

Nonlinear hedonic pricing: a confirmatory study of South African wines

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Abstract: With a sample of South African red and white wines, this paper investigates the relationship between price, value, and value for money. The analysis is derived from a suite of regression models using some 1358 wines drawn from the 2007 period, which, along with red and white blends, includes eight cultivars. Using the five-star rating, each wine was rated both sighted and blind by respected South African publications. These two ratings were deployed in a stripped-down customer-facing hedonic price analysis that confirms (1) the unequal pricing of consecutive increments in star-styled wine quality assessments and (2) that the relationship between value and price can be better estimated by treating successive wine quality increments as dichotomous “dummy” variables. Through the deployment of nonlinear hedonic pricing, fertile areas for bargain hunting can thus be found at the top end of the price continuum as much as at the bottom, thereby assisting retailers and consumers in better identifying wines that offer value for money.

Keywords: price, value, wine

Introduction

Within economics, “hedonics” is defined as the pleasure, utility, or efficacy derived through the consumption of a particular good or service; the hedonic model thereby proposes a market of assorted products with a range of associated price, quality, and characteristic differences and a diverse population of consumers, each with a varying propensity to pay for certain attribute assemblages. In the initial hedonic wine analysis, Oczkowski¹ posited that the price of one bottle of wine relative to another would vary with the additional unit of the different characteristics inherent in one bottle relative to any other. Employing the conventional multiple regression framework, Oczkowski’s study demonstrated how the relative price of a particular wine could thus be constituted as the summation of each of the constituent subprices that they attached to each of these attributes. Since then, numerous studies^{1–19} have seen hedonic modeling gain recognition as a form of wine price analysis.

With this analytical framework, our paper proceeds from the 2004 econometric valuation methodology of Priilaid and van Rensburg,¹⁸ which mapped out the relationship between wine price and value using sighted and blind “star-styled” quality ratings as explanatory variables. Assuming a straight-line relationship between quality rating and value, their linear model failed to provide sensible wine valuations at the extreme ends of the quality spectrum. By way of remedy, this study analyzes the selfsame price–quality continuum employing the so-called dummy-styled approach to address the likelihood of a nonlinear price–quality relationship.

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The approach of this paper is similar to the customer-facing orientation used in a subsequent study by Priilaid and van Rensburg,¹⁹ though here with a more recent and nonoverlapping dataset of red and white wines, two-and-a-half times the size of its predecessor. While the 2006 study¹⁹ was merely based on some 537 wines drawn only from red grape cultivars, this study employs a dataset of 1358 red and white wines tasted during the 2007 period; a significant difference. With this substantially updated and upgraded database, we thus seek to confirm that the dummy approach negates the possibility of value-for-money markers misleadingly being notified at the bottom end of the quality spectrum and neglected at the top. Across both red and white cultivars, confirmatory studies of this nature remain critical if econometric methods are to be sensibly applied in wine guides that assist consumers in the proper identification of wines purporting to offer value for money.

In this paper, we begin by reviewing the relevant literature, then introduce the data. Following this, we describe and contrast the linear and dummy valuation techniques. Analysis of the value-for-money construct is presented; in particular, where along the continuum of value it may be identified. Finally, conclusion is drawn.

Theoretical framework and literature review

Triplett²⁰ notes that hedonic methods were developed and applied in price indices long before the conceptual foundations were wholly articulated. While according to Bartik²¹ and Goodman²² the term “hedonic” was first adopted in 1939 by Court,²³ a number of earlier studies successfully presented a relationship between value and explanatory values of a hedonic nature. In this sense, therefore, while Court’s study was the first “official” contribution to a theory of hedonic price functions, he certainly did not invent the approach, nor indeed did he ever claim to have done so.

The first to have successfully determined a hedonic function was, in all likelihood, a land economist of some sort. In his review of the formative literature, Oczkowski¹ identifies Waugh’s²⁴ 1928 study on “Quality factors influencing vegetable prices.” Malpezzi²⁵ and Freeman²⁶ note that Haas²⁷ produced a hedonic study using sale prices as a basis for farmland appraisal in 1922. Metzmakers and Louw²⁸ trace it back even further, noting that Ricardo’s²⁹ theories were compatible with a characteristics approach to land value determination. His famous quote on the “original and indestructible power of the soil,” on which his theory of agricultural land rents was based, refers to fertility differences between soils. Interpreted thus, Ricardo’s approach clearly

employed land characteristics to determine value, albeit his focus was on fertility only.

In the application of hedonic price theory to wine, the literature finds the varied application of four broad categories of explanatory candidate variables, namely: objective, sensory, climatic, and chemical wine characteristics. Objective characteristics cover nonambiguous aspects of a wine, including varietal, vintage, and country or area of origin.¹ A wine’s sensory characteristics include bouquet, body, and taste – components typically adjudicated by a panel of wine experts. Studies have demonstrated the marked extent to which expert assessment scores impact on the prices of wine.^{1,30} Climatic characteristics are used to determine the extent to which seasonal variations impact on the quality of wine from one season to the next.^{31,32} Lastly, chemical characteristics like sugar and alcohol content have also been applied to hedonic price functions.³

In 2004 and subsequently in 2006, van Rensburg and Priilaid^{18,19} used the link between business and consumer costs to introduce a consumer-facing orientation to wine price hedonics. The rationale for this link is not new³³ and notes that, together with profit, business costs sum to the seller’s price (so often a construct in itself). Buyer costs accrue differently and include the time and effort spent in raising the requisite budget and thereafter locating the desired product. Assuming sufficient budget, a sale then becomes feasible if there is sufficient product value in the eyes of the buyer to warrant the purchase. The thrust of the consumer-facing model is that value should be perceived from the perspective of the buyer, not the seller. Accordingly, such models would eschew chemical and climatic factors, concentrating rather on objective and sensory wine characteristics (notably professional sighted and blind ratings) to develop consumer-friendly hedonic models. (See Priilaid and van Rensburg,¹⁹ Siegrist and Cousin,³⁴ and Priilaid et al³⁵ for an elaboration of the arguments on how and why consumers deploy wine expert ratings as risk-reducing proxies to guide buying and consumption behavior.)

It should also be noted that the persistent glut of wines and the ongoing decline of marginal wine farmers subsequent to the subprime housing crisis and bank failures post-September 2008, both make the case for a consumer-facing orientation even more compelling. Were there an undersupply of wines and markets accordingly driven more by demand rather than supply, this argument might be less convincing. As South African wine critic Fridjhon noted recently, the Australian wine industry is severely vexed by problems of drought and oversupply. This was not the case during the global

boom of 2005 when the wine industry was experiencing good times. By then Australia's 2025 strategic plan had been laid out and many of its strategic goals had already been achieved. However, the subsequent recession and drought have since led to severe complications. "Australia now has 100 million cases in oversupply – or one billion litres. Its surplus is bigger than SA's (entire) wine production, just to put it into perspective," says Fridjhon.³⁶ A recent article in the *New York Times*³⁷ noted similar effects in the USA where, in the last few years, sales of American syrah have gone into free-fall. "There's a joke going around West Coast wine circles. What's the difference between a case of syrah and a case of pneumonia? You can get rid of pneumonia. It would be funnier if it weren't so sad."³⁷

In Europe, too, the oversupply of commodity wines has forced a rethink of strategy, with European Union countries like Spain being granted quality driven planting permits at the expense of traditional table wine producing areas in countries like France.³⁶ South Africa faces a similar set of problems, for despite being the seventh largest wine producer, only 5% of its farmers are turning a profit; again the result of poor bad weather conditions in 2009 and 2010, low prices, and rising costs.³⁸ Assuredly for now, the consumer reigns supreme; and so to sell into such a market, wine retailers and producers need to be cognizant of such realities.

In South Africa large wine retailers like Pick 'n Pay, Makro, and Ultra Liquors have already taken cognizance, publishing quarterly wine catalogs with purchase recommendations based on rough estimates of the price–quality relationship of each wine cited. In a recent development specific to the topic of this paper, under the auspices of Ultra Liquors and the printing and distribution networks of *Wine*³⁹ magazine, a value-for-money wine guide using hedonic price modeling, entitled *WineIQ*, was published.⁴⁰ With such precedent in the public domain, it is becoming increasingly important that the "right" approach to such modeling be mapped out and verified. To this end, with an updated and expanded database, this confirmatory article reviews dummy-styled price modeling as a technique to remediate the problems associated with wine's nonlinear price–quality relationship.

Description of the data

Consumer-facing candidate variables for explaining wine prices appear in Table 1. These include wine varietal and blind and sighted quality ratings. Objective, climatic, or chemical characteristics were not explicitly included, the view being

that these are implicitly captured in the ratings themselves. A discussion of each candidate variable follows.

Wine varietal

Along with red and white blended wines, eight South African-grown cultivars are assessed in this study: Cabernet Sauvignon, Merlot Pinotage, Pinot Noir, Shiraz, Chardonnay, Chenin Blanc, and Sauvignon Blanc. The cultivars selected constitute most of South Africa's national vineyard (see Table 2). Colombard is the third most prolifically planted grape and is excluded since most of its grapes are employed in the production of brandy. Based on its lofty prices and the profile of some of its producers, the ever-fickle though niche-like Pinot Noir is included in this study. However, marginal white wine equivalents, such as Sémillon and Viognier (respectively 1.05% and 0.62% of the national vineyard), are excluded due to lack of workable data. So too are Cinsaut (2.78%), Ruby Cabernet (2.61%), Hanepoort (2.60%), and Cape Riesling (1.13%) since the fruit from these cultivars is generally employed in the production of low-priced blends.⁴¹

The total sample of 1358 wines decomposes into two subsets: red wines: ($n = 896$) and white wines ($n = 462$). Each wine has assessments from both *Wine* (over the period January to December 2007) and the annual *John Platter's South African Wine Guide*⁴² (hereafter *Platter's Wine Guide* or *Platter's*). In aggregate, they represent the 2007 red and white wine market in South Africa. Table 3 depicts the dataset's spread of *Wine* and *Platter's* star ratings per varietal over this period.

The mean average price for the sample is R78.76. The price maximum, minimum, and standard deviation for the sample are R730, R8.50, and R58.32, respectively. Within the red wines, Pinot Noir is on average the most expensive wine per bottle (R108.24), followed by red blends (R96.59), Shiraz (R93.88), Cabernet Sauvignon (R83.34), Merlot (R73.52), and, finally, Pinotage (R70.64). Within the white sample, Sauvignon Blanc is on average

Table 1 Candidate variables explaining wine price

Candidate variables

1. Wine type (red: Cabernet Sauvignon, Merlot, Shiraz, Pinotage, Pinot Noir, red blends; white: Chardonnay, Chenin Blanc, Sauvignon Blanc, white blends)
2. Wine quality assessed sighted
 - a. Star ratings treated as numeric data
 - b. Star ratings treated as descriptive, dummy variables
3. Wine quality assessed blind
 - a. Star ratings treated as numeric data
 - b. Star ratings treated as descriptive, dummy variables

Table 2 Varietals under analysis

Varietals analyzed	% of national vineyard	Total hectareage	National ranking
Chenin Blanc	18.75	19053	1
Cabernet Sauvignon	13.36	13572	2
Shiraz	9.64	9794	4
Chardonnay	7.80	7927	5
Sauvignon Blanc	7.50	7661	6
Merlot	6.83	6941	7
Pinotage	6.39	6493	8
Pinot Noir	0.53	535	19

Notes: White and red blends are also included in the study. Blends aside, alone, the eight varietals listed constitute more than 70% of South Africa's national vineyard. Data from Boom.⁴¹

the most expensive wine per bottle (R73.52), followed by Chardonnay (R71.59), white blends (R59.41), and, lastly, Chenin Blanc (R42.22).

Measurements of wine quality

Oczkowski² observes that, unlike objective wine characteristics such as cultivar and vintage, a wine's quality is difficult to assess dispassionately and precisely. This, Oczkowski² goes on to say, does not however negate the possibility of including professional wine ratings as candidate variables explaining price. As already observed, such ratings are important since, as risk-reducing heuristics,

they effectively equip the wine consumer with the means to identify wines that offer the best available quality for price.¹⁹

In this study, the quality rating systems employed are *Wine* and *Platter's Wine Guide*. Metrics for intrinsic merit are derived from the former, which was launched in 1994, is published monthly, and assesses all wines via blind tastings. In the presence of a professional auditor, a four-judge panel presides, typically comprising a combination of wine professionals: sommeliers, wine-bar managers, wine makers, media people, and the like. Most will possess some form of professional accreditation. Scores are consensus based and tasting sessions always occur at the offices of *Wine* in Pinelands, Cape Town. Though "officially" based on a more fully calibrated 20-point scoring system, the five-star system is always cited for public consumption and is hence the scoring system employed in this study. Superlative wines receive five stars. Four-star wines are considered excellent. Good to very good wines score three stars. Wines deemed appealing receive a two-star rating. Average wines receive one star. A star rating of zero is awarded to unacceptable wines. Of the red wines assessed in this study, the mean average *Wine* score is 2.65, with a maximum, minimum, and standard deviation for the sample of 4.5, 1.5, and 0.90, respectively. Equivalent figures for the

Table 3 Number of wines assessed per varietal – as graded by *John Platter's South African Wine Guide*⁴² and *Wine*³⁹ star ratings, respectively

Cultivar	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	Sum
Platter's ratings for 2007 wines												
Cabernet Sauvignon				1	3	7	8	40	41	16		116
Merlot					6	4	23	38	27	8		106
Pinotage				3		9	20	28	25	10		95
Pinot Noir					1	1	6	8	4	5		25
Shiraz				1	2	8	37	65	65	34		212
Red blends					11	21	43	100	111	56		342
Chardonnay				2	1	5	22	33	55	18		136
Chenin Blanc		1	1	5	4	12	30	23	18	6		100
Sauvignon Blanc			1	3	4	7	15	45	56	20		151
White blends				2	6	6	19	17	15	10		75
		1	2	17	38	80	223	397	417	183		1358
Wine ratings for 2007 wines												
Cabernet Sauvignon	1		7		9	27	38	21	13			116
Merlot	6		19		24	23	19	10	5			106
Pinotage	2		11		17	27	20	10	7	1		95
Pinot Noir	1		3		4	4	6	3	4			25
Shiraz	1		15		41	47	66	21	17	4		212
Red blends	11		21		57	68	92	50	41	1	1	342
Chardonnay	1		4		27	34	45	15	10			136
Chenin Blanc	2		9		24	23	21	6	10	3	2	100
Sauvignon Blanc	1		10		33	43	36	15	12	1		151
White blends	0		4		17	13	10	17	11	3		75
	26		103		253	309	353	168	130	13	3	1358

white wine sample are mean, 2.70; maximum, 5; minimum, 0; and standard deviation, 0.82.

The *Platter's Wine Guide* team taste their wines sighted and employ the selfsame five-star or 20-point scoring system. Over the 896 red wines tasted, the mean average *Platter's* score is 3.61, with a maximum, minimum, and standard deviation for the sample of 4.5, 1.5, and 0.90, respectively. In comparison to the reds, the mean average *Platter's* score for the 462 white wines tasted is 3.50, with a maximum, minimum, and standard deviation for the sample of 4.5, 1.5, and 0.73, respectively.

Results and discussion

Methodology and model construction

Using the ordinary least squares (OLS) regression analysis methodology, the cross-section of wine prices (price) is modeled for the similar goods $i = 1 \dots n$ as a function of K consumer desirable (CD_k where $k = 1, \dots, K$) characteristics. Thus:

$$\text{Price}_i = \alpha + \sum_{k=1}^K b_k CD_k + \varepsilon_i \quad (1)$$

where α = the intercept term as estimated by OLS, b = the K slope coefficients as estimated by OLS, CD = the K "consumer desirables," and ε = a random residual error term following classic assumptions.

The classification of the explanatory variables (CD) includes only those that are likely to constitute perceived value for the consumer, in this case blind and sighted tasting scores as conducted by *Wine* and *Platter's Wine Guide*, respectively. The model thus disaggregates the price of each wine into value and mispricing components. In so doing, the derived fitted values equate to estimates of intrinsic value, the difference between value and price reflecting the level of mispricing (ε_i) in each instance. As per van Rensburg and Priilaid,¹⁸ a wine's price and valuation may thus be charted, yielding a "value frontier" region where maximum value, relative to price, may be observed. Accordingly, ordinal and dummy valuation models are estimated and compared as per the equations:

$$\begin{aligned} OV_i = & \alpha + b_1 \text{cab}_i + b_2 \text{merlot}_i + b_3 \text{pinot noir}_i \\ & + b_4 \text{shiraz}_i + b_5 \text{red blend}_i + b_6 \text{chardonnay}_i \\ & + b_7 \text{sauv blanc}_i + b_8 \text{white blend}_i \\ & + b_9 \text{Wine Stars}_i + b_{10} \text{Platter Stars}_i \end{aligned} \quad (2)$$

$$\begin{aligned} DV_i = & \alpha + b_1 \text{cabernet}_i + b_2 \text{merlot}_i + b_3 \text{pinot noir}_i \\ & + b_4 \text{shiraz}_i + b_5 \text{red blend}_i + b_6 \text{chardonnay}_i \\ & + b_7 \text{sauv blanc}_i + b_8 \text{white blend}_i + b_9 \text{JP}^{0.5}_i \\ & + b_{10} \text{JP}^1_i + b_{11} \text{JP}^2_i + b_{12} \text{JP}^{2.5}_i + b_{13} \text{JP}^3_i \\ & + b_{14} \text{JP}^{3.5}_i + b_{15} \text{JP}^4_i + b_{16} \text{JP}^{4.5}_i + b_{17} \text{W}^1_i \\ & + b_{18} \text{W}^2_i + b_{19} \text{W}^{2.5}_i + b_{20} \text{W}^3_i + b_{21} \text{W}^{3.5}_i \\ & + b_{22} \text{W}^4_i + b_{23} \text{W}^{4.5}_i + b_{24} \text{W}^5_i \end{aligned} \quad (3)$$

where OV_i = ordinal valuation of wine i , DV_i = dummy valuation of wine i , *Wine Stars* = *Wine* rating of wine i , *Platter Stars* = *Platter's Wine Guide* rating of wine i , *cabernet* = 1 if wine i is a Cabernet Sauvignon, 0 if otherwise, *merlot* = 1 if wine i is a Merlot, 0 if otherwise, *pinot noir* = 1 if wine i is a Pinot Noir, 0 if otherwise, *shiraz* = 1 if wine i is a Shiraz, 0 if otherwise, *red blend* = 1 if wine i is a red blend, 0 if otherwise, *chardonnay* = 1 if wine i is a Chardonnay, 0 if otherwise, *sauv blanc* = 1 if wine i is a Sauvignon Blanc, 0 if otherwise, *white blend* = 1 if wine i is a white blend, 0 if otherwise, $\text{JP}^{0.5} = 1$ if wine i obtained 0.5 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^1 = 1$ if wine i obtained 1 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^2 = 1$ if wine i obtained 2 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^{2.5} = 1$ if wine i obtained 2.5 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^3 = 1$ if wine i obtained 3 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^{3.5} = 1$ if wine i obtained 3.5 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^4 = 1$ if wine i obtained 4 *Platter's Wine Guide* stars, 0 if otherwise, $\text{JP}^{4.5} = 1$ if wine i obtained 4.5 *Platter's Wine Guide* stars, 0 if otherwise, $\text{W}^1 = 1$ if wine i obtained 1 *Wine* stars, 0 if otherwise, $\text{W}^2 = 1$ if wine i obtained 2 *Wine* stars, 0 if otherwise, $\text{W}^{2.5} = 1$ if wine i obtained 2.5 *Wine* stars, 0 if otherwise, $\text{W}^3 = 1$ if wine i obtained 3 *Wine* stars, 0 if otherwise, $\text{W}^{3.5} = 1$ if wine i obtained 3.5 *Wine* stars, 0 if otherwise, $\text{W}^4 = 1$ if wine i obtained 4 *Wine* stars, 0 if otherwise, $\text{W}^{4.5} = 1$ if wine i obtained 4.5 *Wine* stars, 0 if otherwise, $\text{W}^5 = 1$ if wine i obtained 5 *Wine* stars, 0 if otherwise.

Empirical analysis

Preliminary analysis

Figures 1 and 2 illustrate the average price (in rand) awarded to white wines during the 2007 period. Note that for sake of space and by way of contrast to the 2006 paper by Priilaid and van Rensburg¹⁹ that featured only red cultivars, only scattergrams relating to white wines are featured in this article. Sighted and blind ratings are illustrated in Figures 1 and 2, respectively.

Close scrutiny of these scattergrams (particularly those derived from the sighted scores), reveals the nonlinearity of

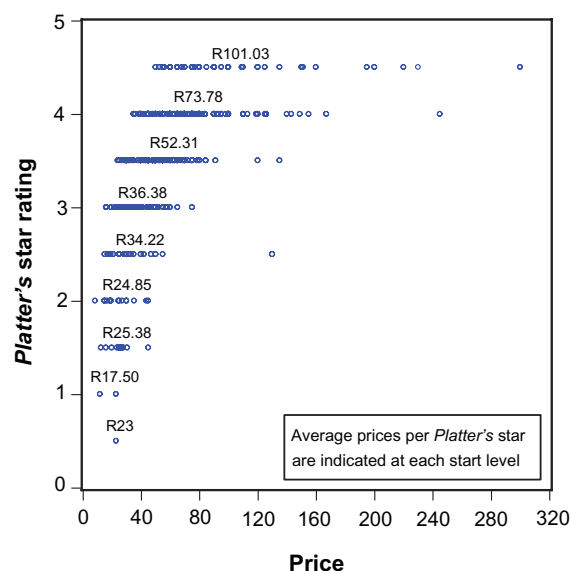


Figure 1 White wines 2007: wine prices (in rand) per John Platter's South African Wine Guide⁴² star conferred.

the price–star relationship, this particularly from three stars upwards. At the zero- and one-star level, mispricing is also prevalent. The extent of mispricing at the lower levels of quality is not as apparent in the sample of sighted assessments. In all cases, the degree to which specific cultivars impact on price per star is uncertain.

To control for multicollinearity, correlations were computed for all model variables as they appear in their form as ratio-styled data (see Table 4). For both the red and white sample, the blind-sighted correlations are relatively low (0.30 for red and 0.40 for white), suggesting that both

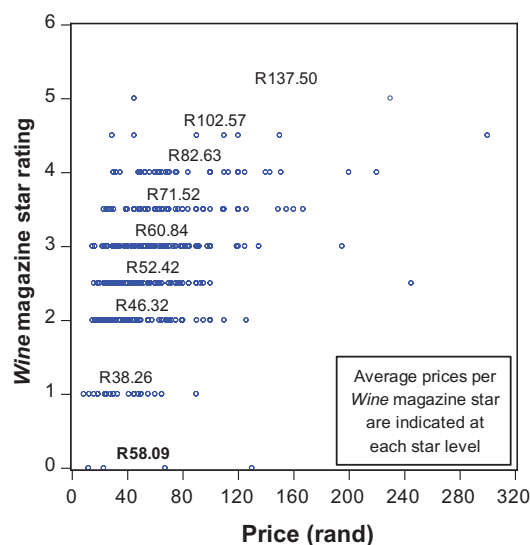


Figure 2 White wines 2007: prices (in rand) per Wine³⁹ star conferred.

styles of assessment supply explanatory power without fear of extreme multicollinearity. Not surprisingly, the price variable is most highly correlated with *Platter's* sighted scores (red correlation = 0.50, white correlation = 0.60) and then only with *Wine's* blind scores (red correlation = 0.25, white = 0.39).

Proceeding from these descriptive statistics, ordinal and “dummy-styled” OLS models are computed for each of the blind and sighted assessment metrics, and subsequently compared. For the varietal and sighted and blind ratings, the dummy comparators in this analysis are Pinotage and Chenin Blanc (in the case of the red and white subsets) and one-and-a-half *Platter's* stars and zero *Wine* stars. All regressions were tested for heteroskedasticity, though none was apparent.

Price versus value

For comparative purposes, final linear and dummy-styled regressions are computed to model wine value, and appear in Tables 5 (for red) and 6 (for white).

The consequent (final linear and dummy) price–value scattergrams are then presented in Figures 3 and 4. With respect to the latter, by deploying the van Rensburg and Priilaid¹⁸ value and “rip-off” frontier typology, wines offering the most and least value for money, respectively, can thus be identified (see Figure 4).

With respect to the scattergrams (Figures 1 and 2), it becomes apparent that the dummy model provides a more realistic set of valuations. For red wines, the increase in the adjusted R-squared values from 26.73% (for the linear model) to 33.81% (for the dummy model) implies a price correlation improvement of over 26%. With white wine adjusted R-squared values increasing from 41.96% (for the linear model) to 50.48% (for the dummy), the price correlation improves by over 20%. Across all but the upper price segment within the red wine dataset, the linear and dummy

Table 4 Red and white wines 2007: correlation matrix of prices and star ratings

Price	Wine ³⁹	John Platter's South African Wine Guide ⁴²
Reds 2007		
1.00		
0.25	1.00	
0.50	0.30	1.00
Whites 2007		
1.00		
0.39	1.00	
0.60	0.40	1.00

Table 5 All red wines 2007: the final linear and dummy model regressions for all wine ratings

Variable	Coefficient	t-statistic
Linear model for blind (Wine ³⁹) and sighted (John Platter's South African Wine Guide ⁴²) assessments (R ² : 26.73%, n = 896)		
Constant	-117.59	-8.69
Shiraz	12.62	2.41
Cabernet Sauvignon	0.93	0.19
Merlot	5.17	1.12
Pinot Noir	32.70	2.72
Red blends	15.75	3.28
Platter's Wine Guide	48.78	13.34
Wine	7.43	3.59
Dummy model for blind (Wine) and sighted (John Platter's South African Wine Guide) (Adj. R ² : 33.81%, n = 896)		
Constant	33.05	3.22
Shiraz	14.27	2.98
Cabernet Sauvignon	2.23	0.52
Merlot	6.42	1.48
Pinot Noir	28.64	2.54
Red blends	15.32	3.38
Platter's Wine Guide 2 stars	-6.24	-0.64
Platter's Wine Guide 2.5 stars	-1.38	-0.15
Platter's Wine Guide 3 stars	10.08	1.11
Platter's Wine Guide 3.5 stars	24.13	2.78
Platter's Wine Guide 4 stars	44.68	5.00
Platter's Wine Guide 4.5 stars	115.60	9.50
Wine 1 star	-0.59	-0.07
Wine 2 stars	-1.54	-0.23
Wine 2.5 stars	0.78	0.12
Wine 3 stars	7.36	1.10
Wine 3.5 stars	17.57	1.94
Wine 4 stars	17.28	1.99
Wine 4.5 stars	1.27	0.04
Wine 5 stars	91.53	7.81

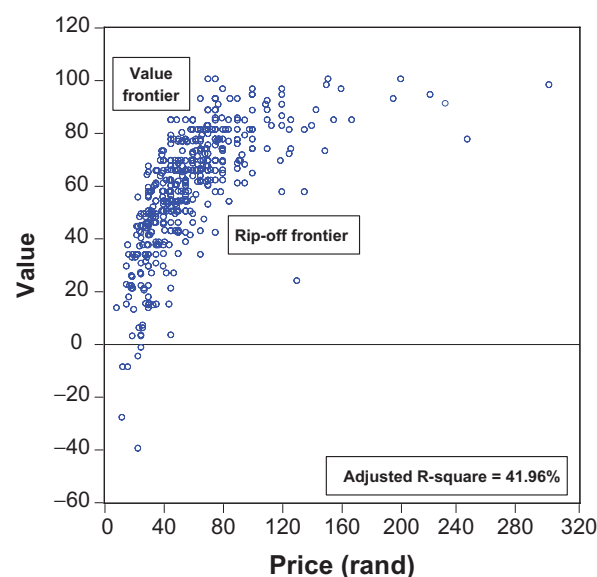
Note: Significant t-statistic figures and their respective coefficients are cited in bold.

valuation averages appear roughly equivalent (see Table 7). However, in the more expensive R150–R199.99 and R200-plus price segments, where each additional increment in wine quality requires further serious outlays of capital, dummy valuations appear considerably more affected. For example, within the R150–R199.99 segment, the average dummy valuation is R139.01, 13% greater than the average linear valuation of R122.51. Within the premium R200-plus price segment, the average dummy valuation increases to R152.16, 17% greater than the average linear valuation of R130.07. Even more significant, however, is the dispersal of values across the upper and lower price segments. Within the lower price segment, the dummy approach enforces a standard deviation decrease of 43%. In the upper price segment, the spread increases by more than twice that amount: 99%.

Table 6 White wines 2007: the final linear and dummy model regressions for all wine ratings

Variable	Coefficient	t-statistic
Linear model for blind (Wine ³⁹) and sighted (John Platter's South African Wine Guide ⁴²) (R ² : 41.96%, n = 462)		
Constant	-51.41	-5.97
Chardonnay	16.59	4.72
Sauvignon Blanc	4.74	1.59
White blends	10.70	2.44
Wine stars	23.47	12.83
Platter's Wine Guide	7.39	3.56
Dummy model for blind (Wine) and sighted (John Platter's South African Wine Guide) (R ² : 50.48%, n = 462)		
Constant	52.90	2.14
Chardonnay	19.81	6.56
Sauvignon Blanc	6.93	2.66
White blends	12.64	3.46
Wine 1 star	-38.61	-1.56
Wine 2 stars	-36.11	-1.46
Wine 2.5 stars	-34.27	-1.39
Wine 3 stars	-29.94	-1.21
Wine 3.5 stars	-29.74	-1.19
Wine 4 stars	-19.57	-0.78
Wine 4.5 stars	15.08	0.42
Wine 5 stars	50.20	0.95
Platter's Wine Guide 0.5 star	-29.90	-1.21
Platter's Wine Guide 1 star	-21.73	-1.16
Platter's Wine Guide 2 stars	-0.73	-0.18
Platter's Wine Guide 2.5 stars	6.95	2.03
Platter's Wine Guide 3 stars	6.83	2.33
Platter's Wine Guide 3.5 stars	21.30	6.96
Platter's Wine Guide 4 stars	38.70	10.84
Platter's Wine Guide 4.5 stars	61.98	11.00

Note: Significant t-statistic figures and their respective coefficients are cited in bold.

**Figure 3** White wines 2007: price versus value (in rand): the final linear model.

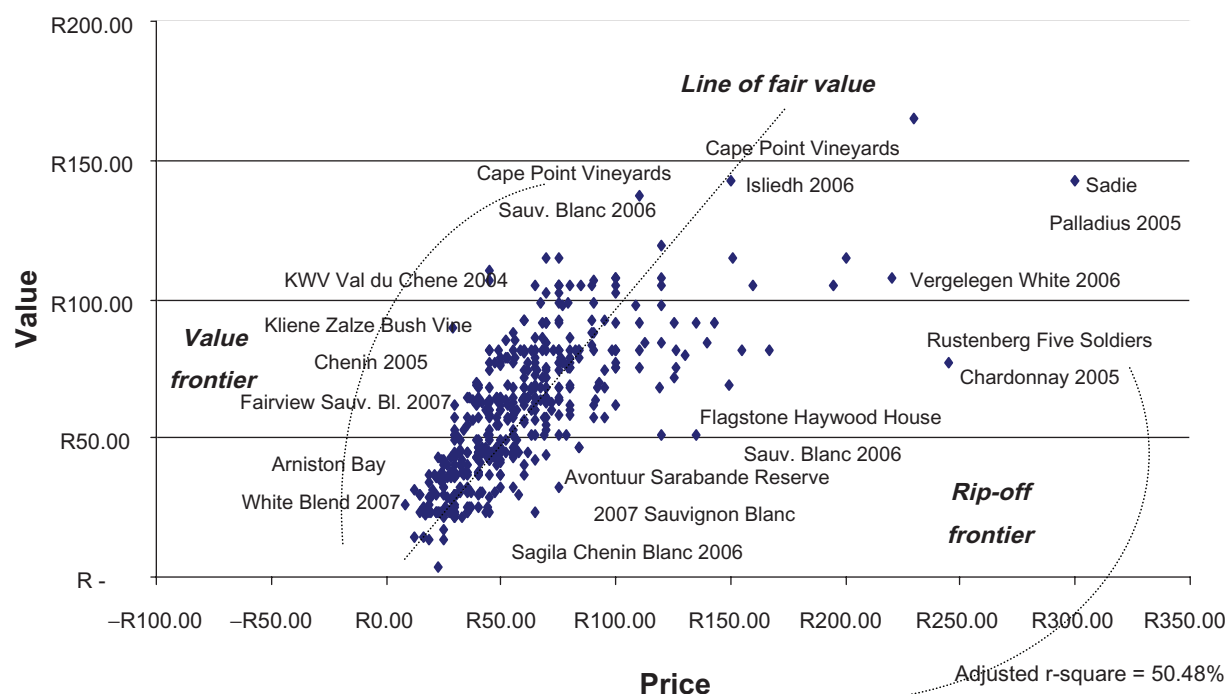


Figure 4 White wines 2007; price versus value (in rand): the final dummy-styled model.

Notes: Using a nonlinear specification, statistically significant variables include all varietals as well as *John Platter's South African Wine Guide*⁴² stars 2.5 to 4.5. Once more wines offering the most value for money can be found on the "value frontier," and include Arniston Bay (a white blend), Fairview's Sauvignon Blanc, Klieene Zalze's bush vine Chenin, the KVV Val Du Chêne, and the Cape Point Vineyards Sauvignon Blanc. Similarly, wines offering the least value for money accrue on or about the so-called "rip-off" frontier. Such wines include the Sagila Chenin Blanc, the Avontuur Sarabande reserve Sauvignon Blanc, the Haywood House Sauvignon Blanc from Flagstone, the Rustenberg Five Soldiers Chardonnay and the Vergelegen White. The "line of fair value" falls between these two extremes and showcases wines (such as the Isliedh from Cape Point Vineyards) that are fairly priced for the quality and hence value on offer. In contrast to the linear multifactor model, we note the absence of any negative valuations and 30 wines valued at over R100. In the linear construction, only four wines are valued at over R100.

Table 7 Red and white wines 2007: final linear and dummy model regressions for all wine ratings

Price segment		Linear model	Dummy model	Percentage change
Red wines				
Less than R50.00 (n = 202, avg price: R38.57)	Average valuation	R58.44	R60.70	4%
	Value SD	R31.33	R17.17	-43%
R50–R99.99 (n = 449, avg price: R71.69)	Average valuation	R88.44	R84.05	-5%
	Value SD	R27.77	R29.75	7%
R100–R149.99 (n = 144, avg price: R118.05)	Average valuation	R108.11	R105.26	-3%
	Value SD	R22.06	R35.57	61%
R150–R199.99 (n = 54, avg price: R164.26)	Average valuation	R122.51	R139.01	13%
	Value SD	R20.04	R39.77	97%
More than R200 (n = 47, avg price: R297.13)	Average valuation	R130.07	R152.16	17%
	Value SD	R20.54	R40.83	99%
White wines				
Less than R50.00 (n = 210, avg price: R33.92)	Average valuation	R43.21	R41.31	-4%
	Value SD	R20.32	R16.67	-18%
R50–R99.99 (n = 208, avg price: R67.37)	Average valuation	R69.37	R69.13	0%
	Value SD	R12.96	R17.97	39%
R100–R149.99 (n = 33, avg price: R116.21)	Average valuation	R79.47	R86.38	9%
	Value SD	R14.20	R18.17	28%
R150–R199.99 (n = 6, avg price: R163.00)	Average valuation	R92.98	R105.12	13%
	Value SD	R6.70	R22.82	241%
More than R200 (n = 5, avg price: R239.00)	Average valuation	R92.32	R121.57	32%
	Value SD	R8.99	R33.68	275%

Abbreviations: avg, average; SD, standard deviation.

Moving through each of the four price segments within the white wine dataset, we see a similar pattern. Once more, the linear and dummy valuation averages appear roughly the same for low- to medium-priced wines (see Table 7). However, within the R100–R149.99 segment, the average dummy valuation is R86.38, 9% greater than the average linear valuation of R79.47. Between R150 and R199.99, the variation between dummy valuations (average = R105.12) and their linear versions (average = R92.98) jumps to over 13%. These increases pale in comparison to the variation evinced in the premium-plus R200-plus price segment. Here, the average dummy valuation is R121.57, 32% greater than the average linear valuation of R92.32.

A study of the measure of spread across the various white wine price segments is also revealing. Within the lower price segment, the dummy approach enforces a standard deviation decrease of between 4% and 18%. As with the red wine dataset however, in the upper price segments the linear to dummy spread increases dramatically: 241% in the R150 to R199 category, and 275% in the R200-plus.

Value versus mispricing

This final subsection considers the degree to which the relationship between value and extent of mispricing alters between the linear and dummy approaches. (For white wines see Figures 5 and 6.)

For both red and white wine datasets, an examination of the value to extent of mispricing relationship reveals four noteworthy features, all of which echo and confirm the earlier findings by Priilaid and van Rensburg¹⁹ conducted on an independent dataset.

1. The spread of mispricing reduces significantly from the linear to the dummy version. In the case of red wines, the linear spread is 438.5% (166.2% to –272.3%) compared with 312.7% (86.0% to –226.7%) in the dummy version. Similar to the white wines, the linear spread is 474.2% (332.9% to –141.3%) compared with 291.5% (83.3% to –208.2%) in the dummy version. A survey of the standard error of regression for each of the four final models yields a similar result. In the final red valuation models, the standard error drops from 55.70 (linear model) to 52.94 (dummy model). The final white wine valuations reveal a similar pattern of standard errors: linear model, 26.26; dummy model, 24.22.
2. Both at the bottom and top end of the quality continuum, valuations predicted by the dummy model are markedly higher than those predicted by the linear model. At the

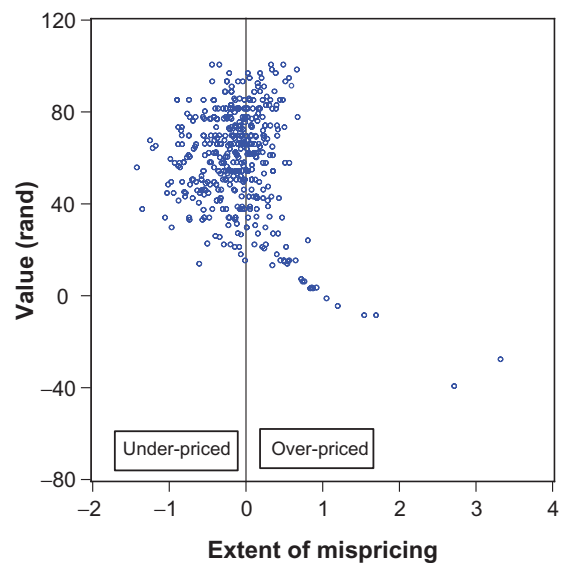


Figure 5 White wines 2007; extent of mispricing versus value (in rand): the final linear model.

bottom end, for example, whereas in the instance of red wines the lowest 15 linear valuations are all negative, with a lowest valuation of –R36.05 and an average of –R13.87, in the dummy style valuations, the corresponding figures are R27.50 for the lowest valuation and a far more realistic R31.04 for the bottom 15 average. The same can also be said of white wines. Of the lowest 15 linear valuations, six are negative, with the lowest at –R39.68. The average of these 15 is R2.23. By comparison, the average for the lowest 15 dummy valuations is a more realistic R18.29, and no negative valuations are derived. At the top end we see the same: the highest linear valuation is R100.34,

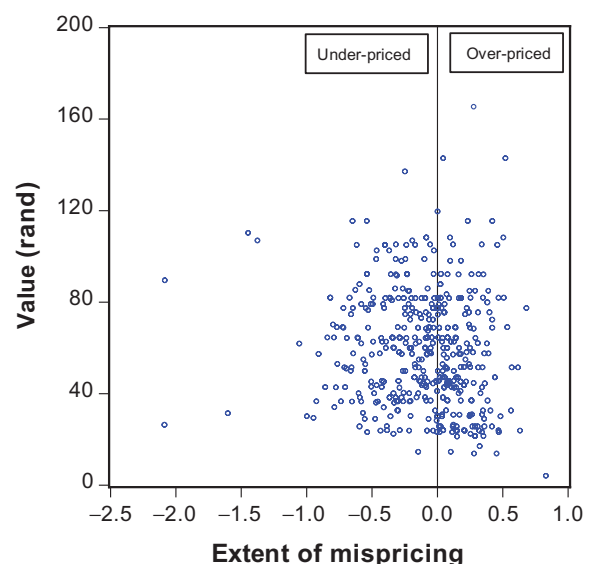


Figure 6 White wines 2007; extent of mispricing versus value (in rand): the final dummy-styled model.

Table 8 Red and white wines 2007: 20 high-priced wines that offer exceptional value for money

Wine label	2007 price	Wine ³⁹ star rating	John Platter's South African Wine Guide ⁴² star rating	Linear valuation	Dummy valuation	Linear model: extent of percentage mispricing	Dummy model: extent of percentage mispricing
Red wines							
The Chocolate Block	R120.00	3.5	4.5	R143.70	R181.53	-19.75%	-51.28%
Boekenhoutskloof 2005							
Warwick Trilogy 2004	R135.00	3.5	4.5	R143.70	R181.53	-6.44%	-34.47%
Grangehurst Nikela 2001	R140.00	3.5	4.5	R143.70	R181.53	-2.64%	-29.67%
Kaapzicht Streytler Vision	R150.00	3.5	4.5	R143.70	R181.53	4.20%	-21.02%
Cape Blend 2003							
Rustenberg John X	R115.00	4	4.5	R147.42	R181.25	-28.19%	-57.61%
Merriman 2004							
Stellenzicht Syrah 2002	R160.00	3.5	4.5	R140.56	R180.48	12.15%	-12.80%
Grangehurst Nikela 2000	R110.00	3	4.5	R139.98	R171.33	-27.26%	-55.75%
Delheim Grand Reserve	R145.00	3	4.5	R139.98	R171.33	3.46%	-18.16%
2004							
Saronsberg Full Circle 2005	R150.00	3	4.5	R139.98	R171.33	6.68%	-14.22%
Saxenburg Private Collection	R100.00	3	4.5	R136.85	R170.27	-36.85%	-70.27%
Shiraz 2004							
White wines							
Cape Point Sauvignon	R110.00	4.5	4.5	R92.18	R136.88	16.20%	-24.43%
Blanc 2006							
Paul Cluver Chardonnay 2005	R75.00	4	4.5	R100.34	R115.11	-33.79%	-53.48%
Sumaridge Chardonnay 2006	R70.00	4	4.5	R100.34	R115.11	-43.34%	-64.44%
Scali Blanc 2006	R100.00	4	4.5	R94.45	R107.94	5.55%	-7.94%
Hermanuspietersfontein Die	R99.95	4	4.5	R94.45	R107.94	5.51%	-7.99%
Bartho 2006							
Bellingham The Maverick	R90.00	4.5	4	R75.71	R106.67	15.88%	-18.53%
Chenin Blanc 2005							
Chamonix Reserve	R100.00	3.5	4.5	R96.64	R104.95	3.36%	-4.95%
Chardonnay 2006							
Woolworths Danie de Wet	R89.95	3	4.5	R92.95	R104.74	-3.34%	-16.45%
Chardonnay Reserve 2003							
Oak Valley Chardonnay 2006	R85.00	3	4.5	R92.95	R104.74	-9.35%	-23.23%
Waterford Chardonnay 2006	R75.00	3	4.5	R92.95	R104.74	-23.93%	-39.66%

markedly lower than its dummy equivalent: R165.09. Across the top 15 linear and dummy valuations, the trend is similar: the linear top 15 average is R97.00 versus the dummy average of R121.02.

3. In the case of both red and white wine datasets, while the relationship between value and the extent of mispricing is random in the linear version (see Figure 5 for white wines), the extent of scatter becomes that much more apparent in the dummy approach (see Figure 6 for white wines).
4. In terms of the above, we note that through the application of properly conceived valuation techniques, fertile areas for bargain hunting can thus be found at the top of the price continuum as much as at the bottom. Table 8's well-stocked list of premium value-for-money red and white wines serves to corroborate this point; with linear models this would simply not happen.

Conclusion

In the preface to a new South African bargain listing booklet,³⁹ which used the self-same dummy-styled pricing model presented in this analysis, *Wine* editor Cathryn Henderson observed that while controversial, blind and sighted ratings serve as a means to interpret an overload of information and, thus, within the clutter of the wine marketplace they help consumers narrow down the options on hand. So saying, Henderson also remarked how often sighted and blind methods of tasting wine produce different scores. While cues like region, price, and label can detract from the intrinsic merit of the wine itself, exterior influences like heritage and particular wine making philosophies certainly have their own place in the world of wine, she opined. Using both sighted and blind based scores, the "*WineIQ*" calculation acknowledges the merits of each, and takes both methods and the resultant rating into account, as well as the all important factor in any purchase: value-for-money," she concluded.

Henderson's commentary is insightful in that for the first time in South Africa, the melding of the two sometimes-incompatible styles of blind and sighted tasting could now enable consumers to make informed purchase decisions based on the simultaneous appraisal of both price and the two versions of wine quality. The booklet cited over 600 bargain wines, ranging in price from R17.10 to R230.

Notwithstanding the launch of this publication, there remains a degree of skepticism in the industry toward such guides – typically because, it is claimed, they do not help the industry to sell wines using the stock techniques of branding and self-promotion. As invitations to purchase, these

techniques typically invoke an array of cue assemblages including aging quality, vineyard prestige, wine complexity, diversity of range, esoteric wine language, award stickers, and labeling in general. In terms of the latter, drinkers of South African wine are subjected to a diversity of fonts ranging from crude to sophisticated, the occasional African wild animal, gestures of Dutch gabbling, and frequently some suitably unpronounceable estate names. In their 2005 analysis of the US wine market, Kim and Mauborgne⁴³ observed that to the novice consumer it is the uniformity of these cues, and not their differential deployment, that has the most impact. Consequently, the market appears to the consumer both uniformly confusing and without obvious differentiation.

Breaking from these blunted marketing techniques, this paper's stripped-down dummy-style approach to wine price modeling is explicitly customer facing and forsakes all other cue additions, construing these as baffling noise and mere distraction. Its constitution cleaves to Thrane's¹⁷ view that customers would be better served with a simplified set of relevant hedonic cues than by a plethora of irrelevant product-driven alternatives that serve merely to justify the price being asked. While such cues may increase price–value correlations and hence prove more statistically relevant, this practice occurs at the expense of serving the consumer's best interests.

With wine rating information increasingly available to consumers, there are certain consequences that stem from the argument above for the industry at large. First, customer-facing hedonic pricing enables consumers to both identify fair-priced quality wines and to avoid paying for overpriced "hyped-up" wines. Secondly, working from the fitted values of the nonordinal models developed here, producers can accurately price their wines either as loss leaders, fully priced premium wines, or fairly priced offerings. Such insight consequently provides producers with the means to move their product through appropriate pricing (or repricing) strategies. Thirdly, for the retailer, the ability to identify wines on or about the "value frontier" enables them to pre-emptively purchase stock that is likely to move faster than the norm, thus creating a "value offering" that will attract customers and hence gain market share.

Clearly, the formulation of simplified and properly specified pricing models is critical and it was this, along with an exploration of the connections between a wine's price, its value, and, hence, value for money, that formed the focus of this study. Here, two pricing models were created from a dataset of some 1358 South African red and white wines obtainable during the year 2007. With

the underpinning hypothesis that consecutive quality increments are not similarly priced, the analysis presented sought to value wines that, in conjunction with intrinsic grape variety, employed a combination of blind and sighted wine assessments drawn from available accounts of professional wine critics.

Such is the current pressure within the wine industry that the ongoing availability of such data is of course no longer a given. In September 2011, *Wine* published its final hard copy edition and no further ratings have been forthcoming. The consequent availability of blind data going forward is thus by no means assured. Clearly, the lack of such data serves as a threat to the viability of price modeling and this certainly constitutes a weakness in this study. Without the necessary data – both blind and sighted – customer-facing accounts of wine value will not be possible. Additionally, it should be noted that no objective, climatic, or chemical attributes were included for other than those implicit in the blind and sighted ratings themselves. To some this may represent a level of weakness in the hedonic computation of values derived. Once more, in our defense, the rationale throughout this study was one of producing a demand side account of wine values that computes and identifies wines that offer significant value for money to the customer. Specific to this is a view that wine consumers will, and will increasingly, employ wine media ratings to search out wines that offer value for money.

Underpinned by this perspective, the consequent analysis of our statistical output confirms that dummy-styled modeling techniques do much to address the problems associated with linear pricing models. Therefore, and with a more recent and expanded dataset, this analysis affirms Priilaid and van Rensburg's earlier work¹⁹ on the bias-reducing effect of substituting conventional linear calibrations with binary or dummy variables.

Disclosure

This paper follows on from a prior version entitled "The use of hedonic pricing in the valuation of South African wines" presented by the authors at the 22nd Conference of the South African Institute of Management Scientists (SAIMS), September 12–15, 2010, Mpekwini Beach Resort, hosted by Rhodes University, and published in the *SAIMS Conference Proceedings*. Other than in the ongoing development of customer-facing wine bargain-spotting models, there is no conflict of interest pertaining to the content of this paper and any work done by either of its authors.

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