

**Pricing Red Wines of Médoc  
Vintages from 1949 to 1989 at Christie's auctions\***

by

Albert Di Vittorio\*\* and Victor Ginsburgh\*\*\*

November 1994  
(Revised April 1995)

Abstract

We collected data concerning some 30,000 lots sold by Christie's London between 1980 and 1992 and study the closing bids obtained for wines of 40 vintages (1949-1989) coming from 60 châteaux in the Médoc region (Haut-Médoc, Margaux, Pauillac, St Estèphe, and St Julien). Our main findings are as follows:

- (a) the price of a standard quantity of wine is negatively related to the quantity sold in the lot;
- (b) prices seem to decrease as the sale progresses, though not significantly so;
- (c) wines in original cases fetch a higher price than wines that have been repackaged, but the effect is small;
- (d) wines sold in larger bottles (magnums, jeroboams, etc.) tend to be more expensive than those in regular 75 cl bottles;
- (e) the ageing of a wine increases its price by some 3.7% per year;
- (f) prices increased by 75% between 1981 and 1990, and have decreased by 15% since;
- (g) the correlation between "vintage" prices and the grading of vintages by wine experts is high; the same holds true for the ranking of châteaux;
- (h) as expected, weather conditions have a strong impact on prices.

Published in *Journal de la Société Statistique de Paris* 137 (1996), 19-49 (in French)

---

\* We are grateful to Bernard Steyaert and Andrea Szechenyi, both from Christie's Belgium, who have very kindly given us access to the wine sales catalogues on which our data are based. Financial support from the Belgian Government under Contract PAI n°26 is also gratefully acknowledged.

\*\* CEME, Université Libre de Bruxelles.

\*\*\* CEME, Université Libre de Bruxelles and CORE.

## Introduction

In this paper we analyze the prices fetched by Red Bordeaux Growth wines (from the Haut-Médoc region) at auctions held between 1980 and 1992 at Christie's London. We selected 101 out of some 300 sales that took place during the period.<sup>1</sup> This makes for 29,911 lots sold, covering vintages from 1949 to 1989. For each lot, we collected the price, as well as a certain number of characteristics generally thought to explain the price; vintage, château and year of sale are obviously among the most important ones: the price for a 1961 Mouton-Rothschild sold in 1992 is likely to be different from the price for a 1963 or 1965 Château Dauzac sold in 1980, but there are other characteristics, also signalled by Christie's in their sales catalogues, that we thought might influence the price of a lot. Among these is the age of the wine, the number of bottles in the lot, the size of the bottles, the moment at which the lot is auctioned during the sale, the fact that a wine is sold in original cases or not, and the "fullness" of bottles.

Our main interest, however is in the pricing of vintages and châteaux, and in comparing the prices obtained at auctions with a number of classifications, both old (the 1855 classification<sup>2</sup>) and new.

The analysis is in the spirit of those by Ashenfelter et al. (1993),<sup>3</sup> Ginsburgh et al. (1994), Nerlove (1992) and Landon and Smith (1994), where hedonic pricing techniques are used to analyze the quality of wines. Like Ashenfelter (1989), we argue that prices obtained at auctions where there are enough bidders are sufficiently freed from noncompetitive elements and are representative of the quality (or at least of the true value) of a wine, as perceived by informed consumers.<sup>4</sup> Therefore, prices will be used as a proxy for quality and the hedonic equations that are estimated will make it possible to price out the effect of vintages, châteaux and a few other characteristics; we also construct a price index of Haut-Médoc wines for the years 1980 to 1992.

---

<sup>1</sup> See Appendix 1 for the list of sales and details on the selection procedure.

<sup>2</sup> The 1855 classification distinguishes 60 Haut-Médoc wines as Growth wines. It ranks them in five categories: First to Fifth Growth, according to quality (actually, the ranking is said to have been essentially based on prices posted 150 years ago by the various vineyards). This old distinction is advertised by all vineyards on their label, with the exception of Ducru-Beaucaillou and Léoville Las Cases (two Second Growth Saint-Julien); most chateaux simply mention "Grand Cru Classé en 1855" but do not give their rank.

<sup>3</sup> Including the various articles published in *Liquid Assets*.

<sup>4</sup> Note that this is not the case in Ginsburgh et al. (1994) or in Landon and Smith (1994) who use prices posted at the vineyard or prices coming from specialized journals. Nor is it the case in Nerlove (1992) who works with prices set by the Swedish spirit monopoly.

The paper is organized as follows. Section 1 gives an outline of the (very simple) methodology used, and discusses the pricing of characteristics other than vintage and vineyard, covered in Section 2. The price of a vintage is derived from the coefficient of the vintage dummy, but this is only descriptive; therefore, in Section 3, we relate vintage prices to weather conditions prevailing since 1949. Section 4 is devoted to comparing our rankings of vintages and vineyards to those established by others (which are essentially based on tasting); this leads us to conclude that the 1855 classification is no worse than those that supposedly take into account the quality of today's wines. Likewise, weather conditions contain most of the information concerning vintage quality, and we find that some simple econometrics can do as good a job at describing vintages as expensive (though certainly very pleasant) wine tasting parties. In Section 5, we offer a few concluding remarks.

## 1. Methodology and general results

Our methodology is based on well-known hedonic regression techniques; the standard equation is of the form:

$$(1.1) \quad \ln p_i = \sum_j \alpha_j u_{ji} + \sum_j \beta_j x_{ji} + \sum_t \gamma_t y_{ti} + \sum_\tau \delta_\tau v_{\tau i} + \sum_h \phi_h z_{hi} + \varepsilon_i,$$

where  $p_i$  is the observed price for a standard 75 cl quantity of wine in lot  $i$ , the  $u_j$ 's are variables, such as the age of the wine or the number of bottles in a lot, the  $x_j$ 's are dummy variables for different bottle sizes,  $y_t$  is a dummy variable representing the year of sale (it takes the value one if lot  $i$  was sold in year  $t$ ),  $v_\tau$  is a dummy for vintage  $\tau$  (equal to one if lot  $i$  is from vintage  $\tau$ ) and finally,  $z_h$  is a dummy for chateau or vineyard  $h$  (equal to one if lot  $i$  is a wine from vineyard  $h$ );  $\varepsilon_i$  is an error term and the  $\alpha_j$ 's,  $\beta_j$ 's,  $\gamma_t$ 's,  $\delta_\tau$ 's and  $\phi_h$ 's are coefficients to be estimated. These five groups of effects on prices will be discussed separately.

We also run regressions for all First and Second Growth wines; these are similar to (1.1) except that the vineyard variables do not appear:

$$(1.2) \quad \ln p_i = \sum_j \alpha_j u_{ji} + \sum_j \beta_j x_{ji} + \sum_t \gamma_t y_{ti} + \sum_\tau \delta_\tau v_{\tau i} + \varepsilon_i.$$

Equation (1.1) is estimated using the full sample of 29,911 observations; it includes 122 variables (4 general characteristics, 8 bottle sizes, 12 years of sale, 40

vintages<sup>5</sup> and 58 vineyard dummies<sup>6</sup>); the general fit is excellent with an  $R^2 = 0.906$ . The results are displayed in Tables 1 to 3. Equation (1.2) is estimated for the 18 First and Second Growth wines classified in 1855;<sup>7</sup> here, the number of variables in each equation may change, since some vintages, especially poor ones, may not appear at auction. The fits are also excellent, with R-squares ranging between 0.77 and 0.92. Selected results are given in Appendix 2, Tables A1 to A3.

Equation (1.1) obviously forces restrictions on the coefficients which, in view of the results of equations (1.2) for selected chateaux, may not be statistically acceptable. However, since there are not always enough observations for every chateau, we could not run separate regressions for each of these, and, therefore, we could not properly test whether the restrictions that we impose do hold or not.<sup>8</sup>

### *1.1 General characteristics*

The factors we have labeled as general characteristics include the age of the wine, the quantity sold in a lot (expressed in numbers of standard 0.75-liter bottles), a variable indicating whether or not the lot was sold in its original packaging, and the order in which the lot appeared in the auction.<sup>9</sup> Results are given in Table 1 (and Appendix A1 for First and Second Growths).

#### *Age*

The age of a wine is measured by the difference between  $t$ , the year of sale and  $\tau$ , the vintage. Our results indicate that one year of ageing adds 3.7% to the price of a given vintage; this is of course a very rough average, since, as can be seen from Appendix A1 (columns 1 and 2), there are significant differences from one vineyard to the other (for some, the effect is zero, while for others it is as large as 12%). Moreover, with the

---

<sup>5</sup> The vintages run from 1949 to 1989, but the dummy for 1982 is excluded from the regression, since it is collinear to others.

<sup>6</sup> There are 60 Haut-Médoc Growth wines, but there were no observations for Château Desmirail and Château Ferrière, which are small vineyards, producing only 3,000 and 1,000 cases respectively.

<sup>7</sup> Mouton-Rothschild was upgraded from Second to First Growth in 1973.

<sup>8</sup> Note also that, given the number of coefficients to estimate ( $3,960 = 60 \text{ chateaux} \times 66 \text{ variables}$ ) it would have been very difficult to carry out the analysis of variance tests in any meaningful way.

<sup>9</sup> The "fullness" characteristic of a bottle probably also influences its price, since the contact of wine with air should be minimized. "Ullage," as the seepage of wine from a bottle is called, results in different levels of fullness (from high-fill to below low shoulder); these are described for some of the lots sold by Christie's, but not for all; moreover Christie's changed the description and the terms over time, with no obvious relation between terminologies. Therefore, we could not retain the filling characteristics in our regressions.

exception of First Growth and some Second Growth wines, vintages from bad years no longer sell after a certain time (see Table A3). Consequently, the rate of price increases generated by our regression is probably applicable to good vintages only.

### *Quantity*

A lot may consist of one or several bottles of different sizes; for the purposes of this study, we converted each lot into an equivalent number of standard 0.75 liter bottles. The quantity so defined is included as a variable in order to capture a demand effect which should be - and indeed is - negative: each additional 0.75 liter in a lot subtracts 0.25% from the price per bottle-equivalent. Clearly, this effect is small, since it amounts to a mere 3% discount per bottle on a case of twelve, but it is significantly different from zero. This result may again vary somewhat from one vineyard to the next, but as is seen in Table A1 (columns 3 and 4), it is, in all cases, consistent with a correctly signed quantity discount effect (and is significantly different from zero in almost all cases).

### *Original cases*

Lots may be sold in original cases. Our results show that this will increase the price by an average of 3% per standard bottle. This may also vary between vineyards, as shown in Table A1 (columns 5 and 6).

### *Lot number*

Finally, we also included the lot number in our regressions, as an indication of the moment at which the lot was sold during a particular auction. Here, the idea is to capture the effect described by Ashenfelter (1989), who notes that the price of a specific wine will decrease from one lot to the next if it appears more than once during an auction. The influence of the "order in sale" variable is negative, though the coefficient is not significantly different from zero. The same is true in 11 cases out of 18, for the First and Second Growth wines of the region (see Table A1, columns 7 and 8). Prices thus seem to decrease as the auction progresses: the first lots are sold at a higher price than the last ones, though, as Ashenfelter points out, there is no clearcut theoretical argument in support of this phenomenon.<sup>10</sup>

---

<sup>10</sup> A recent paper by McAfee and Vincent (1993) does offer some insights, however. Note that the assumption tested in our study is slightly more general than Ashenfelter's: he discusses the issue about the same wine and vintage; we test the assumption across wines and vintages, and this encompasses Ashenfelter's hypothesis.

### *Bottle size and oxidation*

Bottle sizes may vary; the standard "Bordelaise" contains approximately 0.75 liter. One may occasionally encounter smaller bottles - half-bottles or very rarely, pints (approx. 3/4 of a standard bottle) - or larger ones: 30-ounce bottles (1.136 standard bottles), magnums (2 standard bottles), double magnums, also called marie-jeannes (4 standard bottles), jeroboams (6 standard bottles), and imperials (8 standard bottles).

Because of the porous nature of the cork, there is always some exchange between the wine and air through the cork. However, as is well-known, there should be as little direct air-liquid contact as possible while a wine is ageing. One way to minimize this contact is to maximize the volume of liquid for a given amount of air-exposed surface-area.<sup>11</sup> This can be achieved by using larger bottles. Consequently, one would expect this quality effect to be reflected in the price of larger bottles. As can be seen from Table 1, this is indeed the case (except for magnums): the price increase (for a standard volume of 0.75 liter) can be as large as 42% for imperials.<sup>12</sup> Obviously, this also includes the effect of rarity, for which collectors are willing to pay more.

### *1.2 The year of sale*

The  $\beta_t$  coefficients in Table 1, which capture the time-inflation effect, can be translated into an index, the evolution of which is displayed in Figure 1. This index is free of any effects other than time, since it is constructed on the basis of equation (1.1), which corrects for the possibility of different sales mixes over time. Consequently, it represents the price for a wine of constant quality and age, and shows that nominal prices increased quite dramatically until 1985, then fell by some 15%, and subsequently remained stable until 1992.<sup>13</sup> In 1986, Christie's London introduced a buyer premium of 10%, which is not included in our prices. This may thus partly explain why prices obtained at auction fell in 1986, since the premium is anticipated by buyers.

[Figure 1 here]

---

<sup>11</sup> See also footnote 8.

<sup>12</sup> The "imperial" effect is equal to  $.3514 = .3179 + .0535$  (standard bottle) -  $8 \times .0025$  (quantity effect of the number of bottles in lot).

<sup>13</sup> See Krasker (1979), Jaeger (1981) and, more recently, Weil (1993) for a discussion of investment in wines.

**Table 1**  
**General regression results**

	Coeff.	St. dev.	Index
<b>General characteristics</b> ( $\alpha_j$ coefficients)			
Age	.0366	.0013	
Nb of bottles in lot	-.0025	.0001	
Original cases	.0298	.0029	
Order in sale (x100)	-.0004	.0008	
<b>Bottle size</b> ( $\beta_j$ coefficients)			
Half bottle (.5 b)	-.0948	.0141	91
Pint (.757 b)	-.1586	.1031	85
Standard bottle (1 b)	-.0535	.0090	95
30 oz bottle (1.14 b)	.0655	.2306	107
Magnum (2 b)	-.0107	.0052	99
Double magnum (4 b)	.0510	.0111	105
Jeroboam (6 b)	.2850	.0157	132
Imperial (8 b)	.3179	.0141	137
One doz. bottles (12 b)	.0000	-	100
<b>Year of sale</b> ( $\gamma_t$ coefficients)			
1980	.0000	-	100
1981	.0640	.0072	101
1982	.2002	.0075	122
1983	.3957	.0086	149
1984	.5285	.0091	170
1985	.5953	.0096	181
1986	.4977	.0103	164
1987	.5016	.0115	165
1988	.4905	.0127	163
1989	.4988	.0134	165
1990	.5654	.0145	176
1991	.5134	.0161	167
1992	.4443	.0171	156
<b>Intercept</b>	1.5393	.0302	
<b>Vintage effects</b> ( $\delta_\tau$ coefficients)			
See Table 2			
<b>Châteaux effects</b> ( $\phi_h$ coefficients)			
See Table 3			
<b>R-square</b>	.906		
<b>Standard error</b>	.229		
<b>Nb of obs.</b>	29,911		

If one wants to compute the price index for a wine of a specific vintage  $\tau$ , one must also take into account the age effect  $\alpha_1(t-\tau)$ , where  $\alpha_1 = .0366$  is the coefficient for age,  $t$  is the year of sale and  $\tau$  the vintage; the formula is thus:

$$\ln p_i = .0366(t-\tau) + \sum_t \gamma_t x_{ti} + \text{constant.}$$

This shows, for example, that the (log of the) price of a 1949 vintage wine rises from  $1.135 = (31 \times 0.0366 + .0)$  in 1980 to  $2.007 = (43 \times 0.0366 + .443)$  in 1992; the index is thus 239 in 1992 (1980 = 100).

There is some variation if one looks at the details for selected vineyards. Table A2 shows that First Growth wines did better than others, while Second Growth Margaux did not do very well over the last 12 years. Cos d'Estournel performs best, reflecting the years of much celebrated work that Bruno Prats has put into this Saint-Estèphe vineyard.

## 2. Vintages and vineyards

### *Vintages*

The vintage effects resulting from equation (1.1) are detailed in Table 2. It appears that prices can vary between 16 in 1965 and 136 in 1961.<sup>14</sup> Auction prices thus vary by a factor of eight and, as was pointed out earlier, many wines from bad vintages cannot be found at sales after a few years. Clearly, vintage dummies are not an explanation in themselves; the underlying factor is weather conditions, the object of Section 3.

The vintage index of Table 2 is again an average taken over all châteaux, and more specific details are given in Table A3 for First and Second Growth wines. It is obvious however, that since the quality of the vintage depends essentially upon weather conditions, and since these are relatively homogeneous over the whole Haut-Médoc region, a vintage is good or bad for all vineyards. This has also been pointed out on many occasions by Ashenfelter and his collaborators: "good vintages produce good wines in all vineyards and the best wines in each vintage are usually produced by the best vineyards." (Ashenfelter et al. (1993)). This leads us to consider the importance of vineyard effects.

---

<sup>14</sup> 1954 is known as a poor vintage and picks an odd coefficient, which is probably due to outlying observations. Excluding 1954 would have changed very little, since there are anyway few observations for this poor vintage.



**Table 2**  
**Vintage effects**

	<b>Coeff.</b>	<b>St. dev.</b>	<b>Index<sup>1</sup></b>
<b>1949</b>	.0000	-	100
<b>1950</b>	-1.1898	.0867	30
<b>1951</b>	-1.4930	.1018	22
<b>1952</b>	-.8071	.0484	45
<b>1953</b>	-.1721	.0515	84
<b>1954</b>	.5469	.1375	173 <sup>2</sup>
<b>1955</b>	-.5409	.0394	58
<b>1956</b>	-1.6639	.0929	19
<b>1957</b>	-1.2277	.0412	29
<b>1958</b>	-1.2956	.0440	27
<b>1959</b>	-.1441	.0321	87
<b>1960</b>	-1.3175	.0372	27
<b>1961</b>	.3055	.0276	136
<b>1962</b>	-.5308	.0277	59
<b>1963</b>	-1.6596	.0395	19
<b>1964</b>	-.6998	.0246	50
<b>1965</b>	-1.8090	.0474	16
<b>1966</b>	-.1143	.0212	89
<b>1967</b>	-.8958	.0211	41
<b>1968</b>	-1.2549	.0372	29
<b>1969</b>	-1.2801	.0208	28
<b>1970</b>	-.1175	.0159	89
<b>1971</b>	-.4770	.0157	62
<b>1972</b>	-1.2713	.0173	28
<b>1973</b>	-.7716	.0147	46
<b>1974</b>	-1.0842	.0203	34
<b>1975</b>	-.2371	.0106	79
<b>1976</b>	-.3796	.0103	68
<b>1977</b>	-1.107	.0215	33
<b>1978</b>	-.2003	.0081	82
<b>1979</b>	-.4258	.0107	65
<b>1980</b>	-.8778	.0234	42
<b>1981</b>	-.4504	.0075	64
<b>1982<sup>3</sup></b>			
<b>1983</b>	-.3377	.0070	71
<b>1984</b>	-.8592	.0184	42
<b>1985</b>	-.2682	.0098	76
<b>1986</b>	-.1808	.0154	84
<b>1987</b>	-.6496	.0374	52
<b>1988</b>	-.3588	.0331	70
<b>1989</b>	.0924	.1628	110

<sup>1</sup> 1949 = 100.

<sup>2</sup> 1954 is considered as a "worse than average" vintage and the coefficient obtained is quite odd, and probably due to outlying observations.

<sup>3</sup> This variable is excluded from the regression, since it is collinear to others.

### *Vineyards*

Table 3 provides details about the coefficients (converted into an index) estimated for the château dummies in equation (1.1). Prices vary from 73 (for Château Dauzac, a

Fifth Growth Margaux) to 452 (for the celebrated First Growth Pauillac, Mouton-Rothschild). It is interesting to note that the vineyard effect causes prices to vary by a factor of six; this is smaller than the spread generated by weather (1 to 8).<sup>15</sup>

**Table 3**  
**Château effects**

	<b>Cru classé</b>	<b>Coeff.</b>	<b>St. dev.</b>	<b>Index<sup>1</sup></b>
<b>Margaux</b>				
Ch. Margaux	1	1.3128	.0446	371
Brane-Cantenac	2	.2295	.0300	126
Durfort-Vivens	2	.0125	.0543	101
Lascombes	2	.1220	.0363	113
Rausan-Segla	2	.1297	.0320	114
Rauzan-Gassies	2	.0607	.0321	106
Boyd-Cantenac	3	.0235	.0335	102
Cantenac-Brown	3	.0711	.0326	107
Desmirail <sup>2</sup>	3			
d'Issan	3	.1254	.0342	113
Ferrière <sup>2</sup>	3			
Giscours	3	.3534	.0303	142
Kirwan	3	-.1596	.0370	85
Malescot-St-Ex.	3	.0473	.0333	105
Marquis-d'Alesme B.	3	.0587	.0436	106
Palmer	3	.9654	.0296	263
Marquis de Terme	4	-.0761	.0452	93
Pouget	4	-.2837	.0569	75
Prieuré-Lichine	4	.0235	.0359	102
Dauzac	5	-.3208	.0915	73
du Tertre	5	.0000	-	100
<b>Pauillac</b>				
Lafite-Rothschild	1	1.4894	.0295	443
Latour	1	1.4293	.0294	417
Mouton-Rothschild	1	1.5081	.0294	452
Pichon L. (Baron)	2	.2468	.0310	128
Pichon L. (Lalande)	2	.8100	.0299	225
Duhart-Milon Roth.	4	.0371	.0339	104
Batailley	5	.0420	.0303	104
Clerc-Milon	5	-.1196	.0750	89
Croizet-Bages	5	-.0498	.0340	95
Grand-Puy-Ducasse	5	-.0382	.0356	96
Grand-Puy-Lacoste	5	.2781	.0306	132
Haut-Bages-Libéral	5	-.0390	.0446	96
Haut-Batailley	5	.1615	.0317	118
Lynch-Bages	5	.5437	.0297	172
Lynch-Moussas	5	-.2181	.0403	80
Mouton Bar. Phil.	5	.1638	.0351	118
Pédesclaux	5	-.0083	.11841	99
Pontet-Canet	5	-.0197	.0318	98

<sup>1</sup> Château du Tertre (Margaux) = 100.

<sup>2</sup> There were no observations available for this château.

<sup>15</sup> Obviously, the range would become much larger if unclassified wines were taken into account.

**Table 3 (cont.)**  
**Château effects**

	<b>Cru classé</b>	<b>Coeff.</b>	<b>St. dev.</b>	<b>Index<sup>1</sup></b>
<b>Saint-Estèphe</b>				
Cos d'Estournel	2	.5536	.0300	174
Montrose	2	.3930	.0301	148
Calon-Ségur	3	.2732	.0305	131
Lafon-Rochet	4	-.1502	.0374	86
Cos-Labory	5	-.1657	.0398	85
<b>Saint-Julien</b>				
Ducru-Beaucaillou	2	.7001	.0296	201
Gruaud-Larose	2	.4027	.0296	150
Léoville Barton	2	.3115	.0301	137
Léoville Las Cases	2	.7033	.0297	202
Léoville Poyferré	2	.2260	.0303	125
Lagrange	3	-.1010	.0313	90
Langoa-Barton	3	.0884	.0323	109
Beychevelle	4	.4813	.0297	162
Branais-Ducru	4	.2459	.0310	128
Saint-Pierre-Sevestre	4	.1425	.0446	115
Talbot	4	.2595	.0299	130
<b>Haut-Médoc</b>				
La Lagune	3	.3679	.0300	144
La Tour Carnet	4	-.2328	.0590	79
Belgrave	5	-.2519	.0602	78
Camensac	5	-.1060	.0382	90
Cantemerle	5	.1504	.0304	116

<sup>1</sup> Château du Tertre (Margaux) = 100.

The second column in Table 3 gives the ranking of each wine, according to the classification established in 1855, which was primarily based on prices charged by the vineyards. As one can see, there are outliers: some wines fetch much higher prices than they should according to the 1855 ranking (Château Palmer is a striking example); others (such as Château Pouget and Château du Tertre) fetch lower prices. In Section 4, we shall return to this issue, as well as to that of comparing various contemporary rankings with the 1855 classification.

### 3. Weather conditions

To determine how weather conditions affect the price (and the quality) of a wine, we ran a regression similar to (1.1), replacing the vintage dummies by frost, hail, rain and temperature conditions. All the other variables were maintained in the equation, which now reads:

$$(3.1) \quad \ln p_i = \sum_j \alpha_j u_{ji} + \sum_j \beta_j x_{ji} + \sum_t \gamma_t y_{ti} + \sum_k \theta_k w_{k\tau,i} + \sum_h \phi_h z_{hi} + \varepsilon_i.$$

With the exception of the variables  $w_{k\tau,i}$  which represent meteorological conditions of vintage year  $\tau$  (and replace the dummies  $v_{\tau i}$ ), all the variables in (3.1) are as in (1.1). In Table 4, we only report on the weather effects; all other coefficients are of the same order of magnitude as those obtained for equation (1.1). The fit is not as good as it was for equation (1.1), but (3.1) still explains 86% of the variance (of the logarithm) of prices.

The weather conditions used in our regression were those prevailing in the whole Haut-Médoc region, as recorded at the Méridon-Cissac meteorological station. Local conditions may differ between vineyards, but it was not possible to obtain more detailed information. The châteaux either do not keep track of the information or do not wish to disclose it. In any case, our approximation should be fairly good, since the region is rather small.

In the absence of a theoretical model for the exact influence of weather conditions on the growth and the development of vines and on the quality of the resulting wine, we were led to test a variety of alternative specifications, including e.g. weather variables for months other than those which are eventually reported in Table 4.

The equation is obviously similar in spirit to that obtained by Ashenfelter et al. (1993) (AA, for short), though the following differences can be observed: we include frost and hail, which is not taken into account by AA; we disaggregate rainfall and temperature over the various months of the growing season (January to September), while AA use seasonal averages; we ignore rainfall from October to December during the year preceding the vintage, whereas AA include these.

**Table 4**  
**Weather effects**

	<b>Coeff.</b>	<b>St. dev.</b>
<b>Frost (Nb of days)</b>		
January-April	-.0103	.0003
May	-.3891	.0218
<b>Hail (Nb of days)</b>		
April-September	-.0696	.0025
<b>Rain (in mm)</b>		
January-June	.1006	.0025
July	-.1523	.0082
August	-.0878	.0032
September	-.3216	.0087
<b>Temperature (in °C)</b>		
April	.0437	.0021
May	.0453	.0034
June	.1639	.0020
July	.0259	.0020
August	.0784	.0028
September	.0984	.0024
<b>R-square</b>	.858	
<b>Standard error</b>	.282	
<b>Nb of obs.</b>	29,911	

Frost (measured by the number of days on which temperature fell to freezing or below) has a small negative impact between January and April; one may presume that frost has little effect then, since vines are dormant until the end of March, and any damage will be limited.<sup>16</sup> Frost in May, on the other hand, has a much stronger impact, since vines have already come into bud. The negative effect is then very dramatic, and may decrease prices by some 32% per day of subzero temperature.

Hail is very often a local phenomenon, hurting one vineyard, while leaving neighbors untouched. To adjust for this, we constructed a variable by adding the number of days of hail during the whole growing season (our rationale is that hail is more likely to have hurt many vineyards if the number of days on which it occurred is large). As can be observed in Table 4, the effect is very important, cutting prices by some 7% per day of hail.

<sup>16</sup> Out of the growing season, vines can stand temperatures as low as -16°C.

According to our results, rainfall (measured in millimeters) contributes to the quality of a wine between January and June, but detracts from it afterward; late rains add too much water to the grapes or generate rot-conducive humidity on the vines. Dry weather is thus important during the summer, and rain is especially devastating in the late summer since, under normal conditions, harvest starts in mid-September.

Warm weather (measured in terms of average monthly temperatures) benefits wine quality throughout the whole growth season, from April to September. The regression results show that heat has (significantly) different effects at different moments: high temperatures seem to be especially beneficial in June (we find no explanation for this) and in August and September, when grapes reach their final stage of ripening.<sup>17</sup>

We have calculated  $\sum_k \theta_k w_{k\tau}$ , the combined effect of all weather variables for vintage years 1989 (the last vintage appearing in our sample) to 1993 and constructed an index based on these figures. Table 5 shows that both 1989 and 1990 were exceptionally good years but the vintages from subsequent years are likely to be of much lower quality. This is in general agreement with market expertise.

**Table 5**  
**Vintage quality forecasts 1990-1994**

Vintage	Index
1989	100
1990	137
1991	50
1992	49
1993	37
1994	87

<sup>17</sup> Ashenfelter et al. (1993) only use average temperature over the growing season (April-September).

#### 4. Comparing our ranking of vintages and vineyards with those of tasters

Wine specialists spend a considerable amount of resources (those of the readers who buy their books, and the good wines they taste) to classify vintages and vineyards. Here, we compare their rankings with those obtained by adjusting equation (1.1) to our data set.<sup>18</sup>

##### *Vintages*

Table 6 and Figures 2 to 5 give the rankings of vintages by Tastet & Lawton (T&L),<sup>19</sup> the oldest wine broker of the quai des Chartrons in Bordeaux (their archives date back to 1740), by Parker (1990), the American wine guru, and by *Wine Spectator* (1994), as well as the price index constructed on the basis of our regression equation (see Table 2).

[Figures 2 to 5 here]

Figure 2 shows that T&L's and Parker's rankings have much in common.<sup>20</sup> Nonetheless, while the range of T&L grades<sup>21</sup> varies between 3 (in 1963 and 1965) and 20 (in 1961), Parker's range is limited between 50 (in 1963 and 1965) and 95 (in 1961). The spread generated by auction prices is even larger since it varies between 16 in 1965 (19 in 1963) and 136 in 1961.

The relation between grades and prices is nonlinear; all wine experts (T&L, Parker and the *Wine Spectator*) have a strong tendency to overestimate "quality." From Figure 3, it can be seen that grades of 15 and more that were attributed by T&L correspond to a price spread of 86 (50 to 136); Parker does even worse, as can be seen from Figure 4. In the light of these comparisons, it would appear that auction prices discriminate more between vintages than do wine specialists but that, by and large, classifications do agree.

<sup>18</sup> This is also considered in Ginsburgh et al. (1994) and is the main issue in Landon and Smith (1994).

<sup>19</sup> As compiled by Dubourdiou (1992).

<sup>20</sup> The linear relation between the rankings is  $T\&L = -12 + 0.335 \text{ Parker}$ ,  $R^2 = 0.88$ .

<sup>21</sup> Note that the T&L grading is for all Red Bordeaux, and not specific for Haut-Médoc wines, while Parker's is specific to Haut-Médoc. As is obvious from the  $R^2$  of 0.88 between the two classifications, this also seems irrelevant!

**Table 6**  
**Alternative classifications of vintages**

	T&L	Parker <sup>1</sup>	Wine Spect. <sup>2</sup>	Prices <sup>3</sup>
1949	18	na	na	100
1950	16	na	na	30
1951	8	na	na	22
1952	17	na	na	45
1953	18	na	na	84
1954	9	na	na	173 <sup>4</sup>
1955	18	na	na	58
1956	9	na	na	19
1957	12	na	na	29
1958	12	na	na	27
1959	19	na	na	87
1960	12	na	na	27
1961	20	95	99	136
1962	17	86	na	59
1963	3	50	na	19
1964	17	75	80	50
1965	3	50	na	16
1966	17	86	89	89
1967	14	79	na	41
1968	6	60	na	29
1969	12	60	na	28
1970	18	90	91	89
1971	17	82	80	62
1972	10	61	60	28
1973	12	74	68	46
1974	12	73	58	34
1975	17	88	85	79
1976	16	84	80	68
1977	11	71	60	33
1978	17	90	86	82
1979	16	85	83	65
1980	13	77	78	42
1981	16	85	82	64
1982	19	93	94	-
1983	17	92	86	71
1984	12	78	70	42
1985	18	88	93	76
1986	18	91	95	84
1987	13	82	76	52
1988	18	86	93	70
1989	na	na	98	110

<sup>1</sup> Parker distinguishes Southern and Northern Médoc; when grades were different, we computed an average grade.

<sup>2</sup> For all Bordeaux.

<sup>3</sup> 1949 = 100.

<sup>4</sup> 1954 is considered as a "worse than average" vintage and the coefficient obtained is quite odd, and probably due to outlying observations.



## *Vineyards*

Table 7 and Figures 6 and 7 proceed in a similar way, by comparing four alternative classifications (1855, Parker (1990), Dussert-Gerber (1988), the *Wine Spectator* (1994)) with the one given by our pricing equation for châteaux (Table 3).

Figure 6, which compares the 1855 classification with that generated by prices, shows that there are three obvious outliers - one for each of the Third (Château Palmer), Fourth (Château Beychevelle) and Fifth Growth (Château Lynch-Bages) wines; according to our price-based classification, all three should be upgraded to Second Growths.

[Figures 6 and 7 here]

Figure 7 compares with our own, the classifications of 1855, of Parker and of Dussert-Gerber.<sup>22</sup> Both Parker and Dussert-Gerber correct for the three 1855 "misclassifications" detected earlier (Palmer, Beychevelle and Lynch-Bages), but they obviously rank too many wines as First Growths and declassify several wines that do not seem to perform any worse than the Third, Fourth and Fifth Growths they retain.

It is also interesting to note that there is little difference in prices between Third, Fourth and Fifth Growths: the prices in all three classes vary from 50 to 150, regardless of the classification they belong to. The four First Growths wines (Châteaux Margaux, Lafite, Latour and Mouton-Rothschild) are considerably more expensive (by a factor of 3 to 4) than the cluster formed by the wines belonging to other growths.

---

<sup>22</sup> In Figure 7, we have added a sixth class for wines that were classified in 1855 and are considered not to deserve this anymore by either Parker or Dussert-Gerber. The *Wine Spectator* gives a list of their choice of the best 50 Bordeaux wines. This list only includes 25 wines from the Haut-Médoc region, which makes it somewhat pointless to compare their classification with ours.

**Table 7**  
**Alternative classifications of châteaux**

	1855	Parker	D.Gerb.	W.Sp	Prices <sup>1</sup>
<b>Margaux</b>					
Ch. Margaux	1	1	1	96.6	371
Brane-Cantenac	2	5	1	na	126
Durfort-Vivens	2	5	2	na	101
Lascombes	2	4	2	na	113
Rausan-Segla	2	4	2	na	114
Rauzan-Gassies	2	5	-	na	106
Boyd-Cantenac	3	3	3	na	102
Cantenac-Brown	3	5	3	na	107
Desmirail	3	-	-	na	na
d'Issan	3	3	3	na	113
Ferrière	3	-	-	na	na
Giscours	3	3	1	na	142
Kirwan	3	5	5	na	85
Malescot-St-Exupéry	3	5	3	na	105
Marquis-d'Alesme B.	3	-	-	na	106
Palmer	3	1	2	92.2	263
Marquis de Terme	4	5	3	na	93
Pouget	4	5	-	na	75
Prieuré-Lichine	4	4	4	na	102
Dauzac	5	-	-	na	73
du Tertre	5	5	-	na	100
<b>Pauillac</b>					
Lafite-Rothschild	1	1	1	94.3	443
Latour	1	1	1	93.6	417
Mouton-Rothschild	1	1	1	95.8	452
Pichon L. (Baron)	2	4	3	92.0	128
Pichon L. (Comtesse)	2	1	1	93.3	225
Duhart-Milon Roth.	4	5	4	90.0	104
Batailley	5	5	4	na	104
Clerc-Milon	5	5	3	92	89
Croizet-Bages	5	-	4	na	95
Grand-Puy-Ducasse	5	5	4	na	96
Grand-Puy-Lacoste	5	3	2	90.1	132
Haut-Bages-Libéral	5	5	4	na	96
Haut-Batailley	5	5	2	na	118
Lynch-Bages	5	2	1	93.8	172
Lynch-Moussas	5	-	-	na	80
Mouton Bar. Philippe	5	5	-	na	18
Pédesclaux	5	-	-	na	99
Pontet-Canet	5	5	2	na	98

<sup>1</sup> Château du Tertre (Margaux) = 100.

- means not classified as Grand Cru Classé (class 6 in Figure 5).

**Table 7 (cont.)**  
**Alternative classifications of châteaux**

	1855	Parker	D.Gerb.	W.Sp	Prices <sup>1</sup>
<b>Saint-Estèphe</b>					
Cos d'Estournel	2	1	1	92.0	174
Montrose	2	2	1	90.7	148
Calon-Ségur	3	4	2	na	131
Lafon-Rochet	4	5	4	na	86
Cos-Labory	5	-	3	na	85
<b>Saint-Julien</b>					
Ducru-Beaucaillou	2	1	1	90.2	201
Gruaud-Larose	2	1	3	89.7	150
Léoville Barton	2	2	2	na	137
Léoville Las Cases	2	1	1	92.7	202
Léoville Poyferré	2	4	2	na	125
Lagrange	3	-	-	90.6	90
Langoa-Barton	3	3	-	90.7	109
Beychevelle	4	3	2	89.2	162
Branais-Ducru	4	3	2	na	128
Saint-Pierre-Sevestre	4	4	-	na	115
Talbot	4	3	4	90.1	130
<b>Haut-Médoc</b>					
La Lagune	3	2		90.8	144
La Tour Carnet	4	-		na	79
Belgrave	5	-		na	78
Camensac	5	5		na	90
Cantemerle	5	3		na	116

<sup>1</sup> Château du Tertre (Margaux) = 100.

- means not classified as Grand Cru Classé (class 6 in Figure 5).

Finally, in Figure 8, we plot 1993 vintage prices (charged by a Bordeaux dealer<sup>23</sup>) against our ranking, for 28 Growth wines carried by the dealer (4 Margaux, 13 Pauillac, 3 Saint Estèphe, 7 Saint Julien and 1 Haut Médoc). The correlation coefficient between the two rankings is equal to 0.95; some of the correlation, however, is due to the First Growth "northeast" outliers (Châteaux Margaux, Lafite, Latour and Mouton); when these are excluded, the correlation coefficient drops to 0.73, which is still high. If we believe our ranking to give the true quality signal, some wines are overpriced by the dealer, while others may be good bargains (as an example, auction prices rank Rausan-Segla and d'Issan as equal; the first is priced FF 90, the second FF 65).<sup>24</sup> A short list of these

<sup>23</sup> The dealer is Les Vins des Grands Vignobles, 87, quai de Paludate, 33038 Bordeaux; prices are taken from his catalogue *Les Primeurs du Millésime 93*, July-August 1994.

<sup>24</sup> Note that *all* the prices charged by the dealer for these *primeur* wines may be too high (or too low) compared with prices paid (a few years later) at auction. Here, we are concerned with relative prices only.

bargains (excluding First-Growths) would include Beychevelle, Ducru-Beaucaillou, Haut-Bages-Liberal, Haut-Batailley, La Lagune and Lynch-Moussas.

[Figure 8 here]

## 5. Conclusions

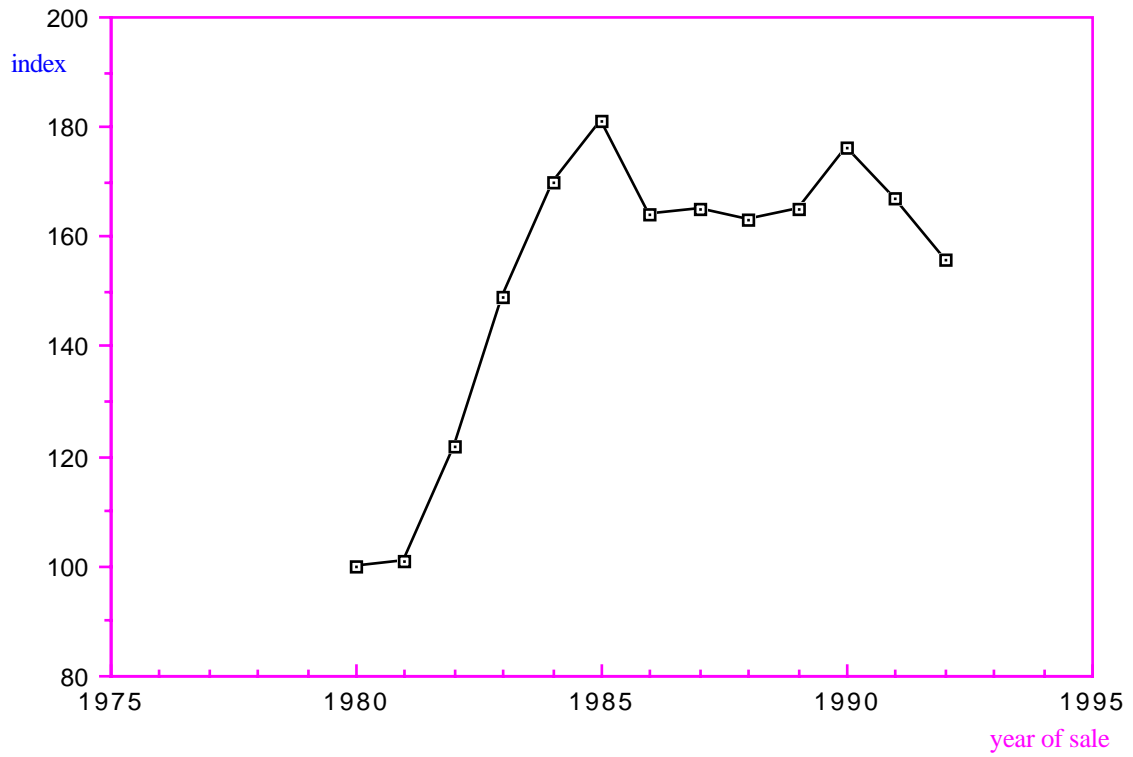
In this paper, we used data concerning 30,000 lots sold in 101 wine auctions over thirteen years to analyze pricing of red wines from the Haut-Médoc. We obtain the following results:

- (a) prices are negatively related to the quantity sold in a specific lot, showing that there is a "quantity discount" effect;
- (b) prices seem to decrease as the sale progresses, confirming Ashenfelter's finding;
- (c) wines in original cases tend to fetch a higher price, but the impact is small;
- (d) bids for (an equal volume of) wines sold in larger bottles (in particular, jeroboams and imperials) tend to be higher than for regular 75 cl bottles; this is presumably due to both a quality and a rarity effect;
- (e) the ageing of a wine increases its price by some 3.7% per year;
- (f) auction prices increased by some 75% between 1981 and 1985, but they have fallen by 15% since;
- (g) weather conditions have the following effects on prices: hail between April and September has a negative impact; rain between January and June is beneficial, though the effect is small; rain between July and September is bad; frost between January and April has a negative, but rather inconsequential impact; subzero temperatures in May have a very negative effect; temperature does not matter before April, seems to be most important in June and is of some importance in August and September.

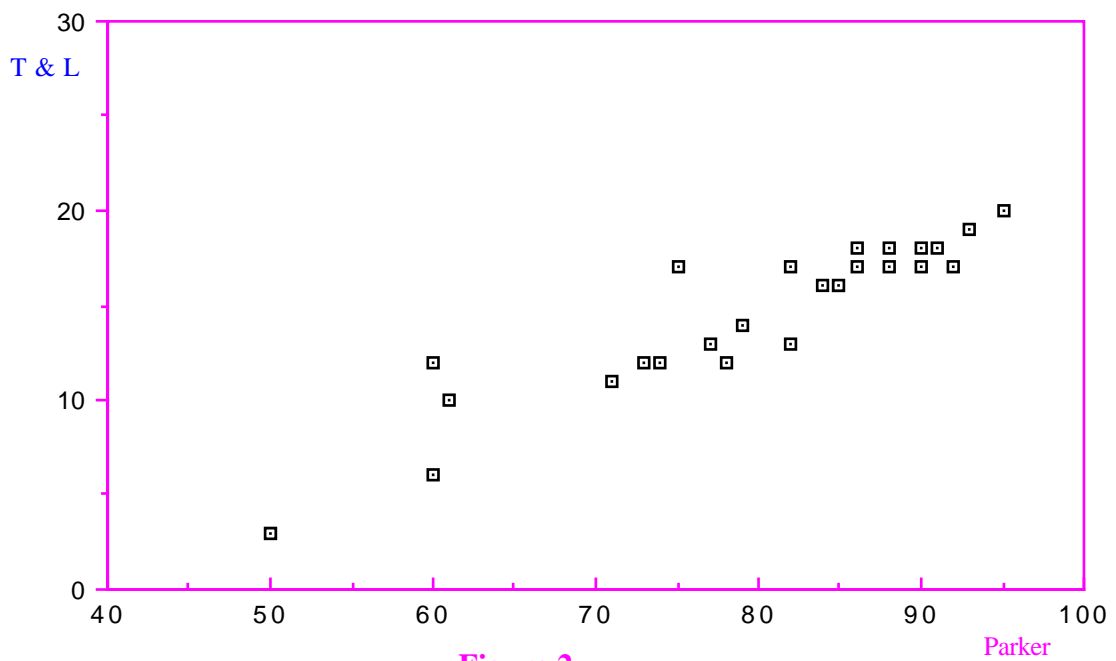
Our approach made it possible to price out vintage and château effects. The correlation between our "vintage" prices and the "grading" of vintages by wine experts is high, though we obtain a larger spread: experts seem to be reluctant to give low marks, and are quite generous in attributing high marks. With the exception of the three wines that should obviously be upgraded, our price-based ranking of châteaux is closer to the old 1855 classification than to the contemporary classifications set up by wine experts. Prices

for 1993-vintage wines are strongly correlated with the ranking obtained for older vintages.

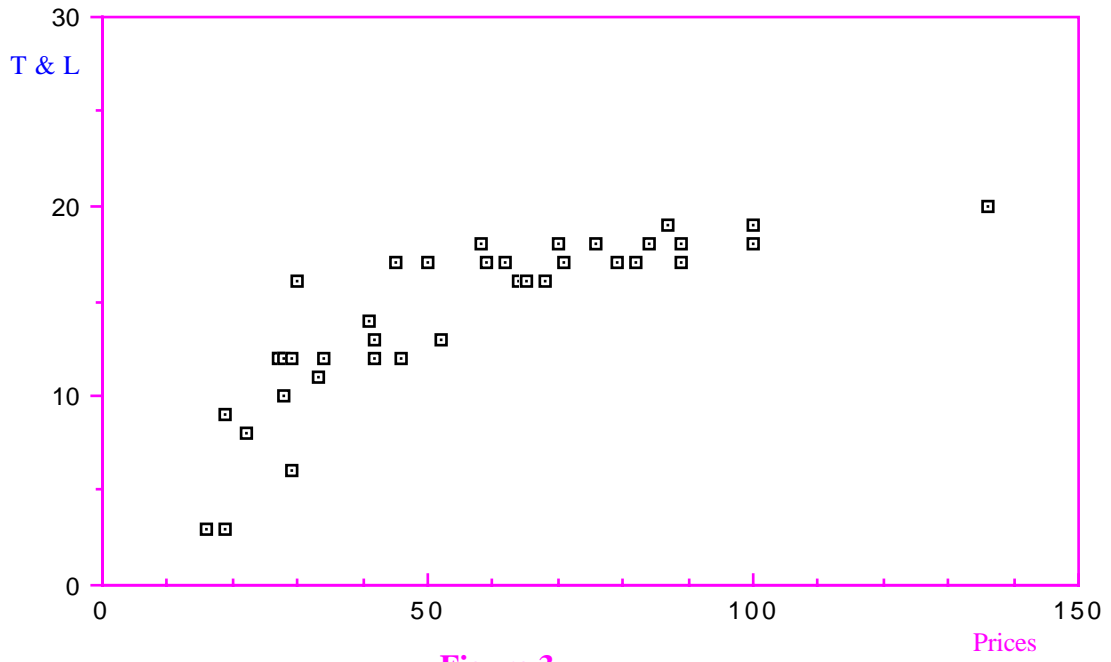
The last conclusions corroborate Ashenfelter's findings and make it clear that prices obtained at auction provide extremely good indicators of quality. This implies that when it comes to ranking vintages and châteaux, some simple econometrics will be just as good as the advice of wine experts. In his preface to Dubourdieu's (1992) very nice book on Bordeaux wines, René Pijassou, professor at the University of Bordeaux, notes that to complete his book, Dubourdieu may have tasted no less than 6,750 bottles of wine. One can quickly come to appreciate the efficiency of econometrics..., but the way of experts is certainly the more pleasant.



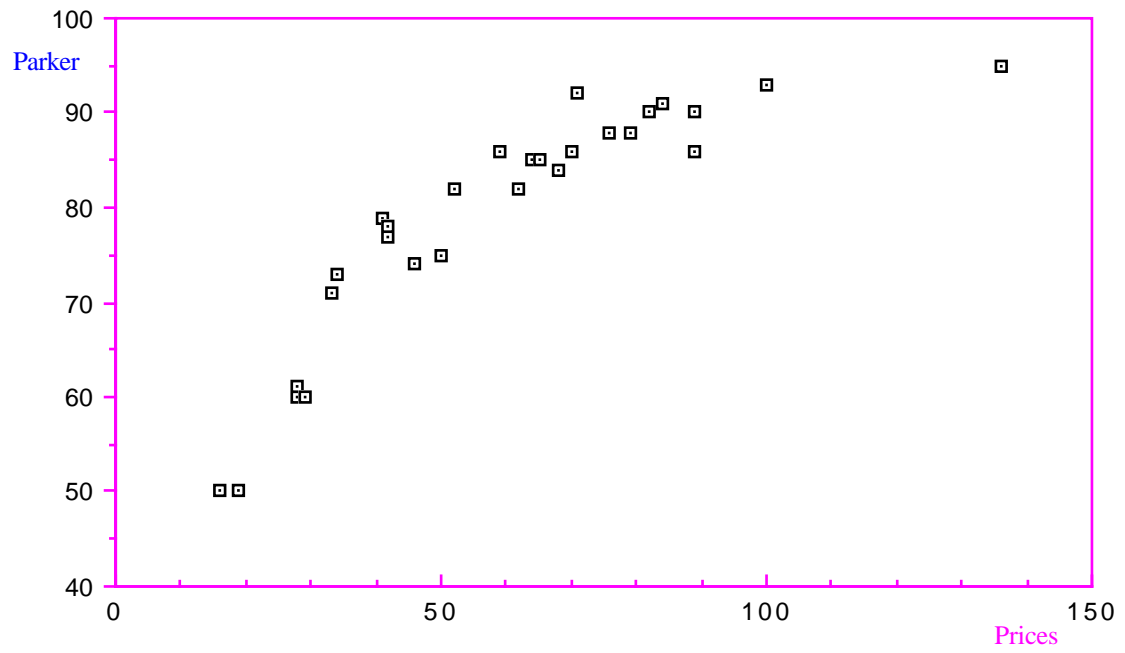
**Figure 1**  
Price index 1980-1992 (1980=100)



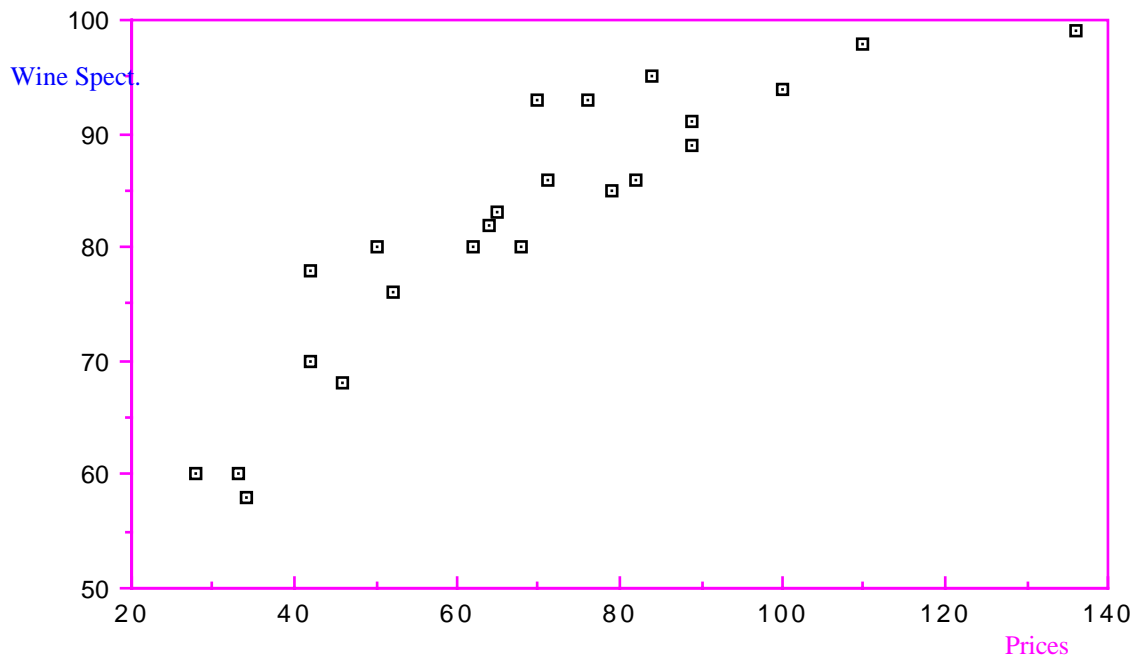
**Figure 2**  
Vintage rankings compared (T&L and Parker)



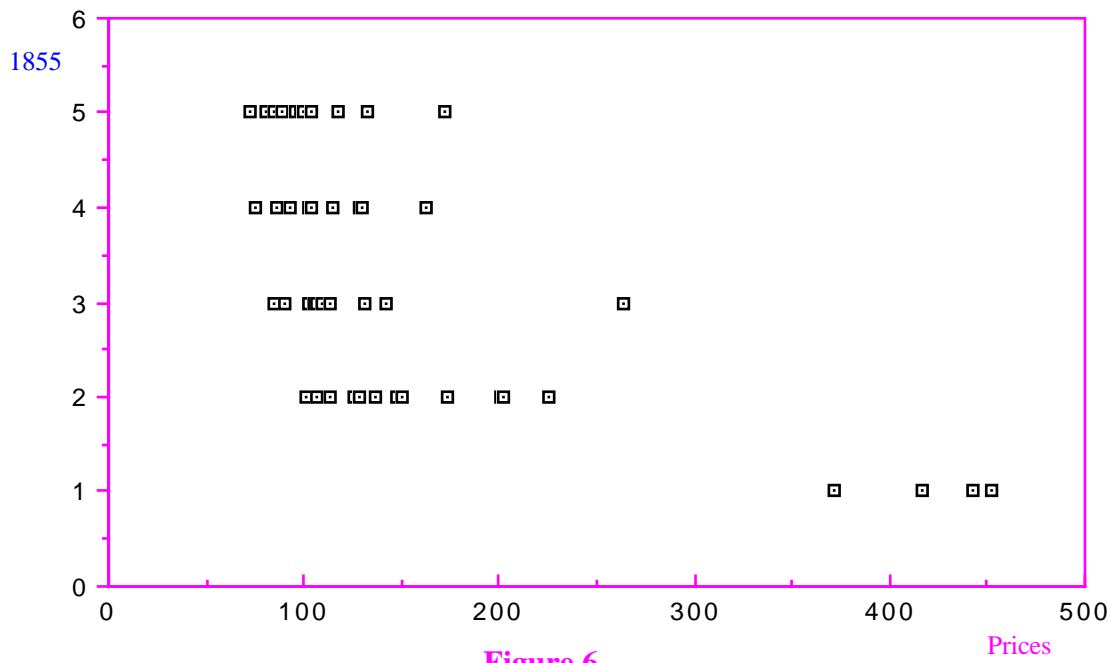
**Figure 3**  
Vintage rankings compared (T&L and Prices)



**Figure 4**  
Vintage rankings compared (Parker and Prices)



**Figure 5**  
Vintage rankings compared (Wine Sp. and Prices)



**Figure 6**  
Chateau classifications (1855 and Prices)



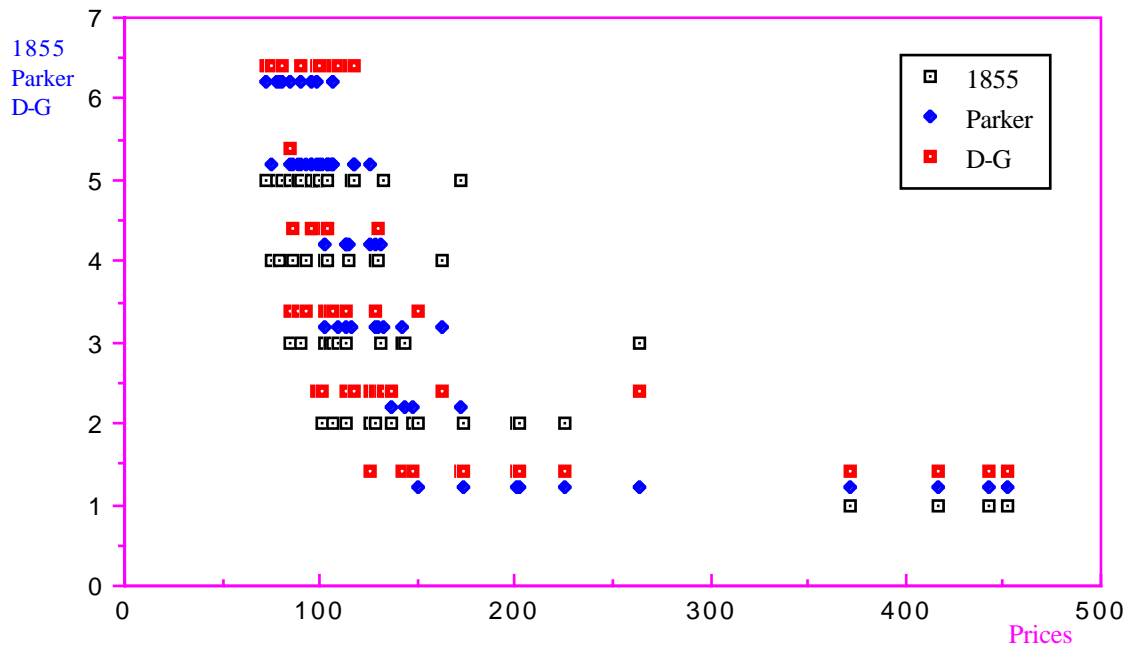


Figure 7  
Chateau classifications (1855, Parker, DG and Prices)

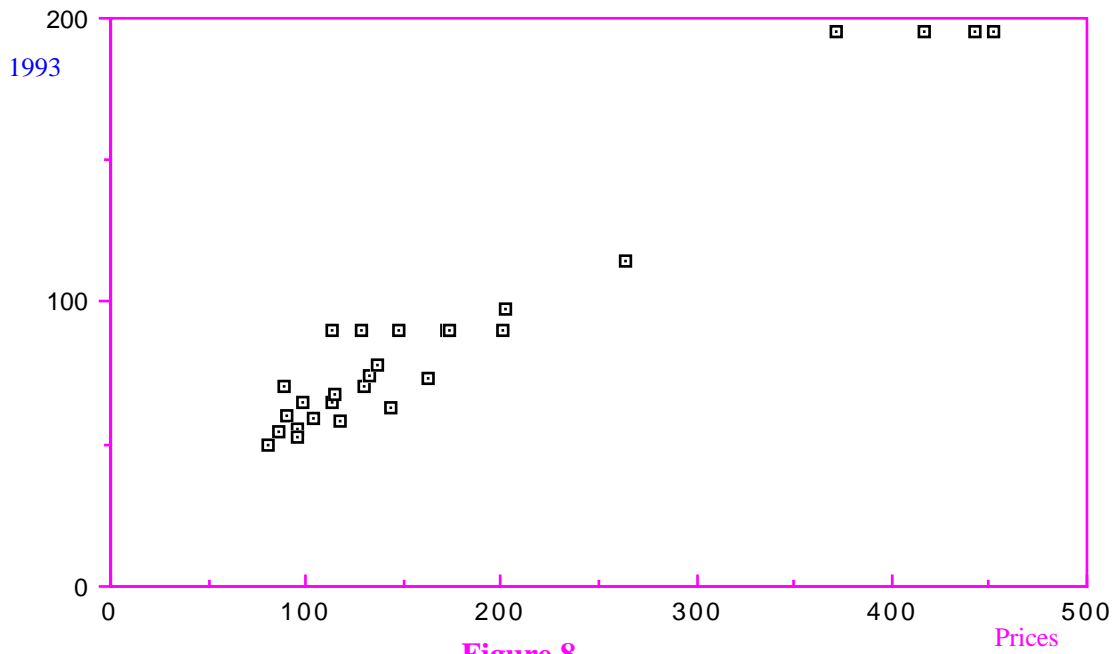


Figure 8  
Comparison of rankings (1993 and Prices)

## References

- Ashenfelter, O. (1989), How auctions work for wine and art, *The Journal of Economic Perspectives* 3, 23-36.
- Ashenfelter, O., D.Ashmore and R. Lalonde (1993), Wine vintage quality and the weather: Bordeaux, paper presented at the 2nd International Conference of the Vineyard Data Quantification Society, Verona, February, also to appear in P. Gaburro, M.C. Pichery and J. Waelbroeck, eds., \*\*\*, Paris: Economica.
- Dubourdieu, F. (1992), *Les Grands Bordeaux de 1945 à 1988*, Bordeaux: Mollat.
- Dussert-Gerber, P. (1988), *Guide des Vins de France 1989*, Paris: Albin Michel.
- Ginsburgh, V., M. Monzak and A. Monzak (1994), *Red Wines of Medoc. What is Wine Tasting Worth*, Verona: Vineyard Data Quantification Society, also to appear in P. Gaburro, M.C. Pichery and J. Waelbroeck, eds., \*\*\*, Paris: Economica.
- Jaeger, E. (1981), The save or savor: the rate of return to storing wine, *Journal of Political Economy* 89, 584-592.
- Krasker, W. (1979), The rate of return to storing wines, *Journal of Political Economy* 87, 1363-1367.
- Landon, S. and C. Smith (1994), Price, quality and reputation: evidence from the market for Bordeaux Wine, Department of Economics, University of Alberta.
- Liquid Assets*, Princeton, various issues.
- McAfee, P. and D. Vincent (1993), The declining price anomaly, *Journal of Economic Theory* 60, 191-212.
- Nerlove, M. (1992), Do more expensive wines taste better? A hedonic analysis of Swedish data, University of Pennsylvania, March.
- Parker, R.M. (1985), *Bordeaux, The Definitive Guide for the Wines Produced Since 1961*, New-York: Simon and Schuster.
- Parker, R.M. (1990), *Les Vins de Bordeaux*, Paris: Solar.
- Suckling, J. (1994), The Bordeaux 50, *Wine Spectator*, October 15.
- Weil, R. (1993), Do not invest in wine, at least in the U.S. unless you plan to drink it, and maybe not even then, paper presented at the 2nd International Conference of the Vineyard Data Quantification Society, Verona, February, also to appear in P. Gaburro, M.C. Pichery and J. Waelbroeck, eds., \*\*\*, Paris: Economica.

## **Appendix 1 List of Christie's sales**

We considered sales of claret and white Bordeaux, to the extent that the sale was advertised as "Fine Claret and White Bordeaux," "Claret and White Bordeaux," or "An important Sale of Fine Claret and White Bordeaux."

This collection of sales is by no means complete. First, there were other types of sales in which the wines described in our study were sold, though not as the main object. These include sales of "Fine Wines," "End of Season Sales," charity auctions, sales at particular châteaux, and many others. Second, we were unable to obtain a complete collection of catalogues, which means that we do not even have the full collection of sales of the types mentioned above. And third, there were six or seven sales for which the price lists were missing.

Though incomplete, our data have not been chosen in any systematic way, and therefore, we believe that there can be no systematic bias.

### **List of sales**

**1980:** January 24, February 28, April 10, July 24, October 9, October 30, November 27.

**1981:** January 29, April 30, May 28, June 25, July 23, October 1, November 5, November 26.

**1982:** January 28, March 11, April 29, May 20, July 22, September 23, October 21, November 18.

**1983:** January 13, February 10, March 10, April 14, May 12, July 14, November 17.

**1984:** April 12, June 14, July 12, October 5-6, November 1, November 29.

**1985:** January 17, March 14, June 13, July 11, September 19, October 17, November 14.

**1986:** January 16, February 13, March 13, May 8, June 5, July 17, September 18, October 16, November 27.

**1987:** January 22, February 19, April 23, May 21, June 18, July 16, September 17, October 15, November 12.

**1988:** January 28, February 25, July 14, September 15, October 13, November 9.

**1989:** January 26, February 23, March 30, April 27, May 25, June 29, July 13, September 14, October 12, November 9.

**1990:** January 25, February 22, March 22, April 19, May 17, June 14, July 12, September 27, October 25, November 22.

**1991:** January 24, February 21, March 21, May 16, May 30, June 27, November 21.

**1992:** January 23, February 20, March 26, April 30, September 24, October 22, November 19.

## Appendix 2 Results for First and Second Growth wines

**Table A1**  
**General Characteristics**  
 (First and Second Growths)

	Age		Nb of b. in lot		Original cases		Order in sale <sup>1</sup>		Nb of obs.	R <sup>2</sup>
	Coeff.	St.dev	Coeff.	St.dev.	Coeff.	St.dev.	Coeff.	St.dev.		
<b>First-Growths</b>										
<i>Margaux</i>										
Margaux	.0234	.0015	-.0011	.0003	.0478	.0102	.0002	.0034	1491	.919
<i>Pauillac</i>										
Lafite	.0245	.0035	-.0029	.0006	.0238	.0132	.0007	.0039	1644	.863
Latour	.0511	.0046	-.0006	.0002	.0063	.0088	.0006	.0025	2416	.929
Mouton-R.	.0049	.0015	-.0008	.0004	.0242	.0089	-.0081	.0029	1927	.894
<b>Second-Growths</b>										
<i>Margaux</i>										
Brane-Cantenac	.0809	.0042	-.0035	.0003	.0168	.0194	.0087	.0059	876	.775
Dufort-Vivens <sup>2</sup>									25	
Lascombes	.0732	.0084	-.0016	.0036	-.0333	.0861	-.0019	.0263	111	.846
Rausan-Ségla	.0899	.0056	-.0008	.0005	.0172	.0384	-.0150	.0094	297	.890
Rauzan-Gassies	.0810	.0026	-.0010	.0003	.0550	.0239	-.0063	.0074	280	.942
<i>Pauillac</i>										
Pichon-L.(Baron)	.0395	.0059	-.0009	.0009	.0445	.0218	.0021	.0066	428	.878
Pichon-L.(Comt.)	.0538	.0020	-.0029	.0005	.0280	.0122	-.0128	.0036	910	.883
<i>Saint-Estèphe</i>										
Cos-d'Estournel	-.0021	.0020	-.0031	.0005	.0335	.0139	-.0012	.0040	863	.903
Montrose	.0463	.0056	-.0023	.0006	.0481	.0149	-.0064	.0042	801	.891
<i>Saint-Julien</i>										
Ducru-Beauc.	.0660	.0021	-.0025	.0005	.0317	.0127	-.0073	.0038	1365	.876
Gruaud-Larose	.0485	.0056	-.0029	.0003	.0037	.0116	.0056	.0032	1323	.889
Léoville Barton	.0438	.0052	-.0036	.0005	-.0022	.0138	-.0019	.0041	742	.857
Léoville Las C.	.1180	.0032	-.0017	.0004	.0243	.0109	-.0048	.0032	1190	.898
Léoville Poyferré	.0333	.0016	-.0006	.0003	.0148	.0142	-.0035	.0041	668	.886

<sup>1</sup> Coefficients (and standard deviations) are multiplied by 100.

<sup>2</sup> There were only 25 lots sold; this is not enough to run a regression.

**Table A2**  
**Price indices 1980-1992 (1980=100)**  
 (First and Second Growths)

	1980	1981	1982	1983	1984	1985	1966	1987	1988	1989	1990	1991	1992
<b>First Growths</b>													
<i>Margaux</i>													
Margaux	100	113	134	169	205	222	193	197	177	194	216	203	193
<i>Pauillac</i>													
Lafite	100	113	138	172	205	216	182	175	164	183	204	177	171
Latour	100	106	123	148	186	193	169	166	172	175	187	175	156
Mouton	100	111	141	182	245	262	242	251	253	278	321	296	292
<b>Second Growths</b>													
<i>Margaux</i>													
Brane-Cantenac	100	103	106	133	149	149	126	122	99	103	-	92	77
Dufort-Vivens <sup>1</sup>													
Lascombes	100	121	105	127	109	128	138	109	112	79	104	114	88
Rausan-Ségla	100	104	114	121	125	112	98	111	97	87	72	69	57
Rauzan-Gassies	100	113	108	115	121	125	99	121	97	93	78	88	79
<i>Pauillac</i>													
Pichon-L. (B <sup>on</sup> )	100	111	145	172	163	182	161	153	144	149	147	146	130
Pichon-L. (C <sup>tse</sup> )	100	99	120	148	169	182	169	179	192	190	208	178	167
<i>Saint-Estèphe</i>													
Cos-d'Estournel	100	112	140	181	231	252	237	257	273	282	319	302	296
Montrose	100	109	114	143	175	183	163	163	159	155	166	143	136
<i>Saint-Julien</i>													
Ducru-Beauc.	100	101	123	152	176	170	156	154	145	150	156	143	116
Gruaud-Larose	100	118	134	147	174	170	162	166	165	168	182	187	174
Léoville-Barton	100	110	124	157	176	176	163	161	176	170	168	164	146
Léoville L. C.	100	106	118	141	149	149	124	116	105	101	-	81	69
Léoville Poyf.	100	102	119	125	160	159	143	130	138	129	138	130	125

<sup>1</sup> There were only 25 lots sold; this is not enough to run a regression.

**Table A3**  
**Good and bad vintages**  
 (Selected Growth Wines)

<b>Year</b>		All	Margaux Margaux	Lafite Pauillac	Latour Pauillac	Mouton Pauillac	Cos d'E. St Estèphe	Ducru B. St Julien	Léov.L.C St Julien
1949	G	100	100	100	100	100	100	100	100
1951	B	22	-	30	-	-	-	-	-
1953	G	84	278	115	53	221	-	-	-
1956	B	19	-	21	20	-	-	-	-
1959	G	87	110	137	109	189	124	70	40
1961	G	136	197	86	165	273	206	125	66
1963	B	19	22	19	18	94	59	-	-
1965	B	16	-	17	19	44	-	-	-
1968	B	29	-	24	26	78	-	18	44
1970	G	89	87	-	-	-	-	-	-
1972	B	28	36	26	26	29	38	28	53
1977	B	33	30	26	31	28	27	33	82
1982	G	-	-	119	157	-	-	169	431
1986	G	84	90	78	91	68	60	132	389