and \* indicate significance at the 1 percent and 10 percent level respectively.

A second area for future analysis is to exploit the time-series nature of the data to explore the development of wine reputation. The length of our data set, plus the inclusion of many new wines provides an opportunity to study this. Our contention is that wines that consistently rank highly over time, or wines produced by wineries that have a well established reputation for quality, will fetch an additional premium over those wines that have only recently received high rankings.

Finally, we would like to expand our measure of quality to include Michael Cooper's "classic wine" rankings, and the receipt of wine awards.

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