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ABSTRACT

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During the last decades auctions of selected wines have regularly taken place in Denmark. Therefore, by now, a considerable amount of data exists for auction wine prices, i.e. both the assessed wine prices of the auctioneer and the eventual price at which the wines are sold. From these data the prices of the most famous French icon wines (Premier Cru Classé) are extracted and a coherent time series data set is constructed. As the auctions have taken place several times each year, the data are analysed at a quarterly frequency. Having obtained the time series data for the price development of icon wines, these are expected to be influenced by a lot of factors, of course, but the income development as reflected in the business cycle fluctuations is considered to be of utmost importance. The wine auction prices are obviously exogenous to the business cycle, and thus eventual questions of causality are easier tested than usually done with many economic variables. Hence, the empirical part of the paper analyses the co-movements in the wine prices and the business cycle, the latter represented by several indicators in order to address the question of whether the wine auctions are affected by the general economic development or not. The major conclusions seem to be that the auctioneers valuation of icon wines may follow the international prices of these goods - and the prices of substitutes as represented by the stock market index - but in contrast to this, in recent years the actual hammer prices are stagnating and deviating from the path of the wine price valuations.

Keywords: Wine auction prices, French icon wines, business cycles.

JEL Codes: E32, D44.

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1. Introduction

During the 1990s, the prices of Cru Classé wines from Bordeaux increased dramatically. Sustained economic growth in the OECD area and significant growth rates in East-Asia combined with a widening of the wine market were the most important factors behind the massive price jumps that took place. The growth in prices of Cru Classé wines took place irrespectable of the huge advances in quality and subsequent increases in supply and variety of premium wines coming from many overseas wine producing countries, i.e. California, Australia, Chile, South-Africa etc. in this period. Furthermore, wine producers in countries within EU, e.g. Italy and Spain, made a large effort in order to strengthen their position at the market by offering wines in nearly all price segments at reasonable prices. Moreover, a standard result from many wine magazines reporting from blind tastings including Cru Classé wines from Bordeaux and top wines from other wine producing areas is often that the Cru Classé wines were valued lower than their market price, whereas the opposite often is seen with wines from California, Australia and Italy.

Still, the prices on Cru Classé wines did seem to live their own lives at least until the Millennium, with primeur prices of each new vintage never starting below the prices of the previous year. For investors of earlier vintages of the top wines, the 1990s certainly was a profitable period. E.g. a Chateau Cheval Blanch 1990 that could be bought en primeur for less than $50 now sells for a little less than $500 at wine auctions. Indeed many buyers of let's say the top 10 of the Cru Classé wines most likely looked and still look at these wines as investment objects, believing that the prices of good vintages will keep rising over time. Consequently, believing that Cru Classé wines can be considered as investment objects their prices are expected to be influenced by economic factors. Moreover, expensive wines like similar assets, e.g. paintings, jewels, real estate etc, .must be considered as luxury products and as a consequence the overall business conditions are expected to influence the price development relatively more than e.g. prices on lower quality wines.

The aim of this paper is to analyse the prices on Cru Classé wines in Denmark. Being part of the EC since 1972 Denmark had to lower its taxes on wine quite significantly, and as a consequence the nominal taxes on wine today correspond to the 1970 level. In the 1990s, there was a 18% decline in real prices on wine, which partly explains that the Danish market for wine has been growing with more than 5% p.a. in the same period. By now the annual wine consumption corresponds to approximately 40 litres per capita (+15).[1] With the growth in demand the market for fine and rare wines has developed too (in Denmark nearly all Cru Classé wines can be bought in liqour store, supermarkets etc.). More and more wines are put on auctions in Denmark, which was certainly not that common in the 1970s and the 1980s.

This paper concentrates on auction prices of eleven top Bordeaux wines at the Copenhagen Wine Auctions (Bruun Rasmussen). Naturally, the wine prices at the Danish Wine Auctions follow the trends at the international wine markets, i.e. the prices in London, New York, Chicago etc. Yet, comparing hammer prices reveals that at least in the short and medium run there are significant price variations for identical wines sold at the same time. Thus, other factors in determining the wine prices seem to

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[1] See Bentzen & Smith (2001) for an overview of the Danish market for wine.

be at work. Again, looking at Cru Classé wines from an asset's point of view, the local business condition potentially is an important factor for prices as is the development in prices of other assets. Consequently, using auction data over the latest 15 years, this paper analyses the influence from changing business cycles on the short-run dynamics of Danish auction prices on Bordeaux Cru Classé wines.

In the following section, the wine auctions in Copenhagen are described. Section three presents price indices of the auctioneers' wine price evaluation and the subsequent hammer prices of the wines sold. Section four analyses the relationship between the auction wine prices and selected business cycle indicators, which is further investigated by causality tests in section five, Finally, section six concludes.

2. The Copenhagen Wine Auctions

Bruun Rasmussen – Auctioneers of Fine Art

The information on estimated prices and hammer prices of wine at auctions in Denmark comes from wine auctions held at Bruun Rasmussen Auctioneers of Fine Art, Copenhagen. It is the largest and most important auction house in Denmark. It was founded in 1948 and today it has an annual turnover of more than US$ 30 million. It means that this auction house is the 8th largest in the world. The turnover at the wine auctions is only of minor importance. Art auctions have the largest turnover, but the house also has auctions of books and jewellery.

Wine auctions are also held by other firms in Denmark but Bruun Rasmussen is without doubt the most important auction house for wine.

The wine auctions

The first information of a wine auction is from 1973 and until 1982 auctions were held irregularly. From 1982, auctions have taken place at a more regular basis. During the last years, the number of auctions has increased to 5-6 auctions per year. At the same time a wider range of wines are put on auction. At first, it was almost only French wine from Bourgogne and Bordeaux, which was sold. Later on other French districts appeared and also wine from especially Italy is sold.

Buyers/sellers

The participants in the wine auctions at Bruun Rasmussen consist of different types. One group is the professional wine merchants who buy and sell. Also restaurants often belong to the professional buyers. If a restaurant has closed down, wine could also be sold at auctions. Furthermore, collectors, wine clubs and individuals with an interest in wine are buying. The majority of buyers and sellers are Danish but also persons from abroad, e.g. from the Nordic countries, take part in the auctions.

Auction catalogues

The data source of this analysis is the auction catalogues from Bruun Rasmussen. These catalogues include an estimated price from the auction house. At the beginning, information on hammer prices is only noted in the relevant catalogue. From 1992 the

hammer price is also printed in the following catalogue. Today information on hammer prices is available on the Internet.

Information on the wine

In the catalogues the following information is given:
- name of the wine and year
- size of the bottle
- number of bottles
- if the wine is a Château vintage
- if the wine is in original wooden case.

For the more expensive wines a measure of the level of wine in the bottle is given. The following specifications are used:
A: Normal
B: Very slightly under normal
C: Slightly under normal
D: Low

The auctions

The estimated price is set by the auction house and rests on the experience of the house. The hammer price is the price for the wine at the auction. The seller might make a condition that a certain minimum price is reached. If the bids do not reach this price, the wine is not sold.

The buyer should pay the hammer price plus 25% in buyer's premium including VAT. Before the auction, a preview takes place so possible buyers can inspect the wine. This means that the wine has to be present in the auction house. Transport to the auction house is an expense for the seller who might want to choose an auction house to which the transport expenses are limited.

The buyer does not have to be present at the auction, but can leave a commission bid instead.

Hammer prices

As a first step in the empirical analysis, the hammer prices at the Bruun Rasmussen wine auctions (Copenhagen) are compared with prices at other auctions. Figure 1 compares the Copenhagen wine prices with auction prices from The Chicago Wine Company. Both price series are measured in terms of the final buyer's price with the 25% buyer's premium added to the Copenhagen hammer prices. The Chicago hammer prices are identical to the buyer's price because only the vendors that consign their wines to the Chicago auction are charged a fee, namely 28%.

Figure 1 shows that except for a short period - between the Fall of 1996 and the early 1998[2] - the Copenhagen auction prices are systematically lower than the Chicago prices. The price differences probably reflect that the demand for fine and rare wines at the Danish market is relatively weak as compared to e.g. the market in the US and also in the UK.[3] The average difference in buyer's prices is $100, but the standard deviation is as high as $88. Looking at the more 'normal' period 1998-2001, the average price difference is close to $130. The question then is whether a price gap of $130 is large enough to cover all costs in connection with arbitrage trade, i.e. bringing the bottles from Denmark to e.g. Chicago and London and offering them for sale there. Noting that the number of bottles supplied at the auctions normally is 12 or less and that the seller must include the 25-28% fee concerning the price difference if he decides to offer the wine at e.g. Christies in London or at the Chicago Wine Company, the margin is probably not large enough for arbitrage as seen from the *sellers* point of view.[4] On the other hand, the potential for making favourable bargains for foreign *buyers* seems to exist, because they can bid by telephone or other communication forms during the auctions in Copenhagen. Still, with permanent price difference existing between different geographical markets there seems to be barriers of trade, i.e. lack of/costs of information, transportation costs, costs for storage of the wines, etc.

Figure 1. Buyer's price for Chateau Mouton Rothschild at the Bruun Rasmussen Auctions in Copenhagen and at the Chicago Wine Company; Vintage 1982, 1996Q2-2002Q2, US$ per bottle.

Sources: Chicago Wine Company and data (auction catalogues) from Bruun Rasmussen, Copenhagen. Prices measured as hammer price plus buyer's premium (auction fee). For some of the quarters in 1996 and 1997, data are missing for the Copenhagen auction which appears as the dotted part of the solid line.

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[2] The Danish economy experienced a period of solid growth from 1994 and onwards, which was accompanied by notable decreases in the rate of interest and significant increases on real estate prices. Most likely these factors explain the Danish 'bubble' in the figure.

[3] See Ashenfelter (1989) who compares auction prices in London, Chicago, Geneva and Amsterdam.

[4] Part of the price differences is due to imperfect information as many suppliers actually do not have information about auctions outside Denmark, how to arrange for transport of the wines etc.

3. Auction price indices of French icon wines

The price information data from the Copenhagen wine auctions goes back to the 1970s but only from 1988 at least two wine auctions take place every year allowing for the construction of reliable price series. Hence, using auction data from the first part of 1988 the construction of quarterly wine price indices is performed. From obvious reasons not all wines - and vintages - are traded at each auction which requires the following data calculation procedure to be persued. For each of the 11 Premier Cru Bordeaux wines and for each of the respective vintages ranging from 1950 to 1998, the increase in both price estimates and hammer prices are calculated from one auction to the next. The total number of auctions in this period covering 1988 to the last auction in June 2002 is 49 and among these only one of the auctions had to be deleted from the analysis due to missing observations. That leaves 48 consecutive auctions to be included in the data set. As a specific vintage from one of the chateaux may be traded more than once at an auction, the potential number of observations is huge - but usually, only a small number of vintages of each of the selected 11 wines appear at an auction.

An additional aspect is the fact that the bottles may be different with respect to defect labels, the level of wine in the bottle, etc. When extracting data from the auction material, observations representing defects (e.g. labels) or wines are bundled (e.g. with other wines). These data are in all cases deleted from the final data. Concerning the so-called A, B, C etc. conditions of the bottles – see above - no corrections have been made when calculating the price indices. The latter aspect is relatively vintage-specific, meaning that the later vintages usually are of condition A (perfect condition) and the older vintages sometimes condition B or C, and as the price indices will be calculated from vintage-specific growth rates, this problem may be of minor importance. The following eleven Bordeaux 'icon wines' (Cru Classé) have been selected for the analysis:

Cheval Blanc
Cos d'Estournel
d'Yquem
Haut Brion
Lafite Rothschild
Latour
Margaux
Mouton Rothschild
Palmer
Petrus
TALBOT

From all available data representing the price increases between two auctions - covering all vintages and the eleven wines - an overall estimate of the average rate of increase is calculated. This procedure allows for the use of all available information in the total

data set and also, when data for one of the wines are missing for a specific auction most likely data is available for some of the other wines in order to construct a coherent time series of wine auction prices. These data representing growth rates of prices are obtained for both the auctioneers' own valuation of the wines to appear at the upcoming auction and the subsequent prices at which they are sold ('hammer prices'). Price indices are calculated from the basis1988Q1=100 and thereafter adding the index level values according to the respective growth rates. The results are graphically exhibited (Figures 1, 2 and 3), and the price indices are in nominal terms as the application of a deflation procedure with e.g. the CPI may not be adequate in all cases in the later analysis where business cycle indicators appear.

The price evaluation made by the auctioneer - and appearing in the pre-auction information material - is termed 'price estimate' in the following text and the prices at which the wines are actually sold appear as 'hammer price'. Both prices are net of a 20% auction fee but as only price indices enter in the analysis, this is of no importance. Figures 1 and 2 exhibit the price valuations and the hammer prices, respectively, as indices and presented as quarterly data. As some of the quarters in the total sample period are missing observations, the data series is completed by applying the exponential smoothing technique. The dotted parts of the price lines are the smoothing calculates and this is done backwards as the later years represent the most complete data set.

In addition, the Hodrick-Prescott (HP) filter has been applied to the data in order to investigate for trend and cyclical components of the wine price series. Looking at the data, there are obviously cyclical variations in the auction prices besides the trend development. Normally the HP-filter has been used in connection with analysing business cycle topics and is calculated for a time period (1...T) as:

$$\operatorname*{Min}_{\mu_t} \sum_{t=1}^{T} \left(X_t - \mu_t \right)^2 + \lambda \sum_{t=2}^{T-1} \left[\left(\mu_{t+1} - \mu_t \right) - \left(\mu_t - \mu_{t-1} \right) \right]^2 \tag{1}$$

The time series is decomposed into a trend component μ_t and a stationary component $X_t-\mu_t$, where μ_t is selected in such a way that the expression in (1) is minimized. The constant (set equal to 1600 in the following calculations) is somewhat arbitrary and reflects the cost of including fluctuations in the trend component. The extremes of this HP-trend are the original series (lambda = zero) and a linear trend (lambda = infinite). The major advantage of the HP-trend in connection with especially time series data for fine wine is that no particular functional form is assumed apriori. Accordingly, the HP-trend seems appropriate to detrend the wine data with a moderate price development in the late 1980s / early 1990s followed by huge price increases until millennium, whereafter the prices stagnate.

Figure 2. An index of the estimated wine prices by the auctioneer, quarterly data 1988:1-2002:2 (Index, 1988:1=100).
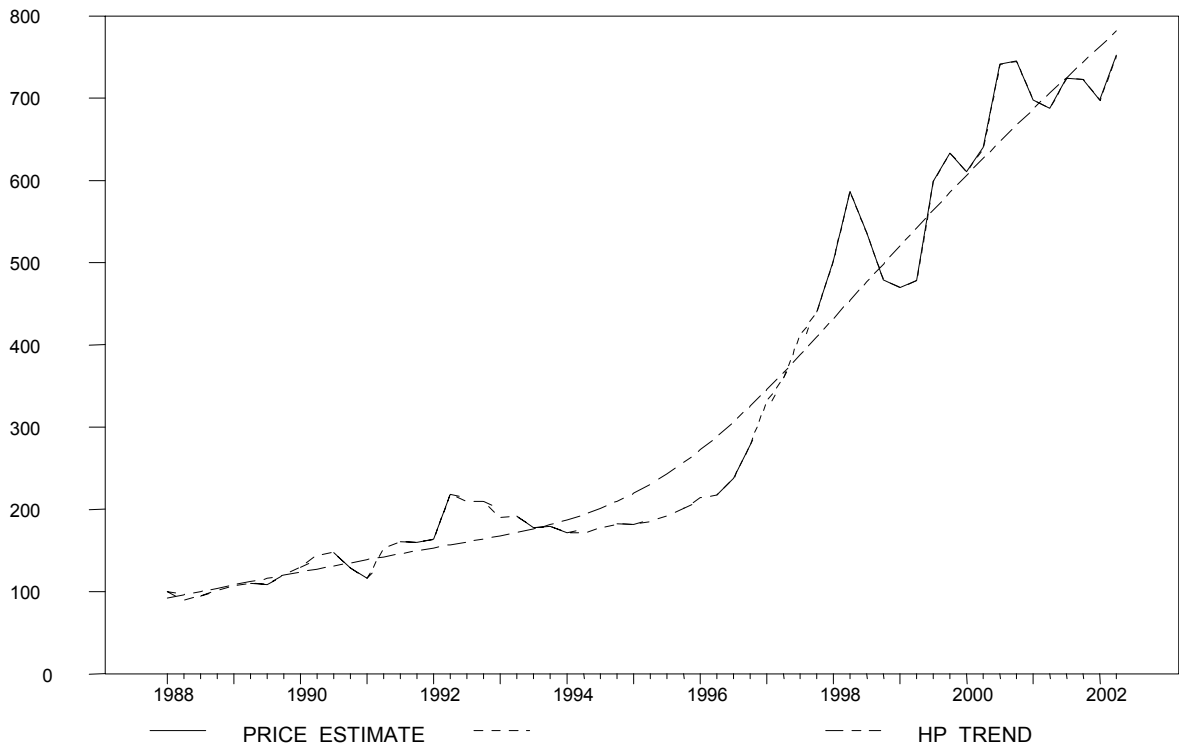

Note: The dotted part of the price index estimated by exponential smoothing using the RATS statistical software, where the optimal smoothing parameters are selected using the SBC and AIC information criteria. Also, the Hodrick-Prescott trend line is included in the graph.

From Figure 2 the well-known high increases in the Bordeaux wines during the last decade are revealed as the index is constructed from the average growth rates of the prices set by the auctioneer. Especially from 1996 to 1998 the prices seem to explode which is in reasonable accordance with international tendencies of the Bordeaux Premier Cru Wines. During this period the primeur prices of Cru Classé Wines kept rising from year to year irrespective of quality, e.g. the primeur price of the 1997 vintage was approximately 20% above the primeur price of the 1996 vintage despite of the fact that 1996 was a significantly better vintage in Medoc as well as in Pomerol/St.Emilion. Consequently, higher primeur prices are expected to affect the estimated auction prices on similar wines from ealier vintages in the same direction.

The dotted part of the price line is the result of the smoothing procedure and this seems to perform well in the present case. The HP-trend can be interpreted as the longer-term development of the time series and shows an ongoing increase in the wine price index, although the prices have stabilized during the last two years. The latter tendency of a stagnating price development path since the spring 2000 may seem reasonable from an economic point of view as the former tremendous price increases must be slowed-down or reversed at some time. Furthermore, increases in primeur prices on Cru Classé Wines have been significantly more moderate/stagnating the latest couple of years.

Figure 3. An index of hammer prices , quarterly data 1988:1-2002:2 (Index, 1988:1=100).
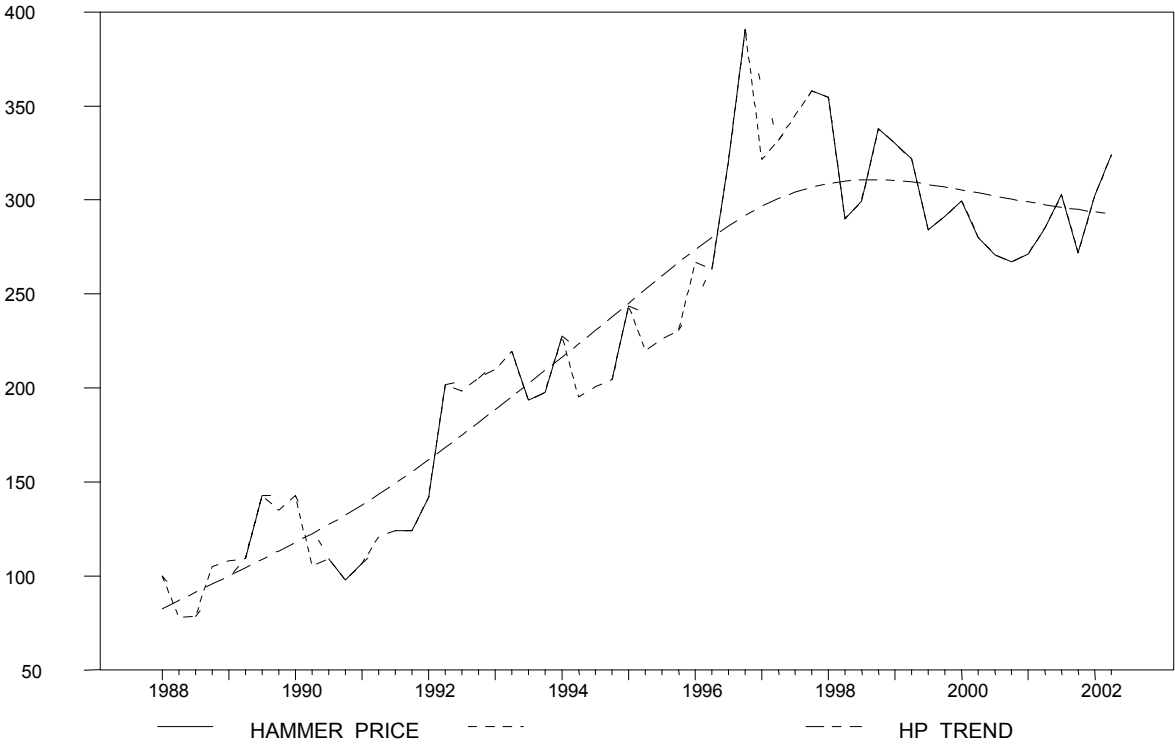
Note: See note to Figure 2.

The actual prices obtained at the Copenhagen auctions - 'hammer prices' - are exhibited as an index in Figure 3 and relates to the same period as the price estimates in Figure 2. Also, the HP-trend is included and now a somewhat different picture evolves as the hammer prices seem to decline somewhat during the later part of the period analysed. The graph is constructed as an index and says nothing about the absolute prices of the wines but the relative increase in the hammer prices in the first part of the whole-sample period is similar to the development of the price estimates and then, from 1997, no further increases in the general development of the hammer prices are experienced. Again, the smoothing technique is applied to the missing observations and due to the rather fluctuating character of the hammer prices the resulting dotted parts of the price curve must be interpreted with care. Alternatively, the data set can be exhibited in 'auction time', i.e. the auctions entering the analysis are considered as a continuous set of observations – which is reported in Figure 4.

Figure 4. Indices of price estimates and hammer prices according to the 48 auctions, 1988-2002 (Indices, 1988=100).
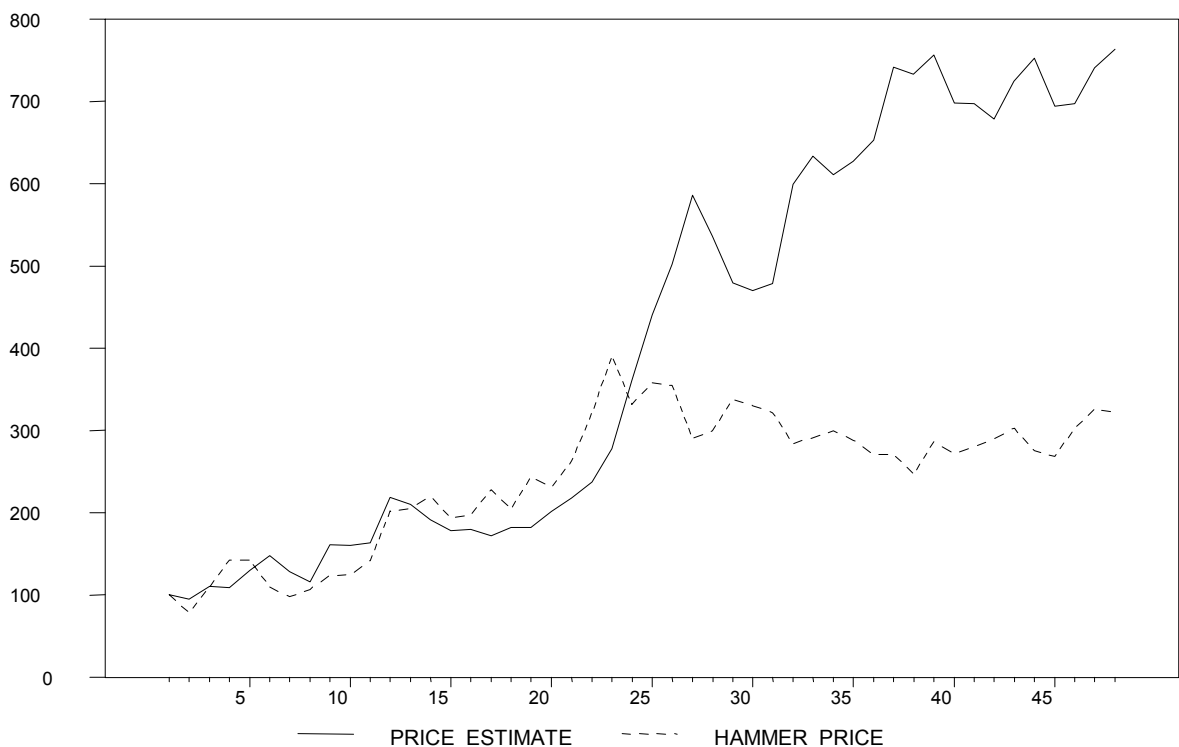
Note: The data represent the 48 auctions taking place from the first quarter of 1988 to the second quarter of 2002, with one auction deleted due to missing observations as only few items of the selected 11 Bordeaux wines appear at the specific auction.

In Figure 4 the data are presented in 'auction time' representing the 48 specific auctions from which data are extracted, i.e. covering the same time period as in the former graphs. The conclusion is similar to the one obtained from the 'real time' graphs with a hammer price index following closely the estimated prices in the first part of the sample period and thereafter prices are stagnating or declining.

The interpretation of the price indices in Figures 2, 3 and 4 must be done with caution as the graphs reveal nothing about the absolute level of wine

prices, e.g. Figure 4 does *not* tell that the hammer prices are below the auctioneer's evaluation. The hammer prices may well match the price estimations – or even bee above these – as the graphs are constructed as relative growth paths both linked to the index level 100 in 1988:Q1. To illustrate the problem the absolute prices of two of the wines are reported in Table 1.

Table 1. Selected auction prices for Mouton Rothschild and Haut Brion, Vintage 1982 (DKK per bottle).

Vintage 1982:	Mouton Rothschild		Haut Brion	
	Price est.	*Hammer price*	*Price est.*	*Hammer price*
June 2000	2100	2250	1500	1800
November 1997	3000	2950	1800	1700
September 1991	800	1000	650	1500
March 1988	650	700	700	800

Note: Prices listed in the Danish currency and referring to the price per bottle.

The data in Table 1 is very selective and certainly not representative of all data used when constructing the former graphs, but it reveals the fact that if wines already in the first part of the sample period are sold at high hammer prices then the price development tends to be modest later on – which is one interpretation consistent with the price graphs.

4. Business cycle indicators and the icon wine prices – empirical tests of co-movements

In order to address the question of whether the auction wine prices are influenced by business cycle factors or not, five different indicators – either leading or coincident to the cycle – have been selected for the analysis. These indicators or macroeconomic variables, e.g. GDP, are listed in Table 2 where the correlation with the price estimates and the hammer prices also are to be found.

Table 2. Correlation between wine auction prices and business cycle indicators.

|	Price estimate	Hammer price
Consumer confidence	0.343	0.661
Industrial activity	0.004	-0.009
Car sales	0.251	0.557
Stock Market Index	0.929	0.591
GDP	0.949	0.829
Private consumption	0.922	0.882

Note: GDP and private consumption seasonally adjusted and measured in nominal prices - like the indices of wine prices. The 'price estimate' is from the published auction sales material as announced in due time before the auctions take place.
Data sources: Statistics Denmark and the Copenhagen wine auctions.

The first two indicators represent the confidence of the consumers concerning the short-run future of the economy and similarly an index measuring the current business conditions are constructed for the industrial sector (in both cases by Statistics Denmark). Car sales are the monthly sales of new cars to consumers and the Stock Market Index is from the Copenhagen Stock Exchange. Finally, GDP and total private consumption are from the quarterly Danish National Accounts.

The macroeconomic variables GDP and consumption are highly correlated with the auction prices but this is due to strong trends in all variables (except hammer prices from 1997) and a closer examination of short-run fluctuations reveals no obvious co-movements. The same conclusion is covering the industrial activity indicator and the sales of new cars which is evident from the low correlation coefficients in Table 2. In contrast to this, the Stock Market Index seems to move in accordance with the wine price estimates as revealed by Figure 5. In fact, changes in stock market prices are expected to affect the auction prices on icon wines for several reasons. First of all, increasing stock prices affect the wealth of consumers positively. Most likely the majority of consumers/collectors demanding expensive wines have a portfolio that potentially is affected by stock prices changes. Secondly, if the prices of one particular asset (e.g. stocks) rise, part of the substitution effect is assumed to be at work and a part of the increased demand will be for other assets, e.g. paintings and fine and rare wines, see Jones and Storchmann (2001).

Figure 5. Indices of wine price estimates and the Copenhagen Stock Market, 1988-2002 (Wine price index, 1988=100).
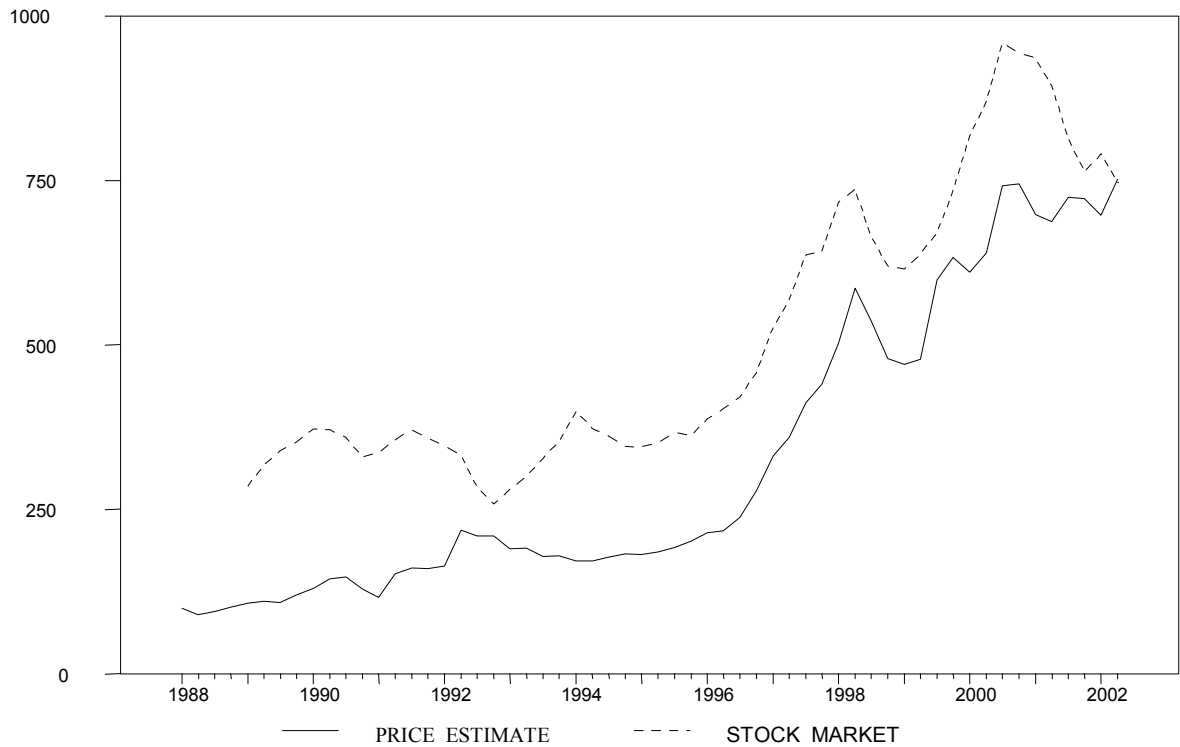

Note: The Stock Market Index is 1983=100 and these data only cover the period 1989-2002.

Especially in the later half of the time period analysed the two variables in Figure 5 seem to behave in a similar pattern with a strong co-movement. This may be due to a coincidence, but from an economic point of view the wines may be perceived as an investment good, cf. the discussion in the introduction. Hence, the prices of icon wines should mimic the development of investment substitutes – at least in the long run. For the hammer prices the closest correlate seems to be the consumer confidence indicator which is included in Figure 6.

Figure 6. Indices of hammer prices and the consumer confidence indicator, 1988-2002 (Hammer price index, 1988=100).
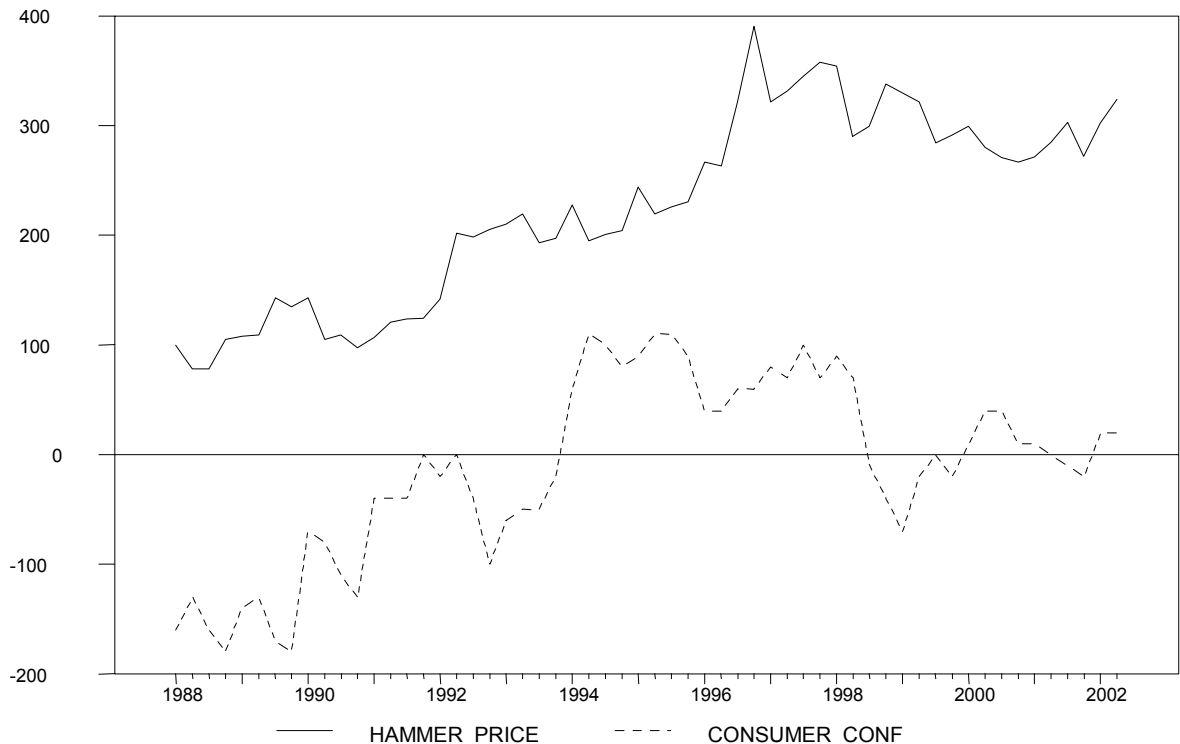

Note: The consumer confidence indicator as published by Statistics Denmark, 2002. The indicator has been multiplied by a factor of ten in order to facilitate comparison with the hammer price in the graph.

The consumer confidence indicator may take on negative and positive values according to the consumers' feelings about the economic conditions they face. This indicator has been increasing from the late 1980s to 1995 and then it showed up with a slight decline somewhat similar to the hammer prices. The short-run fluctuations in the variables from Figure 6 do not seem to be very similar and the hypothesis that the consumer confidence has any influence on the hammer prices appears less convincing in comparison with the former assumption concerning the Stock Market influencing wine price evaluations. This is in accordance with the expected influence because the consumer confidence indicator is a broad measure of the expectations of all consumers, i.e. not only the most wealthy part of the consumer group, that must be assumed to dominate the demand for expensive wines. Therefore, consumer confidence indicators are expected to affect the demand for icon wines only when the up and down turns can be considered as persistent and with a certain time lag.

For the purpose of further investigations of eventual short-run co-movements of the variables, the deviations from the HP-trends of all the respective variables are analysed with the following procedure employed. For each variable the HP-trend is calculated, e.g. as already illustrated in Figure 2 for the price estimates, and the residuals between the actual values of the variables and the HP-trends are for the respective cases depicted in Figures 7 and 8.

Figure 7. Deviations between the HP-trends and the wine price estimates and the stock market index, 1988-2002.
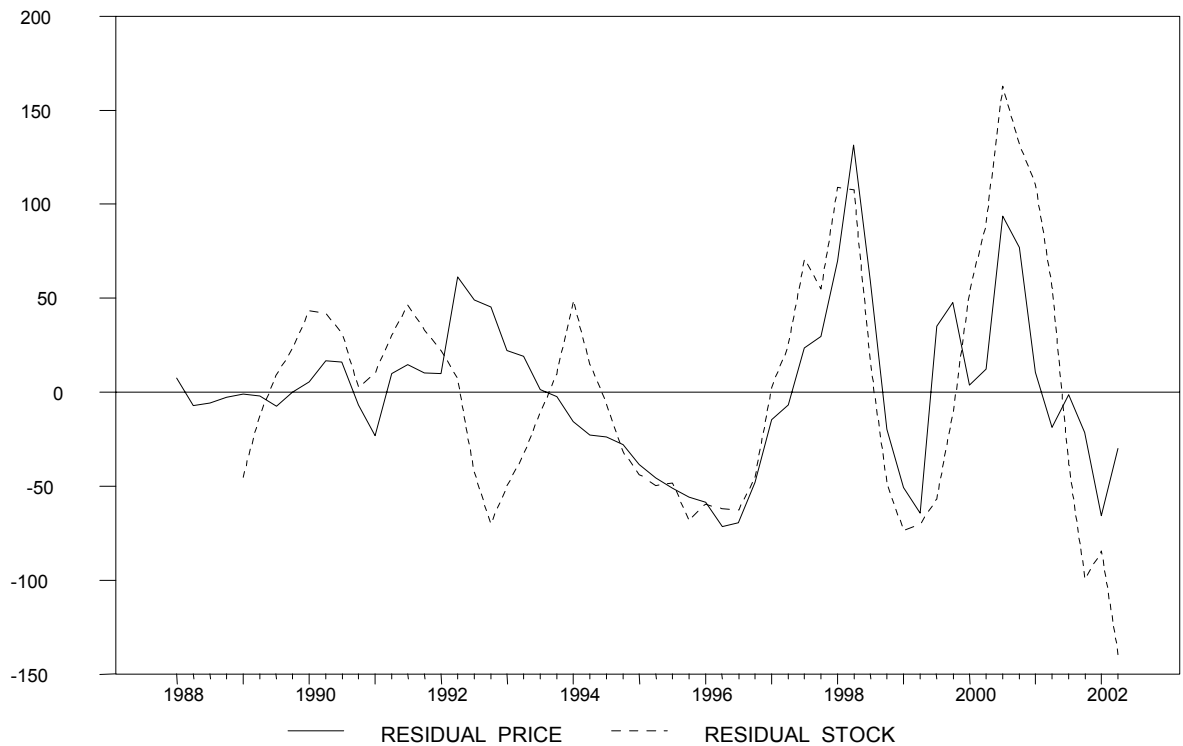
Note: For both the price estimates and the Copenhagen Stock Market the HP-trend has been calculated and the difference between the respective variables and these trends are exhibited in the graph. When calculating the HP-trend, a smoothing weight of 1600 has been applied.

The short-run fluctuations in Figure 7 are of a surprisingly similar character since the mid-1990s and hence a hypothesis of an influence from the stock market prices to the icon wines may be of some relevance and does not seem to be rejected by the data. As noted this argument is also discussed in Jones and Storchmann (2001) in relation to economic depression and the Asian stock market crisis in the 1990s influencing the Bordeaux wine prices.

Figure 8. Deviations between the HP-trends and the hammer price index and the consumer confidence indicator, 1988-2002.
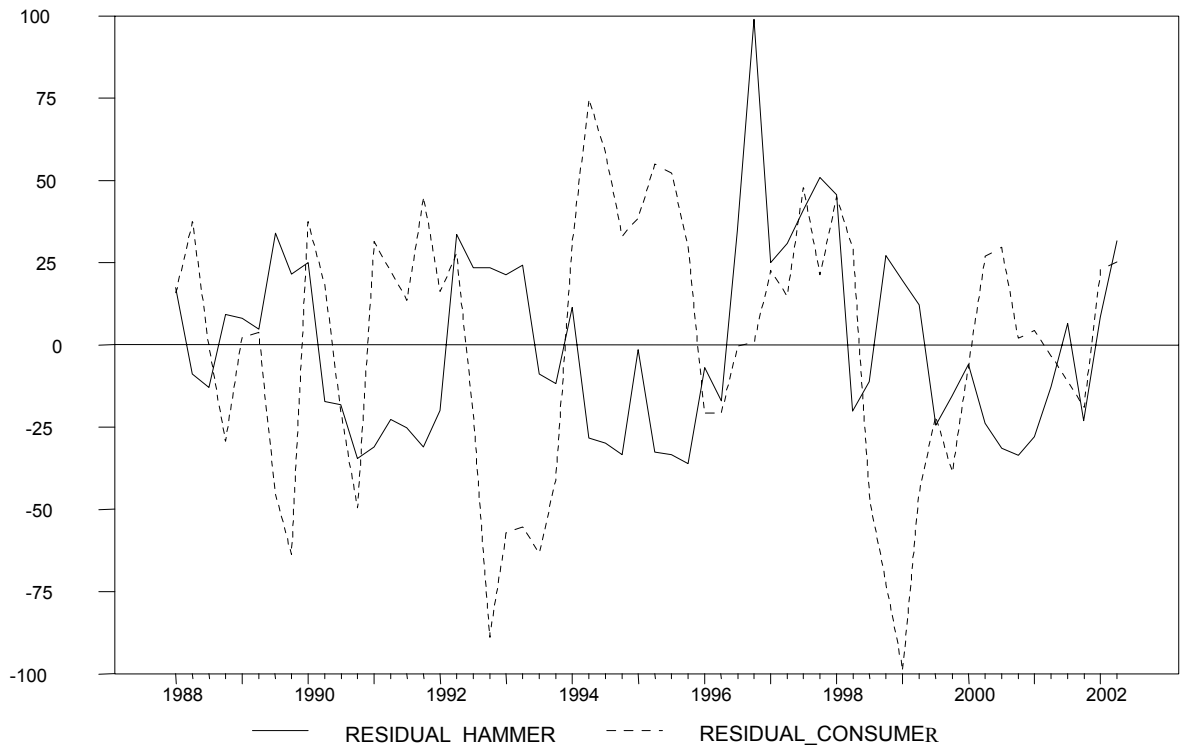
Note: For both the hammer prices and the consumer confidence indicator the HP-trend has been calculated and the difference between the respective variables and these trends are exhibited in the graph. When calculating the HP-trend, a smoothing weight of 1600 has been applied.

A similar methodology is applied for the relationship between hammer prices and the consumer confidence indicator in Figure 8. In this case, no obvious relationship between the respective short-run fluctuations seems present - except when lags are introduced in the sense that lagged values of the consumer confidence indicator influence the present hammer prices, which supports the arguments above, that a present peak in the consumer confidence will show up as a positive hammer price effect at the upcoming wine auction, which may be some months ahead in time and thus causing the lag effect. Apart from this argument, the preliminary conclusion is not in favour of a link from consumer confidence to wine auction prices.

5. Causality tests

In connection with the graphical analysis of coincidence between the wine prices and business cycle indicators, Granger causality tests must be performed, e.g. as whether the stock market price index and the consumer confidence indicator significantly influence icon wine prices. For both cases, i.e. the stock market index and the consumer confidence indicator influencing the wine price estimates and the hammer prices, respectively, bivariate Granger tests are done by the following set of regressions:

$$WP_t = \alpha + \sum_{i=1}^{4} \beta_i WP_{t-i} + \sum_{i=1}^{4} \gamma_i SM_{t-i} + \varepsilon_t \qquad (2)$$

WP: Wine price estimate
SM: Stock market index

An *F*-test is used to ascertain whether lags of the stock market index significantly help to explain the estimated wine price variable on the left-hand side of (2). If this is the case - and the opposite regression, reversing the variables in (2), reveals that wine prices do not impact on the stock market index (which is obvious) - a hypothesis of Granger-causality from stock market prices to wine prices cannot be excluded. A similar set of tests are performed for hammer prices and the consumer confidence indicator, where obviously wine prices should have no influence on consumer confidence. In both cases the test is done for both level values and first difference values of the respective variables, and only the data representing 'auction time' from Figure 4 are included in the analysis in order to avoid performing tests with estimated data observations, cf. the smoothing applied to the monthly data in section 3.

Table 3. Granger causality tests.

variables			Level variables	First difference
WP	->	SM	1.06 (0.39)	0.98 (0.43)
SM	->	WP	2.48* (0.06)	3.20* (0.03)
HP	->	CC	1.17 (0.34)	1.04 (0.40)
CC	->	HP	3.71* (0.01)	1.48 (0.23)

Notes: WP: wine price estimates; SM: stock market index; HP: hammer prices; CC: consumer confidence indicator.
The number of lags included in the tests is four in all cases and in parentheses the p-values are reported. First differences are directly calculated and therefore not of the log-form (also, the consumer confidence indicator may have a negative sign). A * indicates the lagged values of the respective variables to be significant at least at the ten per cent level.

The results from Table 3 are nicely in accordance with the former results from section four. Hypotheses of effects from the wine auction to the stock market or the consumer confidence indicator are in all cases rejected as the high *p*-values indicate no significant influence from these variables. The stock market index may cause the wine price estimates at the ten per cent level of significance as the former variable cannot be excluded from the wine equation. Similarly, for the level values of the respective variables, the consumer confidence indicator influences the hammer prices - but not when first difference variables enter the analysis. Especially the lagged values of the consumer confidence indicator show up with positive signs in the hammer price equation of (2) - where the first lag has a negative sign, but lags of order 2, 3 and 4 are

all positive - and thus help to explain the similarity of the variables depicted in Figure 6; although a short-run relationship (Figure 8) still must be rejected.

Another relevant hypothesis to investigate for in the Granger sense of causality is the question whether the auctioneer's wine price estimates influence the hammer prices - or vice versa. Performing the test for these wine price variables reveals no causality at either the five per cent or the ten per cent levels of significance when the number of lags included is four as in the former tests - although at just the ten per cent level the hypothesis of hammer price influencing the price estimates cannot be rejected when level values of the variables are used. When expanding the number of lags to six in the test procedure, the latter result is still present at least at the ten per cent level of significance, and hence causality between the auction wine prices is most likely to be from the hammer prices to the price evaluations - and not vice versa. This result is in accordance with the functioning of auctions. The auctioneer estimates prices for the auctions coming up based on inter alia earlier hammer prices. But once the auction has started, it is demand and supply conditions that determine prices. Principally, this is how smaller auctions work. On large auctions attracting many buyers and sellers with full information, the hammer prices are expected to be quite close to the estimated price in a more simultaneous way.[5]

6. Conclusion

Economic factors are expected to affect the demand for goods and in particular the demand for luxury goods - and Cru Classé wines from Bordeaux certainly must be considered as belonging to the latter category. The aim of this paper is to evaluate the importance of the economic conditions for the prices of Cru Classé at wine auctions in Denmark. Using price data for eleven Bordeaux 'icon wines' obtained at the Copenhagen Wine Auctions (Bruun Rasmussen) over the period 1988-2002, the trend and business cycle influences are analysed by using various business cycle indicators for the Danish economy. Estimated wine prices as announced by the auctioneer are shown to be rather closely correlated with the overall Danish stock market index. However, stock market prices which are normally considered as a leading business cycle indicator do not seem to affect the hammer prices at the auctions significantly. Instead the hammer prices are more likely to be affected by the Danish consumer confidence indicator which is based on a monthly survey among consumers and represents the general consumer's opinion about the short-run future of the economic conditions. More precisely, the hammer prices depend on the consumer confidence only after consumer confidence has actually changed, and the analyses suggest that there is a short time lag before changing consumer confidence can be traced in the auction prices. This result is in accordance with the apriori expectations concerning the wine market and its agents, i.e. consumers who can afford to buy Cru Classé wines do most likely not belong to that part of the economy where agents are forced to adjust their consumption pattern in accordance with the actual business conditions.

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[5] Emphasising this argument, Figure 2 shows that (except for the outlayers in the beginning and the end of the period illustrated) hammer prices at Copenhagen Actions (Bruun Rasmussen) fluctuate more from one period to the next than is the case for the hammer prices at auctions of The Chicago Wine Company, which is a much larger auction.

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