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# – what is the best predictor?

Department of Economics

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**Abstract:**

This paper analyses the retail prices of champagnes sold in the Scandinavian countries. Price data for the champagnes contain nearly 380 observations including a range of quality attributes of each champagne. The empirical part of the analysis reveals that the retail prices of champagne can be fairly well explained by a hedonic price function with a degree of explanation corresponding to approximately 60 per cent. However the ratings by the wine experts, in this case Robert Parker, Wine Spectator and to a lesser extent the French '1855 Notation', do just as well in terms of explaining the retail prices of champagnes. Especially the rating of champagnes by Robert Parker seems to be the most influential concerning the sales prices.

**Keywords:** Champagne, prices, hedonic price function, Scandinavia.

**JEL Codes**: Q1, D4, P46.

# 1. Introduction

This analysis deals with the retail prices of champagne sold on the Scandinavian markets. The markets for champagne in these countries are rather small, of course, although the consumption of still wines have increased relatively fast during the last decades. A large number of French champagnes are available to the Scandinavian consumers, but there seems to be less price competition in the market concerning champagne as compared to still wine. The demand for champagne is most likely less price sensitive as it is usually perceived as a luxury good which to a large extent is bought on special occasions like weddings, New Years Eve, etc. Thus, the demand must be assumed to be price inelastic but of course the prices must be assumed to reflect the underlying quality of the champagnes. However, because champagne is bought with low frequency many consumers most likely do not have or seek full information on the champagne. Some consumers rely on the reputation of particular brands, e.g. 'Les Grandes Marques', some consumers choose to gain information from sensory ratings of champagne, e.g. Robert Parker and Wine Spectator. In fact, the majority of champagne dealers use points given by Parker and Wine Spectator in their advertising information of champagne. Accordingly, the aim of this paper is to analyse the formation of champagne prices on the Scandinavian markets by applying a hedonic price function – which is also compared to the ratings of Robert Parker, Wine Spectator and the French '1855 Notation'. In order to address this question champagne prices at the retail level in the Scandinavian countries have been collected along with a whole range of 'quality attributes' for these wines. Overall, the data set includes approximately 350 observations representing the main champagne producers and covering all three Scandinavian countries reasonably well.

The analysis reveals that the prices of champagne can be fairly well explained by a hedonic price function including a set of quality attributes, but also the ratings by the wine expert tasters do correspond rather closely to the retail prices of champagnes. These findings are also in accordance with the majority of the empirical literature on hedonic price functions for still wines, see section 3. The paper is organized as follows. Section 2 gives a short description of recent developments in the consumption of sparkling wines in the Scandinavian countries. In section 3 the data are presented along a hedonic price function, and the hypotheses to be tested are also presented. Section 4 reports the empirical estimates and results from the statistical models of champagne prices, and in section 5

similar techniques are used in order to evaluate the ratings from the wine expert tasters, also in relation to prices. Finally, section 6 concludes.

**2. Trends in the Scandinavian markets for sparkling wine**

Until the late 1960s wine consumption was very modest in all of the Scandinavian countries but since then relatively strong increases in the sales of wines have occurred and thus, the present level of per capita intake of wine is more similar or closer to the consumption levels found in other European countries.

Especially for Denmark many consumers consider wine as a regular consumer good and the annual level of wine consumption among the adult population (15+ years) is close to 40 litres. The closeness of Denmark to continental Europe has probably influenced the Danish alcohol policy, e.g. with lower alcohol taxes as the country had to adjust to especially the German standards and the trade liberalization process in the EU, which all influenced positively on the increasing market and sales of wines in Denmark during the last decades.  Contrary to this, Norway has never been a member of the EU – Sweden joined the EU in 1995 – and both countries have adhered to restrictive alcohol policies and still maintain a state monopoly in the retail sales of alcohol. The levels of per capita wine consumption for the adult population is around 25 litres and 15 litres in Sweden and Norway, respectively.

Although the level of wine consumption may be relatively high, especially in Denmark, most of the sales are still wines and only a tiny fraction is champagne or sparkling wines – enjoyed at special occasions and therefore not part of the 'regular' pattern of wine consumption. In the alcohol statistics from the Scandinavian countries data for the sales or consumption of champagne is not available – and in case information can be found, champagne is often part of an aggregate denominated 'sparkling wines', i.e. sparkling wines from other countries than France are included. From the EUROSTAT trade statistics data for the export from France of 'sparkling wines' – to the Scandinavian countries – is available. Thus, more than champagne is included, but as it is the specific French export it must be expected to be primarily champagnes. Additionally, champagne might also be exported to the Scandinavian countries via other countries and in this case the data for

the French export statistics will be biased downwards – but overall, the information in the EUROSTAT trade statistics are assumed to be the best estimate of the amounts of champagnes consumed at the Scandinavian markets. Figure 1 exhibits the total quantities of French sparkling wines exported to the Scandinavian countries.

**Figure 1. Export of sparkling wines from France to Scandinavia (Monthly data, 1000 litres).**
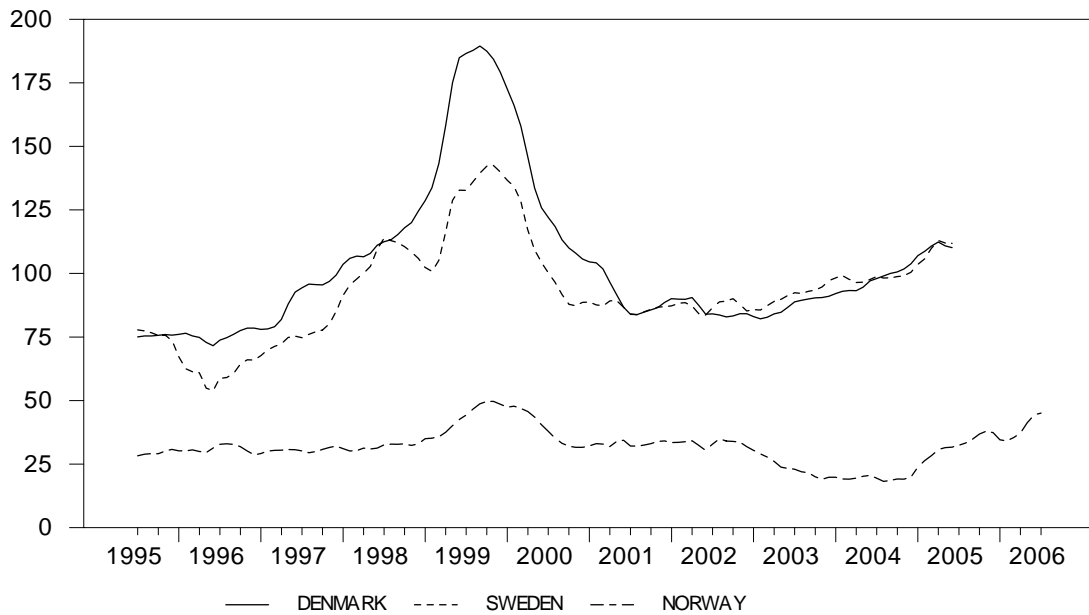


Source: EUROSTAT, External Trade (SITC 11215, 'Sparkling wines'), April 2007.

The total amount of French export of sparkling wines (both Cremant and champagne) to Scandinavia is approximately 250.000 litres per month during the last decade – with a significant 'bubble' around 1999/2000. As the total population in these countries is 18 million people the average annual consumption level is only a few glasses of champagne! EUROSTAT also provides information on export values and hence, the average, whole-sale prices of sparkling wines can be calculated, and they are exhibited in figure 2.

**Figure 2. Average prices of French sparkling wines exported to Scandinavia (€ per litre).**
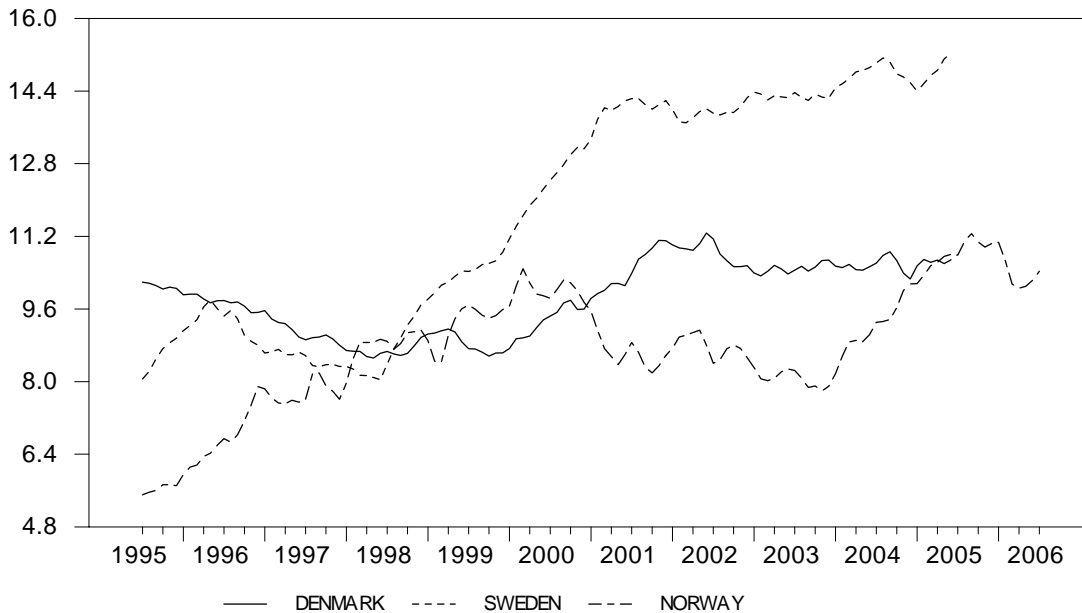


Source: EUROSTAT, External Trade (SITC 11215, 'Sparkling wines'), April 2007.

The average prices from figure 2 reveal that especially for Sweden there seems to be a trend towards consuming the more expensive champagnes – compared to Denmark and Norway – with an average price level of 15 € per litre from 2000 and onwards. The prices in figure 2 represent the values obtained by the French wine exporters and thus, the final retail prices in Scandinavia will be considerably higher due to transport costs, mark-ups in the retail distribution system and taxes. Especially for wine taxes, huge differences still exist among the Scandinavian countries, see table 1 where the present level of wine taxation is reported.

For champagnes, the general wine taxes apply, except for Denmark, where an additional tax is added to all sparkling wines. Wine taxes depend on the content of alcohol, especially in Norway, where the tax is a direct linear function of the volume of alcohol, and for a bottle of champagne (12 % alc. vol.) the tax rate varies pretty much as revealed in the last column of table 1. Although the excise on champagne is four times as high in Norway as in Denmark, these taxes only represent a relatively small fraction of the final retail prices of champagnes in Scandinavia. The whole-sale

prices from figure 2 were found to be in the range of 10-15 € per litre and hence, the excises correspond to less that half of this level.

**Table 1. Wine taxes in Scandinavia, 2006-7 (excl. VAT).**

|  | Alcohol (volume) | Tax per litre (€) | Tax per bottle (€) (0.75 litre, 12%) |
|---|---|---|---|
| Denmark: | ] 6%; 15% ] | 0.82 | |
|  | ] 15%; 22% ] | 1.23 | |
|  | If sparkling wine add: | 0.41 | 0.93 |
| Sweden: | ] 8.5%; 15% ] | 2.38 | |
|  | ] 15%; 18% ] | 4.87 | 1.78 |
| Norway: | 10% | 4.61 | |
|  | 12% | 5.54 | |
|  | 14% | 6.46 | 4.16 |

Notes: The wine tax rates are identical for 2006 and 2007 and converted from national currencies to € in the table using the official exchange rates of April 2007: 7.456 (DKK), 9.2826 (SEK) and 8.1060 (NOK). For sparkling wine there is an extra tax in Denmark, which must be added to the regular wine tax. In Norway the wine tax is 3.74 NOK per % alcohol volume per litre which is used for calculating the three cases in the table. The value added tax (VAT) is 25 per cent for all the countries and VAT is not included in the specific wine taxes exhibited.

## 3. Modeling champagne prices

According to the previous section the consumption of champagne is rather modest as compared to still wine on the Scandinavian markets. The normal procedure to model wine prices is to set up a hedonic price function assuming that consumers pay attention to all relevant product attributes in their buying decision. Noting that there may be an identification problem[1] (the prices are not necessarily equilibrium prices reflecting the embodied attributes of the good because they potentially reflect both demand and supply factors) the basic idea is that the buying price reflects all relevant characteristics included in the wine. The hedonic price function approach is commonly

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[1] ARGUEA & HSIAO (1993)

used on still wines, see e.g. SCHAMEL (2000, 2003), COMBRIS et al. (1997), LANDON and SMITH (1998), OCZKOWSKI (2001), SCHAMEL & ANDERSON (2003) and BENTZEN and SMITH (2006). Regional reputation has important influence on prices of Bordeaux wines, see LANDON & SMITH (1998). SCHAMEL (2000) also finds that the reputation of the region and the individual quality indicator of the wine (awards) are significant factors influencing the prices of Californian red wines. In a similar analysis of wines from Australia and New Zealand SCHAMEL & ANDERSON (2003) stress the importance of regional reputation and sensory quality rating of both the wine and the producers. Focusing on German wines SCHAMEL (2003) finds that sensory quality ratings, the German 'compulsory system', i.e. a precise quality category (the degree of ripeness of the grapes at harvest must be printed on the label), the sweetness of the wine and region where the wine comes from are all essential factors concerning the price. This result is confirmed by BENTZEN & SMITH (2006), who focus on the prices of German wines on the Scandinavian markets. In addition, they find that producer reputation and producer size affect prices positively, and that lower yield (hl/ha) has a significant positive influence on price. LECOCQ & VISSER (2006) use two data sets for Bordeaux wines and one for Burgundy wines to analyse the influence of objective characteristics and sensory ratings on wine prices. Characteristics of the wine appearing on the label of the bottle (ranking, vintage and 'appellation') are found to be the most important factors for prices whereas sensory variables only play a minor role.

Focusing on consumer's valuation of champagne COMBRIS ET AL. (2006) find that consumers are unable to classify low price, medium price and Grand Marques champagnes in blind test experiments. However, when revealing sensory and commercial information to the participants, brands and reputation are found to have a decisive impact on the reservation prices, though consumers' preferences are still heterogeneous, see also LANGE ET AL. (2002) for similar results.

Hence, characteristics that can be seen from inspection of the bottle, e.g. regional reputation, producer reputation, vintage, quality rankings etc. seem to be decisive in explaining wine prices in several studies, whereas the empirical evidence is mixed concerning the influence of expert ratings on consumers' reservation prices.

In line with the above-mentioned studies this paper focuses on objective characteristics and sensory ratings as potential key factors when explaining champagne prices on the Scandinavian markets.

Noting that wine taxes are different we control for country specific effects in the analysis and expect champagne to be cheapest in Denmark due to the free market sales system and lower taxes. Contrary to this, prices are most likely highest in Norway which has the highest taxes and a state monopoly sales system.[2]

Champagne prices are analysed in alternative model specifications, see equation (1)–(4). The first model is very simple using only various sensory ratings as explanatory variables. Naturally, the parameter for the ratings (β) is expected to be positive.

$$(1) \qquad \log(price) = \alpha + \beta \cdot points + \gamma \cdot DK + \delta \cdot SW + \varepsilon$$

As noted above, we use three alternative ratings, i.e. Robert Parker, Wine Spectator and the French website '1855.com'. The influence of sensory ratings on price potentially comes from different sources. In a market oriented system like the Danish both demand and supply may be affected by expert ratings, i.e. both consumers and retailers act according to their knowledge of the ratings. In the short run ratings may be reflected in supply prices in Norway and Sweden, i.e. prices are set by the state controlled firms – *Vinmonopolet* and *Systembolaget*. Of course in the longer run demand conditions also affect prices as consumers may not be willing to pay unrealistically high prices for champagnes with a low rating.

In equation (2) sensory ratings are ignored and champagne prices are instead explained by objective characteristics and tasting attributes.

(2)
$$\log(price) = \alpha + \varphi \cdot (GrandesMarques) + \lambda \cdot (V \operatorname{int} ageChamp.) + \omega \cdot (oldvintage)$$
$$+ \phi \cdot (Extrabrut) + \varphi \cdot (highacidity) + \eta \cdot (fullbodied) + \kappa \cdot (blancdeblanc) + \pi \cdot (blancdenoirs)$$
$$+ \gamma \cdot DK + \delta \cdot SW + \varepsilon$$

Champagnes from one of the 'Grandes Marques' producers, vintage champagnes, champagnes more than 10 years old and champagnes that are extra-brut or full-bodied are all expected to attract

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[2] Due to the total number of observations in the data set the regression analysis presented below has been performed on a pooled data set covering all three countries.

higher prices. Champagnes with high acidity have larger potential for storage, but may also be less attracttive for consumers who demand champagnes for immediate use. Finally, control is made for single variety champagnes, i.e. Blanc de Blanc's (Chardonnay) and for Blanc de Noirs (Pinot Noirs and Pinot Meuniers). The signs of $\pi$ and $\kappa$ are not unanimous. The alternative, blends of the varieties, includes the 'secrets' of the producers resulting in unique complex taste etc. which may attract some consumers. On the other hand, some consumers like the more powerful *mousse* or the prickling style of Blanc de Blanc. Furthermore, some consumers may prefer champagnes with aromas of fruit, dry berries, honey and the more moderate *mousse* which often characterizes Blanc de Noirs.

Finally, we test a combined model using *both* expert ratings *and* objective characteristics in the price equation. Of course, the expert ratings reflect the characteristics of the champagnes, i.e. there will be a problem of multicollinarity when including both the rating and the characteristics of the champagnes. Therefore, the first step is to specify an equation where the ratings are regressed on the characteristics and by a stepwise elimination technique clarify which characteristics are important for the ratings (model 3). The remaining variables from model 3 are then highly correlated with the ratings – and thus not to be included in the final price equation, as the ratings already encapsulate these characteristics. Finally, model (4) represents a price equation where the sensory rating is included together with a vector $Z$ of explanatory factors that were excluded from model 3 .

(3)
$$\log(Po \operatorname{int} s) = \alpha + \varphi \cdot (GrandesMarques) + \lambda \cdot (V \operatorname{int} ageChamp.) + \omega \cdot (oldvintage)$$
$$+ \phi \cdot (Extrabrut) + \varphi \cdot (highacidity) + \eta \cdot (fullbodied) + \kappa \cdot (blancdeblanc) + \pi \cdot (blancdenoirs)$$
$$+ \varepsilon$$

(4)
$$\log(price) = \alpha + \beta \cdot (po \operatorname{int} s) + v \cdot Z + \gamma \cdot DK + \delta \cdot SW + \varepsilon$$

Model (3) and model (4) are estimated using the ratings from both Robert Parker and Wine Spectator, and the specification of $Z$ differs depending on which rating is included in the two-step estimation procedure.

**4. Data and empirical results**

The main data sources are *Vinmonopolet* (Norway), *Systembolaget* (Sweden) and for Denmark the data are obtained from a whole range of wine merchants, supermarkets etc., as the latter is a free market in contrast to the state regulations of the retail sales of wine and spirits in Norway and Sweden. Table 2 gives summary statistics for the data used in the analysis below. In total, the data set includes 376 champagnes of which some of course are identical, i.e. sold on both the Danish, the Swedish and the Norwegian markets. About 21 per cent of the observations relate to the Danish market, 28 per ent to the Swedish market and the reamining 50 per cent are champagnes sold from the Norwegian sale outlets (Vinmonopolet). Thus, Norway is overrepresented in the data set, but the final data set includes all the main champagne producers and it covers reasonably well all the Scandinavian countries.

*Table 2. Summary statistics of variables used in the analysis.*

| Variable | Number of obs. | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|
| Market price (euro) | 376 | 54.6180881 | 43.3674344 | 19.7989941 | 303.1329922 |
| Points, Wine Spectator | 184 | 89.4130435 | 3.6817440 | 73.0000000 | 98.0000000 |
| Points, Robert Parker | 55 | 91.3818182 | 2.4682496 | 88.0000000 | 98.0000000 |
| Points, 1855.com | 128 | 3.9843750 | 0.6871644 | 3.0000000 | 5.0000000 |
| Grandes Marques | 376 | 0.4521277 | 0.4983661 | 0 | 1.0000000 |
| Dummy for vintage champagne | 376 | 0.3989362 | 0.4903321 | 0 | 1.0000000 |
| Dummy for age gt. 10 years | 376 | 0.0930851 | 0.2909388 | 0 | 1.0000000 |
| Dummy for extra brut | 344 | 0.1773256 | 0.3825004 | 0 | 1.0000000 |
| Dummy for full-bodied | 376 | 0.4654255 | 0.4994678 | 0 | 1.0000000 |
| Dummy for high acidity | 376 | 0.0531915 | 0.2247142 | 0 | 1.0000000 |
| Dummy for Blanc de Blanc | 376 | 0.1595745 | 0.3666989 | 0 | 1.0000000 |
| Dummy for Blanc de Noirs | 376 | 0.0585106 | 0.2350192 | 0 | 1.0000000 |
| Dummy for the Swedish market | 376 | 0.2819149 | 0.4505316 | 0 | 1.0000000 |
| Dummy for the Danish market | 376 | 0.2101064 | 0.4079268 | 0 | 1.0000000 |

Furthermore, quality assessments of professional wine experts are included in the data, i.e. ratings from Robert Parker, Wine Spectator and the French '1855 Notation' (www.1855.com). Not all champagnes sold in Scandinavia have been rated by the three wine experts, who obviously only deal mostly with the high-end price segment of the market, as can be seen from the points. Accordingly, the mean value of the points given by Robert Parker, on his scale from 50-100, is 91.4, which corresponds to being outstanding for the particular type of champagne (or wine). The average is a little bit lower for the champagnes rated by Wine Spectator - 89.4. However, this is mainly due to a few cheaper champagnes which were rated relatively low. Finally, 1855.com ends up with an average close to 4 points on its 0-5 points scale. Another indicator of the data set

representing the higher segment of the champagnes is the mean of the variable 'Grandes Margues', which is a 0-1 dummy variable, where close to half of the champagnes are Grand Margues.[3] Forty per cent of the champagnes included are vintage champagnes and nearly 10 per cent are more than 10 years old.

As mentioned earlier, the consumption of champagne is rather modest, i.e. a few glasses per adult yearly, and consequently it seems reasonable to assume that the knowledge on champagnes among most consumers is modest - as compared to still wines. Most likely many consumers' choice of a particular bottle of champagne is based on information that is announced by the retailer and the most obvious information to look for is the expert ratings of the champagnes. On the other hand, some consumers have full information, and therefore various model specifications are tested. Firstly, we look at a simple model, where the consumer only has to look at sensory ratings of the champagnes, with results reported in subsection 4.1. In the next subsection 4.2 a hedonic price model is constructed assuming that the consumers try to obtain relevant information, e.g. from the information given on the labels – but including the expert ratings. Finally, a combined model is presented in subsection 4.3 following the estimation procedure explained in section 3.

**4.1 Explaining champagne prices by using expert ratings**

The first model to be tested is quite simple, cf model (1) from section 3, and with results reported in table 3. Except for controlling for country specific effects on prices – due to tax differences and the different market forms in Denmark, Norway and Sweden – the only explanatory variable is the points given in the expert ratings of the champagnes from Robert Parker, Wine Spectator and 1855.com.

The table clearly suggests that the ratings by the experts are significant, explanatory factors concerning the prices. One extra point in the Wine Spectator rating is associated with a 12% increase in the price, 20% for Robert Parker and only 18% for 1855.com – but note that the latter uses a 1-5 points scale. Looking at the $R^{2'}$s rating by Robert Parker clearly explains prices better than the other experts. In fact 1855.com explains only 13% of the total variation in prices. A possible explanation for the superior performance of Parker's rating is that the retailers include the

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[3] The list of producers is given in Annex 1

valuation by Parker in their price setting, explaining the high correlation, but the ratings come from blind tastings and thus, the points are given exogenously in relation to the prices.

*Table 3. Regression analyses of the champagne prices (log values).*

| Variable / Tasting expert | Wine Spectator | Robert Parker | 1855.com |
|---|---|---|---|
| Constant | -7.7525 (0.9854) | -14.597 (2,3166) | 3.0693 (0.1991) |
| Points | 0.1299* (0.0109) | 0.2049* (0.0255) | 0.1806* (0.0490) |
| Dummy for Sweden | -0.0431 (0.0757) | -0.2318 (0.1452) | -0.1687** (0.0821) |
| Dummy for Denmark | 0.0697 (0.0726) | -0.0002 (0.1500) | 0.0376 (0.0797) |
| Adj. $R^2$ | 0.44 | 0.57 | 0.13 |
| Number of observations | 179 | 55 | 128 |

*Notes:* Values in brackets are standard errors of the estimated parameters, * indicates significance at the 1% level, ** at the 5% level of significance. In case of Wine Spectator the sample has been limited to champagnes ranging between 80 and 100 points in order to increase comparability with Robert Parker and 1855.com, i.e. non of the champagnes in e.g. Parkers rating obtain less than 80 points. Consequently, four champagnes that obtained only 73 points are excluded. If these observations were included, the $R^2$ in the Wine Spectator equation would be reduced by 10 percentage points!

Looking at the country specific effects on prices the estimated parameters are not statistically significant in general, except for the negative parameter for Sweden in the 1855.com equation. Note however, that the dummy variable is always negative for Sweden, and there is a slight tendency that the dummy variable for Denmark is positive, which is a bit surprising as seen both from a tax point of view and from the fact that the competition on the wine market in Denmark presumably was expected to be more intense compared to Norway and Sweden. On the other hand – if demand for champagne is inelastic as noted above – pricing on market conditions will lead to higher prices in Denmark compared to prices set administratively by state controlled retail outlets (Norway, Sweden).

## 4.2 Explaining champagne prices by objective quality attributes

As an alternative to using expert ratings, prices may also be explained by quality attributes and other objective information available to the consumers and the retailers, e.g. information given via the labels. In table 4 we present the results of a series of experiments with hedonic price functions. A preliminary model including all variables is estimated and we use a backward elimination

estimation method to reduce this model in the sense that variables with insignificant parameter estimates (five per cent level of significance) are deleted from the model. The results are reported in table 4.

*Table 4. Hedonic regression analysis of champagne prices, using a backward elimination estimation method.*

| Variable | Full model | Final model | Marginal contribution to overall fit ( Type III SS )[1] |
|---|---|---|---|
| Constant | 3.3971 (0.0481) | 3.3858 (0.0360) | |
| Grandes Marques | 0.4373* (0.0427) | 0.4280* (0.0422) | 14.96 |
| Vintage champagne | 0.4137* (0.0463) | 0.4056* (0.0459) | 10.74 |
| More than 10 years old | 0.5566* (0.0743) | 0.5681* (0.0743) | 7.41 |
| Brut or extra brut | 0.0830 (0.0533) | - | |
| Full-bodied | 0.0692** (0.0451) | 0.1002** (0.0412) | 0.97 |
| Acidity - high | -0.2135** (0.0876) | -0.1964** (0.0865) | 0.53 |
| Blanc de Blanc | -0.1530* (0.0581) | -0.1443** (0.0567) | 0.66 |
| Blanc de Noirs | 0.0420 (0.0882) | - | |
| Dummy for Sweden | -0.0527 (0.0534) | - | |
| Dummy for Denmark | 0.0920 (0.0528) | 0.1068** (0.0482) | 1.02 |
| Adj. $R^2$ | 0.57 | 0.57 | |
| Number of observations | 344 | 344 | |

*Notes:* Values in brackets are standard errors of the estimated parameters, * indicates significance at the 1% level, ** at the 5% level of significance. In each step, explanatory variables which are not significant at the 5% level of significance are removed. The order of exclusion is by level of significance.
1) Type III SS (Sum of Squares) represents the marginal contribution to the sum of squares explained by the model, when the particular variable is included as the last variable in the model. The variation in log(prices) explained by the model is 60.0 out of a total variation on 107.4.

Obviously, two explanatory variables are especially important, namely the dummy variable identifying whether the champagne comes from a 'Grandes Marques' producer and the dummy variable representing vintage champagnes. Both are highly significant and of a considerable size

and also have a significant marginal contribution to the overall fit of the model, i.e. the type III sum of squares (cf. the note to the table). Moreover, the estimated parameters suggest that, compared to the control group, a vintage champagne would be 43 per cent more expensive and according to the model, the price should also be 40 per cent higher if the particular champagne producer is included in the list of Grandes Marques.

Next, if the particular vintage is more than 10 years old there also seems to be a significant higher price, and the marginal contribution from this variable to the total variation in the price is notable. As expected, champagnes which are characterised as full-bodied, are sold at higher prices (10%) and champagnes with high acidity - which normally results in a less soft style and more sharp taste when the champagne is young - cost less, suggesting that the consumers prefer champagnes that are ready to drink. Hence, it must be assumed that most consumers are not buying champagnes in order to store for later use.

Control is also made for single variety champagnes, i.e. Blanc de Blanc and Blanc de Noirs (Pinot Noir and Pinot Meunier). The latter often gives champagnes a more complex taste, with fruit and aromas, but there is no significant price effect. Blanc de Blanc, which is made purely from Chardonnay, is typically giving more light and fresh wines with tastes of flowers and citrus, and with a more aggressive *mousse*.  On the Scandinavian market the Blanc de Blanc's are significantly cheaper than the blends, which might be explained by the fact that the latter are often more complex in their structure.[4]

The model also includes dummy variables in order to reflect country-specific differences, where there seems to be no price differences between Norway and Sweden, but the dummy variable for the Danish market, which is the most liberal and competitive in Scandinavia, is positive, suggesting that prices on average are higher than in the neighbouring countries. This gives support to the hypothesis that the combination of inelastic demand and less competition on this segment of the wine market may result in higher prices as compared to state regulated supply where prices are set by administrative rules.

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[4] Champagnes made from chardonnay typically develop more slowly than Pinot based champagnes and therefore they are more suitable for making vintage champagnes. However, this influence is captured by the vintage dummy in the regression analysis.

Finally, it must be noted that the overall degree of explanation is 57 per cent, which is quite satisfactory for a model based on cross sections data. The simple models reported in table 3 do just as well, and the ratings by Robert Parker result in an overall performance of the same magnitude, which is a little bit surprising – unless the prices are influenced by the retailers knowledge about the expert ratings.

**5 Combining expert ratings and quality attributes**

The analysis above represents distinct alternative models to explain champagne prices. Prices are modelled as either a function of sensory ratings or assumed to be dependent on selected quality attributes. However, in the real world both sets of factors will most likely affect the price of a particular champagne. In case of a free market (Denmark) the retailer will surely look at - and most likely reveal - the points given by the experts, but also include the objective attributes of the champagne when setting the supply price. Similarly, on state regulated markets like Norway and Sweden, the sales price may also be influenced by known sensory ratings like Parker and Wine Spectator as well as including the objective attributes. However, when explaining prices in a combined model it is important to recognize that the ratings given by the experts depend on the quality attributes, meaning that potential multicollinearity problems are prevalent in the estimations. In order to reduce the multicollinearity problem we follow the procedure explained in relation to model (3) and model (4) from section 3, and the results are reported in table 5.

The first column concentrates on the ratings by Robert Parker, whose ratings – based on blind tastings – seem to capture the influence from a Grandes Marques producer, the vintage and the acidity. The remaining quality attributes were deleted from the model as they were found to be insignificant. In addition, the champagne is rewarded with more points from Robert Parker if it is a vintage champagne and if the acidity of the champagne is below medium. These three factors explain half of the variation in the Parker points. Focussing on the ratings according to Wine Spectator[5] - column 3 - an almost similar influence is seen from Grandes Marques and from 'vintage'. Additionally, older champagnes and champagnes which are full-bodied in style also help to obtain the Wine Spectator points.

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[5] In line with the estimations in table 3 only champagnes with at least 80 points are included in the analysis. This means that 4 champagnes with 73 points according to the WineSpectator rating were removed from the sample. However the restriction of 80 points increases the comparability with the ratings of Robert Parker, see Figure A1 and A2

*Table 5. Regression analysis of sensory ratings and quality attributes.*

| Variable | Points according to Robert Parker | Reduced price model including Robert Parker points | Points according to Wine Spectator | Reduced price model including Wine Spectator points |
|---|---|---|---|---|
| Constant | 89.9327 (0.4361) | -12.41903 2.07616 | 87.4085 (0.3242) | -7.9579 0.9875 |
| Points | | 0.1786* (0.0228) | | 0.1325* (0.0110) |
| Grandes Marques | 1.3222** (0.5652) | | 1.4446* (0.3446) | |
| Vintage champagne | 2.9288* (0.5719) | | 2.1721* 0.4097 | |
| More than 10 years old | | 0.9339** (0.2181) | 1.7478* (0.5982) | |
| Brut or extra brut | | | | |
| Full-bodied | | 0.2530** (0.1114) | 1.1602* (0.3408) | |
| Acidity  - high | -1.6478** (0.6867) | | | |
| Blanc de Blanc | | | | -0.1676*** (0.0981) |
| Blanc de Noirs | | | | |
| Dummy for Sweden | | -0.1727 (0.1287) | | -0.0619 (0.0761) |
| Dummy for Denmark | | 0.0173 (0.1312) | | 0.0703 (0.0722) |
| Adj. $R^2$ | 0.49 | 0.68 | 0.41 | 0.44 |
| Number of observations | 54 | 54 | 169 | 179 |

*Notes:* Values in brackets are standard errors of the estimated parameters, * indicates significance at the 1% , ** at the 5% and *** at the 10% level  of significance. A stepwise backward elimination estimation method has been used in the equations.
Estimation of the (hedonic) price model from table 4 on the same data as used in column 2 and column 4 (table 5) results in $R^2$ values of 0.56 (54 observations with ratings by Parker) and 0.51 (173 observations with ratings by Wine Spectator).

Column 2 and column 4 present the results from the estimation of the reduced price models. The points given by the experts are included in the model along the variables that did not significantly influence or explain the expert ratings. The resulting model where the Parker points appear includes the variables representing old and full-bodied champagnes. In the Wine Spectator model no other variable than the points were significant at the 5 per cent level of significance. If the latter is increased to a 10 per cent level of significance the Blanc de Blanc dummy is included in the model with a negative influence on price, which also is in accordance with the results from table 4.

Overall, the reduced price equations come up with the expected signs of the parameter estimates of the variables. Furthermore, the adjusted $R^2$–values are 10 percentage points higher in the equation where the Parker points are included compared to the model in table 4, and thus close to 70 per cent. Contrary to this, the reduced Wine Spectator equation explains only 44 per cent, which is 13 percentage points less than the degree of explanation in the hedonic model from table 3. Consequently, prices seem to be more in accordance with the ratings by Robert Parker than by Wine Spectator.

The buying advice to the less experienced consumer is therefore to note the Parker points, check-out whether it is an old champagne and ask the retailer (the expert) whether the champagne can be characterized as full-bodied. This information is highly associated with the prices of champagnes and ought to be included in the decision to buy a specific bottle of champagne – assuming the consumer's taste is in accordance with Mr. Parker's taste and ratings.

## 6. Concluding remarks

The consumption of sparkling wine in the Scandinavian countries is quite modest compared to the consumption levels of still wines. In fact, the Scandinavians only drink a few glasses of French sparkling wine per year, suggesting that the average consumption of champagne is no more than a single glass per capita. champagne is mostly consumed on special occasions like New Years Evening, at receptions, or at special events within the family, like weddings, celebration of exams etc., and thus the elasticity of demand is most likely relatively low. Due to the low level of consumption, supply conditions most likely become less competitive suggesting that the prices of champagnes reflect cost factors, i.e. the specific quality attributes, tax differences etc.

The empirical analysis presented suggests that the prices of champagnes are closely related to the ratings given by wine experts like Robert Parker and Wine Spectator. In the most simple model the analysis shows that nearly 60 per cent of the variation of the champagne prices can be explained by the ratings made by Robert Parker - and Wine Spectator explains about 45 per cent. Therefore, assuming the professional tasters can assess quality, the price structure of champagnes in

Scandinavia seems to be roughly correct and the easiest way for consumers to secure that a bottle of champagne is sold at the correct price/quality relationship is to be aware of the expert ratings, which are quite often announced by the retailers.

As an alternative to the expert ratings a hedonic price function for champagne is estimated. This includes attributes like the vintage, the age, whether it is full-bodied, a single variety champagne, the content of acid, the dryness and finally if it originates from a Grandes Marque producer. This works very well and in nearly all cases the different explanatory variables are found to be statistically significant with the correct or expected signs of the parameter estimates. This kind of econometric model is able to catch the price structure of champagnes with nearly a 60 per cent degree of explanatory power – in fact like the wine experts. Therefore, from the objective attributes, i.e. the label quality, vintage, the age of the champagne, the grape used, and the acidity of the champagnes it is possible to predict the prices of these just as well as the best of the different rating systems published by the professional wine tasters.

The final section of the paper combines the hedonic modelling approach and the simple sensory rating price model. It is demonstrated that a model where the Robert Parker rating and dummy variables for the age of the champagne and whether it is full-bodied explains close to 70 percent of the variation in the price. Moreover, when including expert ratings in the model the overall variation in prices is explained relatively better than in a hedonic model.

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Annex 1. *Grandes Marques*

Grande Marque, i.e. "great brand", refers to twenty-four top champagne houses, which have been selected by the organization 'Syndicat des Grandes Marques'. The list which comprises most of the better-known firms includes:

"*Ayala, Billecart-Salmon, J. Bollinger, Canard-Duchêne, Deutz, Charles Heidsieck, Heidsieck Monopole, Henriot, Krug, Lanson, Laurent Perrier, Mercier, Moët & Chandon, Mumm, Perrier-Jouët, Joseph Perrier, Piper Heidseck, Pol Roger, Pommery and Greno, Louis Roederer, Ruinart, Salon, Taittinger and Veuve Clicquot-Ponsardin*".

Annex 2. *Pearson correlation coefficients between the variables used in the analysis.*

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

| | Price(euro) | Points WS | Points Parker | Points1855 | Grandemarque | Vintage ch. | Old champagne |
|---|---|---|---|---|---|---|---|
| Price(euro) | 1.00000 | 0.53042 | 0.66769 | 0.28771 | 0.42410 | 0.42675 | 0.47534 |
| Price(euro) | | <.0001 | <.0001 | 0.0010 | <.0001 | <.0001 | <.0001 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| | | | | | | | |
| PointsWS | 0.53042 | 1.00000 | 0.65421 | 0.23743 | 0.11943 | 0.46472 | 0.33203 |
| PointsWS | <.0001 | | <.0001 | 0.0234 | 0.1063 | <.0001 | <.0001 |
| | 184 | 184 | 46 | 91 | 184 | 184 | 184 |
| | | | | | | | |
| PointsParker | 0.66769 | 0.65421 | 1.00000 | 0.17695 | 0.36356 | 0.63658 | 0.29981 |
| PointsParker | <.0001 | <.0001 | | 0.3246 | 0.0064 | <.0001 | 0.0262 |
| | 55 | 46 | 55 | 33 | 55 | 55 | 55 |
| | | | | | | | |
| Points1855 | 0.28771 | 0.23743 | 0.17695 | 1.00000 | 0.24159 | 0.01345 | 0.13530 |
| Points1855 | 0.0010 | 0.0234 | 0.3246 | | 0.0060 | 0.8802 | 0.1278 |
| | 128 | 91 | 33 | 128 | 128 | 128 | 128 |
| | | | | | | | |
| Grandemarque | 0.42410 | 0.11943 | 0.36356 | 0.24159 | 1.00000 | 0.15475 | 0.11358 |
| Grandemarque | <.0001 | 0.1063 | 0.0064 | 0.0060 | | 0.0026 | 0.0277 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| | | | | | | | |
| Vintage ch. | 0.42675 | 0.46472 | 0.63658 | 0.01345 | 0.15475 | 1.00000 | 0.39325 |
| | <.0001 | <.0001 | <.0001 | 0.8802 | 0.0026 | | <.0001 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| | | | | | | | |
| Old champagne | 0.47534 | 0.33203 | 0.29981 | 0.13530 | 0.11358 | 0.39325 | 1.00000 |
| | <.0001 | <.0001 | 0.0262 | 0.1278 | 0.0277 | <.0001 | |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| | | | | | | | |
| Extra brut | 0.01396 | 0.10418 | -0.29614 | 0.03163 | -0.10452 | 0.05054 | 0.06094 |
| | 0.7963 | 0.1726 | 0.0297 | 0.7262 | 0.0528 | 0.3500 | 0.2597 |
| | 344 | 173 | 54 | 125 | 344 | 344 | 344 |
| | | | | | | | |
| Full-bodied | 0.03306 | 0.27436 | -0.06976 | 0.07765 | -0.08701 | 0.15447 | -0.02367 |
| | 0.5227 | 0.0002 | 0.6128 | 0.3836 | 0.0920 | 0.0027 | 0.6473 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| | | | | | | | |
| High acidity | -0.03077 | 0.06821 | -0.22982 | 0.20717 | 0.07042 | 0.04892 | 0.00564 |
| | 0.5519 | 0.3576 | 0.0914 | 0.0190 | 0.1730 | 0.3442 | 0.9132 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| | | | | | | | |
| Blanc de blanc | -0.09828 | 0.13667 | -0.05962 | 0.04207 | -0.19156 | 0.13443 | 0.06036 |
| | 0.0569 | 0.0643 | 0.6655 | 0.6373 | 0.0002 | 0.0091 | 0.2430 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |

*Table A2 cont.*

| | Extra brut | Full-bodied | High acidity | Blanc de blanc | Bl. De noirs | Sweden | Denmark |
|---|---|---|---|---|---|---|---|
| Price (euro) | 0.01396 | 0.03306 | -0.03077 | -0.09828 | -0.09743 | -0.02595 | 0.16126 |
| Price (euro) | 0.7963 | 0.5227 | 0.5519 | 0.0569 | 0.0591 | 0.6159 | 0.0017 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| | | | | | | | |
| pointsWS | 0.10418 | 0.27436 | 0.06821 | 0.13667 | -0.06669 | -0.01795 | -0.02006 |
| pointsWS | 0.1726 | 0.0002 | 0.3576 | 0.0643 | 0.3684 | 0.8089 | 0.7870 |
| | 173 | 184 | 184 | 184 | 184 | 184 | 184 |
| | | | | | | | |
| pointsParker | -0.29614 | -0.06976 | -0.22982 | -0.05962 | -0.07004 | -0.06726 | 0.26011 |
| pointsParker | 0.0297 | 0.6128 | 0.0914 | 0.6655 | 0.6114 | 0.6256 | 0.0551 |
| | 54 | 55 | 55 | 55 | 55 | 55 | 55 |
| | | | | | | | |
| points1855 | 0.03163 | 0.07765 | 0.20717 | 0.04207 | -0.05431 | -0.09226 | 0.15390 |
| points1855 | 0.7262 | 0.3836 | 0.0190 | 0.6373 | 0.5426 | 0.3003 | 0.0828 |
| | 125 | 128 | 128 | 128 | 128 | 128 | 128 |
| | | | | | | | |
| grandemarque | -0.10452 | -0.08701 | 0.07042 | -0.19156 | -0.15816 | 0.02464 | 0.18734 |
| grandemarque | 0.0528 | 0.0920 | 0.1730 | 0.0002 | 0.0021 | 0.6339 | 0.0003 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| | | | | | | | |
| Vintage ch. | 0.05054 | 0.15447 | 0.04892 | 0.13443 | -0.15681 | 0.02068 | 0.03312 |
| | 0.3500 | 0.0027 | 0.3442 | 0.0091 | 0.0023 | 0.6894 | 0.5220 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| | | | | | | | |
| Old champagne | 0.06094 | -0.02367 | 0.00564 | 0.06036 | -0.07987 | -0.01764 | -0.00795 |
| | 0.2597 | 0.6473 | 0.9132 | 0.2430 | 0.1221 | 0.7332 | 0.8779 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| | | | | | | | |
| sweet_d | 1.00000 | 0.19137 | 0.12097 | 0.10897 | 0.07980 | -0.16265 | -0.06378 |
| | | 0.0004 | 0.0248 | 0.0434 | 0.1397 | 0.0025 | 0.2380 |
| | | 344 | 344 | 344 | 344 | 344 | 344 |
| | | | | | | | |
| Full-bodied | 0.19137 | 1.00000 | 0.11147 | 0.20492 | 0.10815 | -0.39504 | -0.04932 |
| | 0.0004 | | 0.0307 | <.0001 | 0.0361 | <.0001 | 0.3402 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| | | | | | | | |
| High acidity | 0.12097 | 0.11147 | 1.00000 | 0.02616 | -0.00859 | -0.06949 | -0.03497 |
| | 0.0248 | 0.0307 | | 0.6130 | 0.8681 | 0.1787 | 0.4990 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| | | | | | | | |
| Blanc de blanc | 0.10897 | 0.20492 | 0.02616 | 1.00000 | -0.10863 | -0.22460 | 0.02484 |
| | 0.0434 | <.0001 | 0.6130 | | 0.0352 | <.0001 | 0.6311 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |

*Table A2 cont.*

| | Price (euro) | pointsWS | pointsParker | points1855 | grandemarque | Vintage | Old ch. |
|---|---|---|---|---|---|---|---|
| Blanc de noirs | -0.09743 | -0.06669 | -0.07004 | -0.05431 | -0.15816 | -0.15681 | -0.07987 |
| | 0.0591 | 0.3684 | 0.6114 | 0.5426 | 0.0021 | 0.0023 | 0.1221 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| Sweden | -0.02595 | -0.01795 | -0.06726 | -0.09226 | 0.02464 | 0.02068 | -0.01764 |
| | 0.6159 | 0.8089 | 0.6256 | 0.3003 | 0.6339 | 0.6894 | 0.7332 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |
| Denmark | 0.16126 | -0.02006 | 0.26011 | 0.15390 | 0.18734 | 0.03312 | -0.00795 |
| | 0.0017 | 0.7870 | 0.0551 | 0.0828 | 0.0003 | 0.5220 | 0.8779 |
| | 376 | 184 | 55 | 128 | 376 | 376 | 376 |

| | chardonnay_ | | | | | | |
| | Extra brut | Full bodied | High acidity | Blanc de blanc | Bl.de noirs | Sweden | Denmark |
|---|---|---|---|---|---|---|---|
| Blanc de noirs | 0.07980 | 0.10815 | -0.00859 | -0.10863 | 1.00000 | -0.15620 | -0.12857 |
| | 0.1397 | 0.0361 | 0.8681 | 0.0352 | | 0.0024 | 0.0126 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| Sweden | -0.16265 | -0.39504 | -0.06949 | -0.22460 | -0.15620 | 1.00000 | -0.32315 |
| | 0.0025 | <.0001 | 0.1787 | <.0001 | 0.0024 | | <.0001 |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |
| Denmark | -0.06378 | -0.04932 | -0.03497 | 0.02484 | -0.12857 | -0.32315 | 1.00000 |
| | 0.2380 | 0.3402 | 0.4990 | 0.6311 | 0.0126 | <.0001 | |
| | 344 | 376 | 376 | 376 | 376 | 376 | 376 |

Annex 3. Plots of prices versus the expert ratings

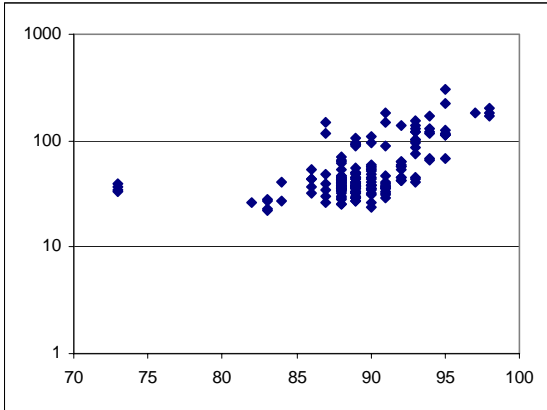*Figure A1. Log prices versus the ratings by Wine Spectator, 184 observations.*



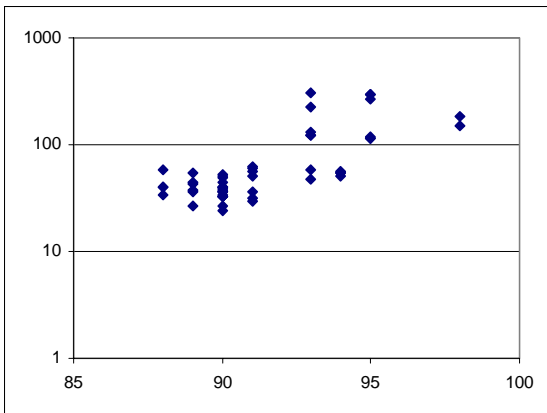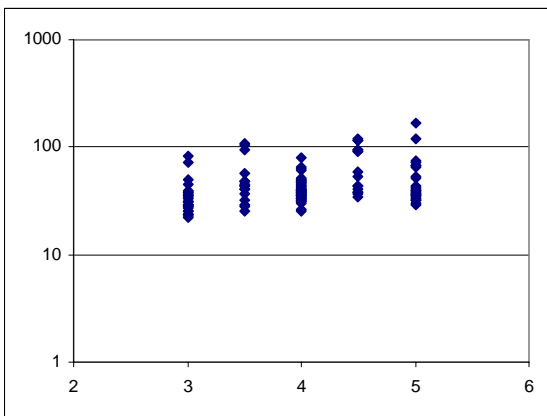*Figure A2. Log prices versus the ratings by Robert Parker, 55 observations.*



*Figure A3. Log prices versus the ratings by 1855.com, 128 observations.*

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