RAISE YOUR GLASS:
WINE INVESTMENT AND THE
FINANCIAL CRISIS

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Abstract

This paper uses auction hammer prices over the period 1996-2009, with a special emphasis on periods of economic downturns, to examine risk, return and diversification benefits of fine wine. Our research shows evidence that the wine market is heterogeneous with wine regions and price categories evolving differently in terms of volume and turnover. We construct wine indices for various wine regions and prices using repeat-sales regressions and find out that fine wine yields higher returns and has a lower volatility compared to stocks especially in times of economic crises. Forming portfolios for typical investors and taking risk aversion, different financial assets and various wine indices into consideration we confirm that the addition of wine to a portfolio as a separate asset-class is beneficial for private investors. Not only are returns favourably impacted and risk being minimised but skewness and kurtosis are also positively affected. Particularly, during the recent financial crisis these effects are most pronounced and improve portfolio diversification when it is most needed. Most importantly, balancing a portfolio with fine wine has resulted in added return while reducing volatility with the most prestigious and expensive vintages and estates outperforming the General Wine Index (GWI) during the entire research period. Results from the CAPM show that alpha is significantly positive over the period 1996-2009 while showing a low beta coefficient. The use of a conditional CAPM model allows us to clarify the time-variance of alphas and betas depending on the economic environment that is not generally captured by the traditional CAPM. The time-varying dynamics of alphas and betas are in particular best explained by the spread between BAA- and AAA-rated bonds and the USD/EUR foreign exchange rate. Our findings confirm that wine returns are primarily related to economic conditions and not to the market risk.

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1   Introduction

In 2003 a bottle of 1982 Lafite-Rothschild sold for an average amount of 490 USD at auctions. Six years later the same bottle went for 2'586 USD yielding the seller an annual return of around 70%. As a matter of fact, even investing in fine wines other than from the premier wine estates of the Bordeaux region has been a lucrative affair. The auction price of a 1982 Barbaresco Riserva Santo Stefano, for example, has risen from an average 135 USD in 2002 to 613 USD in 2009. Examples of such hefty price increases for fine wines are frequently cited in newspapers and suggest that the demand and prices for wines have surged in recent years. An ever growing number of positive press commentaries on the favourable risk-return profile of this asset class has helped to convince investors of the advantages of adding wine to their financial portfolio. As a consequence, wine is increasingly viewed not only as a pure consumer good but also as an interesting investment opportunity by many an investor.

As a result, a small but steadily growing investment market for fine wines has established itself. Auction houses have expanded their presence to new geographical regions outside Europe and the United States to reach new customers, especially in Asia, and have simultaneously increased the number of wine auctions throughout the world. The increase in worldwide turnover from some 90 million USD in 2003 to more than 276 million USD in 2008 at major auction houses as noted by Winespectator provides a proof for the growing popularity of this market. At the same time wine-funds and -indices (e.g. Liv-Ex in the U.K. or Idealwine in France) have emerged to cater for this new demand from investors. The resulting improvement in transparency and liquidity has rendered this market even more attractive for investors.

In response to the growing interest in wine as an asset class from investors academic research has been conducted on financial characteristics of the wine market. As early as 1979, Krasker (1979) analyses returns on wine investments but does not find evidence that wine can outperform a riskless asset. In a response to this paper, Jaeger (1981) argues that Krasker's use of rather a low number of observations and a short period (coinciding with the oil crisis in the 1970) may bias his results. Indeed in using Krasker's methodology and extending the period into the 1960s Jaeger comes up with much more favourable research results. Later studies expand the research framework to incorporate risk and conclude that wines, like other collectibles, have a higher volatility (Burton and Jacobsen (1999)) and are cyclical (Di Vittorio and Ginsburgh (1996), Bentzen et al. (2002), Fogarty (2006)). Burton and Jacobsen (2001) using a repeat-sale-regression show evidence that the heterogeneity of the wine market must be taken into account. Even inside the examined Bordeaux region, vintage can widely influence returns on wine investments. Although wine generates positive investment returns throughout the analysed period, only the

1

1982 vintage outperforms the Dow Jones Industrial Average. More recently, Fogarty (2006) in a study of premium Australian wines in the 1990s finds similar returns but a lower volatility of wines as compared to Australian equities. However, contrary to Burton and Jacobsen (2001) who find a worse performance for first growths Bordeaux wines than for their aggregate index more expensive wines seem to achieve larger returns and have a lower volatility in Australia.

If fine wines are to be considered as an asset class on its own the risk-return-framework used in the above studies needs to be extended. Potential diversification benefits from a collection of wines in an investor's portfolio and the possibility of a portfolio risk reduction through low correlations between wine and financial assets must be taken into account. Fogarty (2007) shows that the addition of wine to a portfolio consisting of stocks and bonds shifts the efficient frontier to the left which means a better risk-return trade-off for an investor once wine is included in the portfolio. Sanning et al. (2008) use the Capital Asset Pricing Model and the Fama-French three factors model to assess the benefits of wine with regard to portfolio diversification. They find evidence of excess returns for wines and suggest a low correlation of wine with financial markets and the Fama-French risk factors. Masset and Henderson (2009) confirm previous findings of a high return and low variance of wine assets and expand the focus by taking portfolio skewness and kurtosis into account. They find a low correlation between wine and other assets and suggest that best-rated wines offer the best portfolio return, volatility, skewness, kurtosis trade-off in the long-run for most investors.

Both common belief and academic research indicate that investing in wine has desirable attributes for portfolio diversification. In times of economic uncertainty investors are increasingly looking for alternatives to diversify their portfolio and often turn to less conventional assets. Fine wines, in line with other collectibles such as art works, coins or stamps, are widely promoted as being interesting choices due to their interesting risk-return profile and low correlation with other asset classes. However, correlation among assets tends to rise during economic downturns. Unfortunately, diversification tends to be less effective when it is most needed. Journalists in the mass media frequently claim that wines have remained unaffected by this correlation breakdown phenomenon and can still be considered as investment grade. There is, however, not yet any solid empirical evidence to reach a consensus on this claim.

The main contribution of this paper is to analyse risk-, return- and diversification-benefits of wine in a portfolio in times of economic downturns using a unique dataset covering the period 1996-2009 and several wine regions across the world. We want to assess the impact of the financial crisis on the trading activity and performance of various wine categories. A possible robustness of wine to financial contagion delivers important insights into the stability of portfolio

diversification across economic cycles. We construct different wine indices using repeat sales regressions and compare these to different financial assets by forming portfolios for bull and bear markets and different investor types. We also investigate the possibility that wine returns may rather be cyclical in their nature and unrelated to market risks and therefore affected by prevailing economic conditions and extend our initial analysis to a conditional CAPM model in order to obtain input from additional criteria and parameters. The main advantage of our approach is to keep a standard financial framework that is easy to interpret while looking controlling for economic variables that might affect the wine market and are not captured by the traditional CAPM. These enhanced modelling efforts as compared to previous studies may allow us to improve our understanding of the dynamics of the wine market, its returns and its future development.

In a nutshell, our findings show that the inclusion of wine in a portfolio and, especially more prestigious wines, increases the portfolio's returns while reducing its risk, particularly during the financial crisis. This is true for all model-portfolios both during bull and bear periods; during crisis-periods the defensive impact of wine is more pronounced in aggressive style portfolios than in conservative ones. The defensive nature of wine is confirmed by a less negative skewness and a kurtosis approaching three. Using the classic CAPM we observe high alphas except during the crisis and low betas. The use of a conditional CAPM model allows us to clarify the time-variance of alphas and betas depending on the economic environment that does not seem to be captured by the traditional CAPM. Especially, the BAA-AAA spread and the USD/EUR exchange rate explain the time-varying dynamics of alphas and betas. Our findings confirm the cyclical nature of wine with returns primarily related to economic conditions and not to market risks.

The remainder of this paper is structured as follows: Section 2 describes the data and methodology employed in the present analysis. Section 3 shows main results on portfolio diversification and conditional portfolio evaluation while section 4 gives an outlook on future benefits of the wine market and wine investing. The paper ends with our conclusions in section 5.

2   Data and methodology

2.1   Data description

The data for the study is taken from The Chicago Wine Company (TCWC) and covers all auction hammer prices between January 1996 and January 2009. We start our analysis by discarding wines that are not traded on a regular basis and which therefore do not provide comparable results. The remaining data is sorted according to certain characteristics such as

region, vintage, producer and scanned for any apparent errors. Whenever possible, errors in the dataset are corrected or otherwise removed, where the correct value could not be inferred with certainty. All in all, the sample consists of more than 400'000 transactions from 144 auctions and a turnover exceeding 237 million USD. The size of the dataset covering 13 years and therefore larger than earlier studies allows us to cover two significant economic boom phases (1996-2001 and 2003-2007) as well as two major economic and financial crises (2001-2003 and 2007-2009) and is therefore an ideal setting for our research.

After having cleaned up the dataset, we look which wines are traded the most. If wine is to be taken seriously in an investment strategy it must have a minimum sales volume, be liquid and traded on a frequent basis. We, therefore, concentrate on wines that meet these conditions by compiling data as follows:

Step1: We only use vintages from 1981 to 2005. This enables us to discard wines that are viewed as antiques and not as wine as such. Moreover, it eliminates wines that are mostly illiquid and are traded infrequently. A positive side-effect of limiting the sample is the reduction of time-varying characteristics of wine which results in a better price index. Vintages after 2005 are not yet interesting as they appeared on the market in 2008 at the earliest and thus are not reliably priced.

Step2: We only consider wines from major regions. Wines originating from France (Bordeaux, Burgundy and Rhône Valley), Italy and the United States represent 90% of all trades in the sample and are therefore analysed. Other regions from the initial sample included Australia, Germany, Spain, Austria but these regions only make up a very small part at auctions and are traded infrequently.

Step3: Unconventional bottle sizes are equally removed as they represent a very small proportion of our sample and can lead to erroneous price patterns. The analysis only focuses on bottles with 0.375, 0.75, 1.5, 3, 4.5 and 6 litres contents.

Step 4: We only take those wines into account that have traded at least once every twelve months. This ensures that long periods without trades in a wine are eliminated since they lead to erroneous price jumps that are difficult to interpret.

Step 5: We calculate monthly wine prices by taking the median price of every transaction of a specific wine pair for a given month. Observations with price increases of more than 40% in a given month and drops again by 40% or more the following months and vice versa, are removed. Such erratic price movements would seem odd and difficult to explain and are most probably due to erroneous data.

The size of the dataset employed stands in contrast to earlier studies, which focus either on shorter time periods or on Bordeaux wines only. This allows us to draw a comprehensive and reliable picture of the prices and returns investors can hope for in the wine market.

[Insert table 1 here]

Table 1 shows the number of trades, the USD turnover and the number of 75cl equivalents traded at TCWC during the period 1996-2008. Panel A looks at data per year and region. Obviously, the various wine regions have developed quite differently over time. All regions have, however, experienced substantial volume growth until the peak of the Internet bubble. Wines of US origin have steadily gained in popularity amongst investors even thereafter and growth has not slowed down ever since. Burgundy wines have been out of favour since 1998/1999. Wines from the Rhône Valley and Italy have seen an increase until 2001/2002 but have then lost their attractiveness even during boom times. During the financial crisis of 2007-09 Rhône Valley, Italian and especially Bordeaux wines have fared worst while wines form Burgundy and especially the USA have experienced volume gains and yielded higher USD turnovers. All in all, Bordeaux wines have been by far hardest hit by the crisis and volume is now below 1996 levels. It must also be noted that this wine region has been the clear volume leader over many years but its lead has now substantially been reduced over other regions.

Panel B shows the development of different price categories over the same period of time. By far the largest volume has been traded in wines under 200 USD which have also experienced the steepest trade growth and sharpest decline thereafter (for wines under 100 USD). Wines selling for more than 200 USD are showing a steady increase in market share until 2002 but have declined since. The very expensive wines (>400 USD) have, however, experienced upside growth during the recent crisis although coming from a modest level. Volumes in expensive wines have proven to be a lot less volatile than the cheap wines, probably because they are considered collectibles and thus safer investments. The arrival of the outstanding vintage of 2005 has given the market for prestigious and high price wines a noticeable boost that helps explain the doubling of market share for the >400 USD category in 2008 when this vintage dominated this market segment. This illustrates the importance of vintage as a specific valuation criterion and parameter independent of the economic environment and other market factors.

2.2   Index construction

We compute a variety of indices using the repeat-sale regression (RSR) method. This technique uses the purchase and sales price of a specific asset with identical properties (in our

case a specific wine-vintage pair) to estimate price appreciations. This approach has been extensively used to estimate the price evolution on the real-estate market (e.g. Bailey et al. (1963), Case and Shiller (1987), Goetzmann (1992)) and has more recently been applied to the arts market (e.g. Goetzmann (1993), Pesando (1993)).

We start by deflating all prices to obtain constant USD amounts across time and winsorise price data at the 99.9% level to discard very extreme outliers.[1] For each purchase ($P_{i,p}$) and sale ($P_{i,s}$) price of a specific wine in the index, we calculate the log-return $r_{ips} = \ln(P_{i,s}) - \ln(P_{i,p})$ for the period between the purchase (p) and sale (s). Each return is subsequently regressed and is described as $r_{ips} = \sum_{t=1}^{T} b_t x_{it} + w\varepsilon_{ips}$ where b_j is the value of the index at time t; x_{it} is a dummy variable taking the value 1 at the time of sale, -1 at the time of purchase and 0 otherwise; w denotes a weight based on the winsorised average trading volume that can be assimilated to the freefloat market capitalization in stock indices and ε_{ips} is an error term. In aggregate we get $r = bX + w\varepsilon$, with r and ε being a N-dimensional vector for N repeated sale pairs and b a T-dimensional vector of the index values to be estimated.

The use of the RSR method offers several interesting properties that make it ideal for the calculation of wine indices. The use of identical goods to calculate price fluctuations constitutes the main advantage of this technique. Compared to a hedonic pricing model in which individual specifications of a good must be collected and modelled appropriately the RSR allows for a simple mean to calculate quality-adjusted indices. Over a simple compounding formula using two endpoints and extrapolating annual returns the RSR method has the advantage of generating estimates for each period. It therefore maximises the information use of intermediate sales. The main drawback of the RSR model is the sample reduction due to the fact that a good must at least be traded twice to be usable. However, examining a market like wine circumvents this problem. Unlike the arts market in which each painting is unique (the printing market marks an exception) any given wine is normally produced in multiples. This dramatically increases the probability that a given wine is sold more than once. However, the problem is not completely resolved as some wines might still be traded infrequently or the number sold at any one auction might be very small and as a result bias the results in that an outlier is created.

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[1] We also (i) omitted the winsorising process and (ii) winsorised data at the 99% level which both do not alter results significantly.

2.3 Descriptive statistics

Figure 1 shows the evolution of the general wine index and its split into different wine regions.

Figure 1
Evolution of the Russell 3000, the general wine index and first growths for top vintages for the period 1996-2008
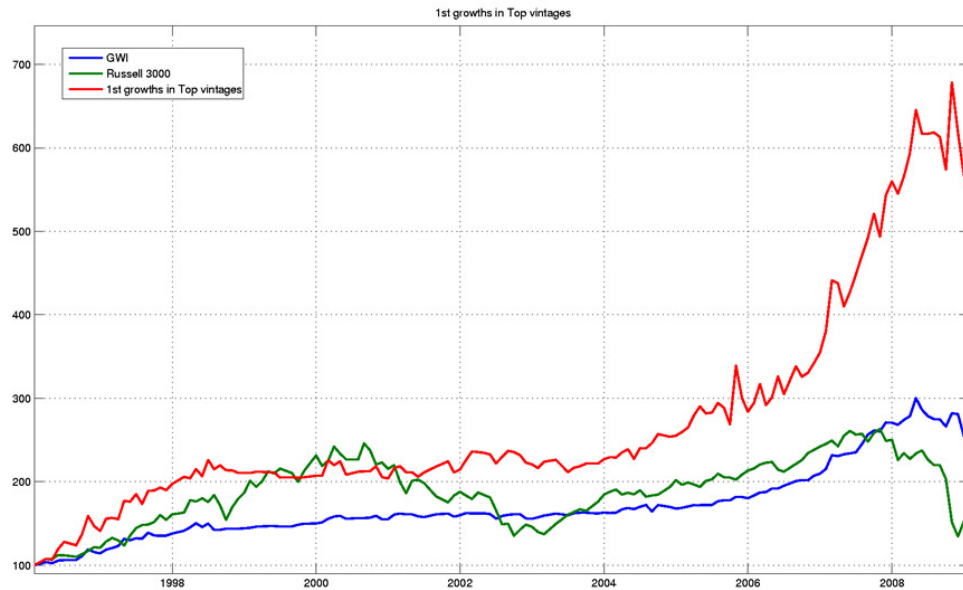
The wine index and the Russell 3000 have both gone up between 1996 and 1998. While the Russell 3000 declined heavily between 2001 and 2003 before it recovered again the wine index grew steadily over the period 1998-2005. Neither the terrorist attacks in New York (9.11), nor the burst of the internet bubble or the boycott of French goods after the Iraq invasion (Ashenfelter et al. (2007)) have had much effect on wine prices. The period 2005 to 2008 may be called the golden age for wine in which the index doubled. Since mid-2008 the wine index, however, decreased by 17% as a result of the economic and financial crisis in line with other financial assets but far more moderately than the Russell 3000 which lost 47% in the same period. Interestingly, the general wine index clearly outperformed the Russell 3000 during the crises in this study, be it in 2002/03 or 2007/08. In comparing, first growths wines of top vintages only the general growth trend is similar to the general wine index. However, the amplitude is substantially bigger. Especially from 2005 onwards this category hugely outperforms both the general wine index and the Russell 3000.

Figure 2
Evolution of sub-indices for different wine regions for the period 1996-2008
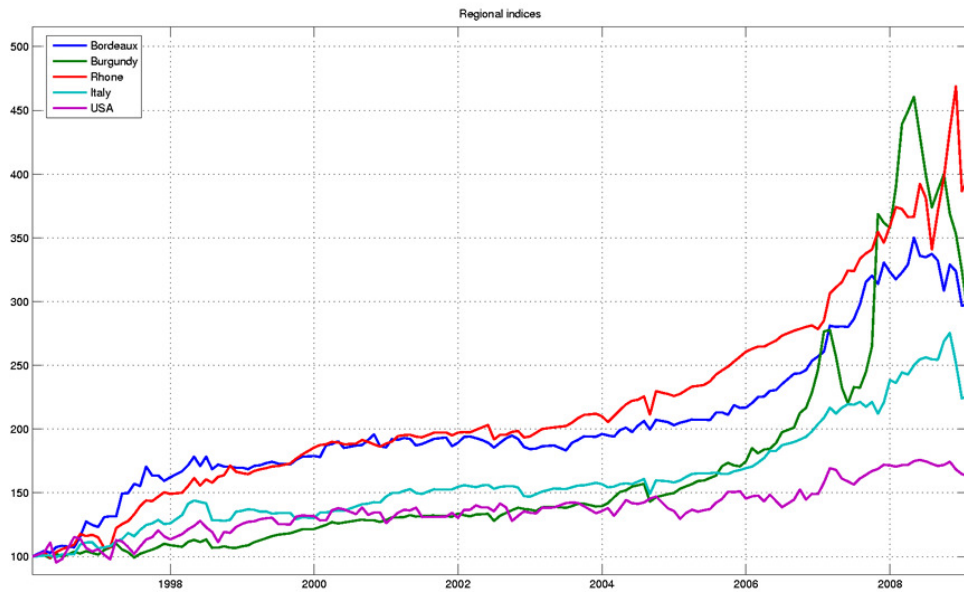
Figure 2 shows that all the different wine regions follow the upward trend of the general wine index but the amplitude is diverging. Regions outside France show positive returns for the period 1996-2009 but only at a cumulated scale of 66% for the USA or 125% for Italy. Prices for the various French wine regions have developed much more favourably and yielded returns of some 200% in Bordeaux (with very similar returns for the left and right bank) and Burgundy and 300% for the Rhône Valley. Prices have decreased in all regions since March 2008 as a result of the crisis. The effect has however been more moderate (minus about 15% for Bordeaux, the Rhône Valley and Italy and only 6% for US wines) than for major equity markets with the exception of the Burgundy region which suffered a setback of 39% (although from a record high). Over the period subject to our research the wine index has clearly beaten the Russell 3000 and experienced much less volatility.

Indices (by price category)

Looking at different price categories of wines sold at auctions as exhibited in figure 3 some interesting patterns appear. Wine selling below 200 USD a bottle has seen a steady increase over the period 1996-2009 and yielding a return of 120% (wines for 100-199 USD) and 170% (wines below 100 USD). On the other hand, wines selling for more than 200 USD a bottle and especially those above 400 USD that can be categorised as collectibles have seen a 3-4 fold price increase and have accordingly fallen most during the financial crisis. Since their high in March 2008 wines under 200 USD have only lost 5-10% of their value while those above have lost approximately 25%.

[Insert table 2 here]

Table 2 illustrates returns and volatilities for different wine indices and the Russell 3000. All wine indices have substantially outperformed the stock index while having a much lower volatility (except for the first growths index that had a similar risk) during the period 1996-2009. Looking at the sub-periods it becomes apparent that the outperformance is essentially due to favourable returns in downturns. During economic growth-periods wine underperforms the Russell 3000 but in crises times it substantially outperforms equities and mostly even yields positive returns. Volatility is lower for all wine indices (with the exception of best wines) in almost all subperiods. Interesting enough, the 2001-03 downturn did not result in an increase in wine volatility compared to prior and post boom cycles. The different wine indices are especially solid in down

markets and therefore seem to be ideally suited to provide balancing and diversification benefits to an investor's equity portfolio.

3 Empirical results

3.1 Portfolio diversification

We start by building different portfolios that represent the risk attitude of typical investors. This allows us to gauge to what extent investing in wine may be of interest in general and more specifically if risk aversion has an impact on investors' choice when adding wine to their portfolio. Following common bank practice and described in Canner et al. (1997) we denote the portfolios as conservative, moderately conservative, balanced, moderately aggressive and aggressive. Table 3 illustrates the asset allocation for each portfolio type.

[Insert table 3 here]

As can be expected risk averse investors, focus on low risk assets such as Fixed Income products, bonds or Blue Chips. Allocation will gradually move towards more volatile assets once risk aversion declines. We select four different cases for each of the five types of investors described above. The initial case stands for investors that hold a portfolio with the above-mentioned assets and does not consider investing in wine. The other three cases include an investment in (i) the general wine index, (ii) first growths wines only or (iii) first growths wines from top vintages. For these portfolios a share of 20% is allocated for and the weight of the other assets is reduced proportionally. An investor holding a portfolio with a value between 500'000 and 1 million USD would typically be able to diversify his portfolio in such a way.

Figure 4
Evolution of different portfolios without and with 20% invested in 1st growths from top vintage wines
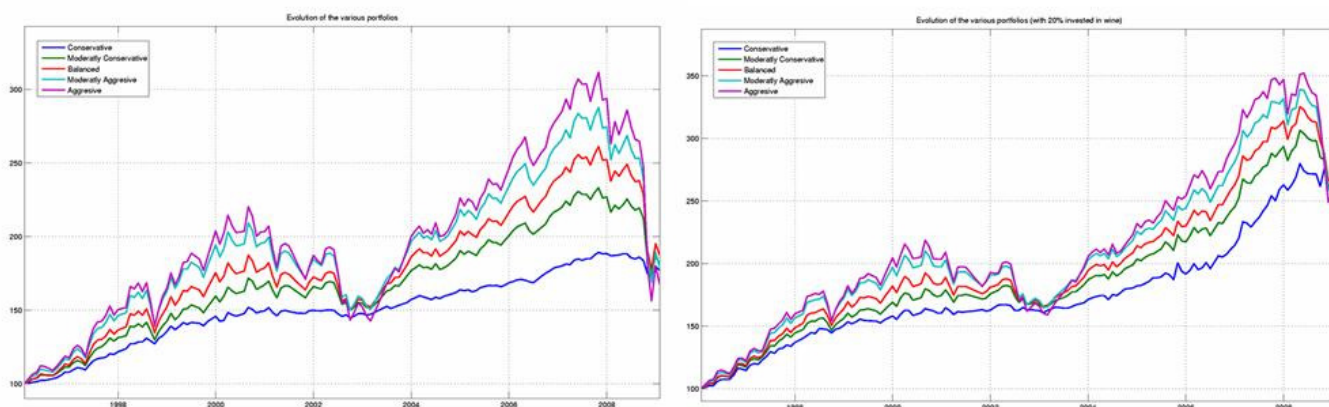

Figure 4 shows that the degree of risk has an impact on portfolio returns.[2] In boom-periods risky portfolios clearly outperform all other investor types. Performance trends are, however, reversed in crises periods. Figure 4 illustrates that the performance of all investor types actually finds a common return level in crises periods (2001-03 and 2007-09) since all the riskier types are losing the head start they have gained over conservative types during growth periods. The addition of wine, however, produces higher returns for all portfolios (different scale in right figure) including conservative portfolios. Again all portfolio types meet the same performance level during crises periods but at a much higher return level.

As can be seen in Panel A of table 4 the different initial portfolios appropriately model the risk-aversion of investors, i.e. volatility of a portfolio increases in line with its aggressiveness. However, more risk does not necessarily imply higher returns. During the financial crisis, the aggressive (higher risk) portfolios performed worse than the balanced or conservative ones. The inclusion of wine as an additional asset-class into a portfolio is favourable. Compared to the initial portfolio, portfolio returns rise and volatility decreases across investor type and wine index. The defensive features of wine are further underlined by a slightly less negative skewness and a kurtosis approaching three. Panel B focuses on the period of the financial crisis (i.e. from mid-2007 onwards). Due to the worldwide crash of stock markets, returns obviously turn negative and volatility increases as compared to the period 1996-2008. It is not a surprise that more aggressive portfolios are the worst performers and have the highest volatility. As for the period 1996-2008 investors with wine in their portfolios perform better than without. In general, returns are higher and volatility is lower. Even more interestingly, a conservative portfolio with 20% first

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[2] Results for the General Wine Index and different price categories are similar to those shown in figure 4.

growths wines or first growths wines from top vintages yields a favourable return of some 3.5% during the crisis with a low volatility of 7-9%.[3]

[Insert table 4 here]

As a further step we run CAPM regressions for the different portfolios. As can be observed in table 5 the above mentioned results are being confirmed. Portfolios that invest in wine have a significantly higher alpha, which increases the more prestigious the wines are. For first growths wines from top vintages alpha at least doubles. This rise in alpha is accompanied by a significant decrease in beta for all portfolios. We broaden our research to include extended regressions in which a dummy for the crisis is added to obtain the following model:

$$R_p - R_f = \alpha_p + \beta_{pM}(R_M - R_f) + D_{FC}(\alpha_p^{FC} + \beta_{pM}^{FC}(R_M - R_f)) + \varepsilon \qquad (1)$$

where the first term represents the initial model and the second term the term for the crisis period with D_{FC} being a dummy taking the value 1 for the crisis period. It can be concluded that results for alphas follow those in the initial model. Alphas do not change for any portfolio type during the crisis and thus similar to the initial model increase in line with the portfolio aggressiveness and wine investment. On the other hand, betas vary significantly during the crisis. For the initial portfolio betas are either significantly positive or insignificant, but for all wine portfolios the beta-dummy for the crisis is significantly negative. It is further proof that the addition of fine wine in portfolios is generating high alphas while reducing its exposition to systematic risk.

[Insert table 5 here]

3.2   Conditional CAPM

Literature on wine investments has shown that fine wine has a low correlation with other assets (Masset and Henderson (2009)) and that standard asset pricing models cannot explain wine returns on their own (Sanning et al. (2008)). Our results support these findings. Alphas of portfolios including wine seem to turn negative in periods of economic downturns and wines

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[3] We also consider portfolios for economic boom periods only. Results are in line with those presented above. The addition of wine in a portfolio does yield positive results independent of the economic cycle.

seem, at least graphically, to follow a similar trend as stocks. This indicates that while wines may not directly be correlated with stock returns they might at least be affected by similar economic factors.

The traditional, unconditional CAPM that is used to evaluate portfolio performance has the major drawback of not taking the changing nature of the economy into account. As a consequence alphas and betas might be miscalculated and misinterpreted. The use of a conditional CAPM model in which alphas and betas can be time-varying is therefore proposed. This approach allows us to identify economic and financial variables that might help explain wine returns more accurately. It, in particular, permits to deepen the understanding of how the wine market works and helps to forecast the evolution of future wine returns while keeping the intuitive interpretation of the CAPM.

The analysis fits the conditional performance of the General Wine Index, 4 sub-indices depending on price category and the first growths from top vintage index, using the Russell 3000 as a benchmark. The model takes the form:

$$r_{p,t} = \alpha_{0p} + \alpha_p^{'} z_{t-1} + \beta_{0p} r_{m,t} + \beta_p^{'} (z_{t-1} r_{m,t}) + \varepsilon_{p,t} \qquad (2)$$

where α_{0p} and β_{0p} are the average alpha and beta, $A_p^{'}$ and $\beta_p^{'}$ the response of the conditional alpha and beta to the information variables z_{t-1}.

The market condition variables z_{t-1} that might influence the evolution of wine prices include: the spread between BAA- and AAA-rated bonds which is suggested by Jagannathan and Wang (1996) as an excellent indicator for the market risk premium; the USD/EUR foreign exchange rate to account for the fact that most wines in the sample come from Europe and are sold in the US. Returns should therefore be especially influenced by this exchange rate. Finally, we also use the lagged wine index returns.[4]

We find evidence that neither alpha nor beta is constant over time. As can be seen in figure 5[5] beta oscillates around zero but does not seem to be too varying and can therefore not be the main driver of the wine market. Alpha, however, is clearly time-varying. It appears that it is strongly influenced by general economic conditions as alpha decreases below the risk-free rate in times of crises (2002/03 and 2007/08) but rises in boom periods.

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[4] We also added the volatility index VIX as an investor fear measure (Whaley (2000)) in our conditional CAPM model. Although the use of the VIX is interesting conceptually and R2 increases slightly it is not significant and causes major multicollinearity problems with the spread variable.

[5] The figure refers to the General Wine Index and the index for first growth wines from top vintages. The same was done for the sub-indices with similar results.

Figure 5
Conditional alpha and beta for the General Wine Index (top) and for 1st growths from top vintages wines (bottom) for the period 1996-2009
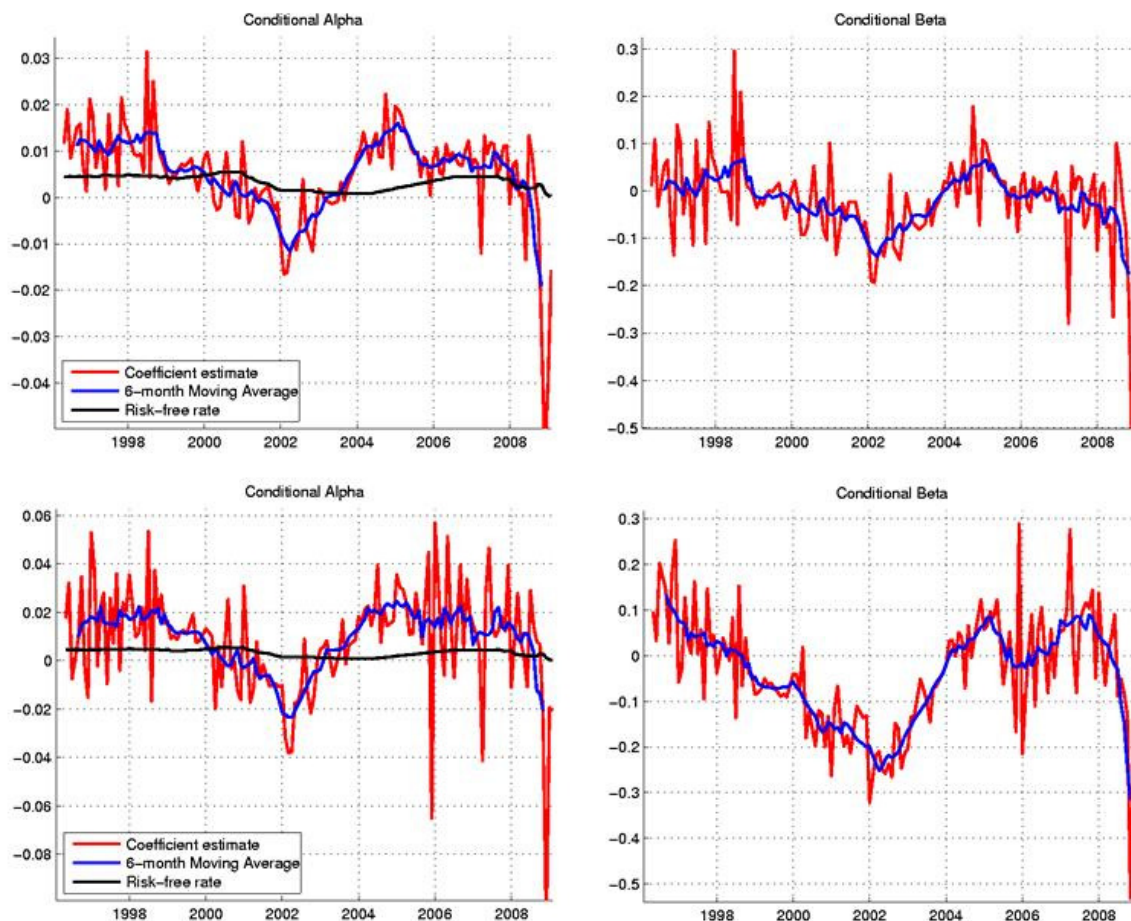
Following equation 2 we present results of the conditional CAPM model in table 6. The USD/EUR foreign exchange rate and lagged returns of the wine index are not significant for the beta coefficient but the spread between BAA- and AAA-rated bonds seems to explain some of the variation in market risk. However, it cannot fully explain the beta variation in wines under 200 USD. These wines are predominantly from Italy and the USA and are highly priced per se. Therefore they stay expensive but are far less affected by economic conditions and less speculative and volatile than French wines. The sensitivity of the alpha coefficient to the spread and foreign exchange rate is significantly negative for all but one index and thus seems to explain most of the variance. The autocorrelation of the index is also significantly negative apart for wines that cost less than 100 or more than 400 USD.

[Insert table 6 here]

14

The explanatory power (R2) can be used to compare the relative performance of the various specifications. The unconditional CAPM has a very low R2 for all portfolios (between 0 and 0.12) which indicates that it is not able to explain the wine market. For the conditional framework it increases (0.07-0.27) which indicates that parameters are time-varying and the estimation with a conditional model more precise. The low R2 of 0.07 and 0.09 for wines costing between 100 and 200 and more than 400 USD respectively can be explained by the characteristics of the wine market. The lower priced wines, come from less speculative wine regions while the wines costing more than 400 USD can primarily be rated as collectibles and thus are also less speculative and crisis resistant. Consequently, the market conditions do not have as high an impact on these wines as on others.

4   Summary and conclusions

In times of economic downturns correlation among financial assets tends to rise and diversification becomes less effective when it is most needed. As a result, investors are increasingly looking for alternatives to diversify their portfolio and often turn to less conventional assets. Fine wines are widely recommended as a possible choice due to their interesting risk-return profile and low correlation with other asset classes. In this paper, we have looked into investments in fine wine for the period 1996-2009 with a special emphasis on how they performed in economic crises.

In this paper we have analysed risk, return and diversification benefits in the wine market in general and in several submarkets. The use of a unique dataset from TCWC covering over 400'000 auction hammer prices allows us to build repeat-sales regression indices and to look at different wine regions, price categories and vintages. Our results show that since 1996, the General Wine Index and particularly first growths wines from top vintages have performed better than equities while showing a lower volatility.

A further and more detailed research into different investor types and wine indices fully supports this evidence and confirms that wine in a portfolio has produced higher returns and lower risks than the Russell 3000 equity index during the period of time. Especially in times of economic downturns such as in the periods 2001-03 or 2007-09 the defensive characteristics of wine are most pronounced. Wine's performance has declined less than other assets. It had an even lower volatility (with one exception) and also showed improved skewness and kurtosis measures. Fine wines may therefore be regarded as an interesting addition to an investor's portfolio.

Results when using the CAPM indicate higher alphas and lower betas for portfolios containing wine. By focusing on the financial crisis we find that although alpha is not significantly different in periods of economic downturns it also does not seem to be constant over time. We therefore extend the analysis to a conditional CAPM framework. This more detailed approach allows us to explain the low explanatory power of the unconditional CAPM and to find which economic variables are best able to describe wine returns while keeping the intuitive interpretation of a CAPM model. Our results suggest that alpha and beta both are time-varying. Wine returns are essentially unrelated to market risk but behave cyclically being affected by the state of the economy.

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Table 1

Trades, USD turnover and number of 75cl equivalent bottles traded per year and region (in absolute numbers) and per year and price category (in relative terms)

Panel A illustrates the relative importance of different wine regions for each year in the period 1996-2008 in terms of number of trades, USD turnover and number of 75cl equivalent bottles. Panel B shows the same for different price categories.

		Panel A: Number of trades, USD turnover and 75cl equivalent bottles sold per year and region												
		1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
# trades	Bordeaux	0.5772	0.4861	0.4664	0.4541	0.3947	0.4009	0.4065	0.4307	0.4197	0.4638	0.5162	0.4776	0.3207
	Bourgogne	0.1936	0.2679	0.2988	0.2792	0.2506	0.1600	0.1084	0.0788	0.0613	0.0398	0.0239	0.0120	0.0469
	Rhone	0.0844	0.0972	0.1055	0.1069	0.1536	0.2058	0.2024	0.1795	0.1791	0.1579	0.1621	0.1680	0.1059
	Italie	0.0849	0.0880	0.0656	0.0708	0.1130	0.1467	0.1946	0.1986	0.1932	0.1667	0.1289	0.1095	0.0881
	USA	0.0600	0.0609	0.0636	0.0891	0.0881	0.0866	0.0881	0.1125	0.1468	0.1719	0.1689	0.2329	0.4384
USD turnover	Bordeaux	0.6277	0.6109	0.6154	0.6232	0.5669	0.5511	0.5427	0.5647	0.5639	0.5853	0.6308	0.5948	0.5287
	Bourgogne	0.1960	0.2301	0.2368	0.2121	0.1848	0.1098	0.0801	0.0573	0.0485	0.0403	0.0233	0.0096	0.0794
	Rhone	0.0637	0.0655	0.0646	0.0771	0.1272	0.1786	0.1743	0.1590	0.1559	0.1475	0.1524	0.1615	0.0863
	Italie	0.0752	0.0646	0.0461	0.0405	0.0747	0.1121	0.1573	0.1662	0.1565	0.1381	0.1062	0.0937	0.0524
	USA	0.0374	0.0290	0.0371	0.0472	0.0465	0.0484	0.0456	0.0527	0.0752	0.0887	0.0873	0.1404	0.2532
# 75cl equiv	Bordeaux	0.6383	0.5127	0.4673	0.4683	0.3874	0.4238	0.4404	0.4628	0.4683	0.5157	0.5819	0.5709	0.3827
	Bourgogne	0.1521	0.2464	0.2959	0.2762	0.2557	0.1451	0.0834	0.0572	0.0490	0.0342	0.0172	0.0053	0.0384
	Rhone	0.0770	0.0995	0.1153	0.1162	0.1605	0.1959	0.1935	0.1744	0.1688	0.1520	0.1568	0.1597	0.1050
	Italie	0.0741	0.0869	0.0618	0.0661	0.1286	0.1690	0.2205	0.2261	0.2107	0.1746	0.1422	0.1150	0.0673
	USA	0.0585	0.0545	0.0596	0.0733	0.0678	0.0663	0.0622	0.0795	0.1031	0.1235	0.1020	0.1491	0.4066
		Panel B: Number of trades, USD turnover and 75cl equivalent bottles sold per year and price category												
		1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
# trades	<$99	0.4576	0.3702	0.3459	0.3397	0.3140	0.3306	0.3263	0.3421	0.3851	0.4394	0.4660	0.4453	0.3305
	$100-$199	0.3167	0.3330	0.3497	0.3495	0.3595	0.3224	0.3465	0.3704	0.3558	0.3490	0.3150	0.3127	0.3505
	$200-$399	0.1757	0.1984	0.2091	0.2131	0.2086	0.2297	0.2188	0.1935	0.1855	0.1560	0.1544	0.1677	0.1675
	>$400	0.0501	0.0984	0.0953	0.0976	0.1179	0.1174	0.1084	0.0941	0.0736	0.0557	0.0647	0.0744	0.1515
USD turnover	<$99	0.2752	0.1789	0.1628	0.1554	0.1399	0.1486	0.1544	0.1711	0.2056	0.2439	0.2738	0.2623	0.1332
	$100-$199	0.3184	0.2792	0.2835	0.2715	0.2661	0.2423	0.2785	0.3172	0.3123	0.3356	0.2999	0.2819	0.2293
	$200-$399	0.2722	0.2521	0.2816	0.2897	0.2837	0.3150	0.2878	0.2793	0.2794	0.2332	0.2466	0.2365	0.1858
	>$400	0.1342	0.2898	0.2721	0.2835	0.3103	0.2941	0.2793	0.2324	0.2027	0.1873	0.1798	0.2193	0.4516
# 75cl equiv	<$99	0.5434	0.4545	0.4212	0.4066	0.3840	0.4071	0.4092	0.4180	0.4507	0.4917	0.5449	0.5541	0.4046
	$100-$199	0.3065	0.3302	0.3476	0.3445	0.3540	0.3159	0.3396	0.3609	0.3464	0.3466	0.2980	0.2859	0.3525
	$200-$399	0.1241	0.1505	0.1662	0.1770	0.1781	0.1955	0.1764	0.1584	0.1529	0.1234	0.1197	0.1203	0.1394
	>$400	0.0260	0.0648	0.0650	0.0718	0.0839	0.0816	0.0748	0.0627	0.0499	0.0383	0.0374	0.0396	0.1035

Table 2
Return and risk for different indices

Indices include the general wine index (GWI), four sub-indices depending on price categories, an index for first growths from top vintages and the Russell 3000. Periods are divided into two boom and two bear periods. Period one covers the period 1996-2001, period two 2001-2003, period three 2003-mid-2007 and period four mid-2007-2009.

	GWI	Bordeaux	Burgundy	Rhône	Italy	USA	<99 USD	100-199 USD	200-399 USD	>400 USD	First growth	Russell 3000
Total Return	148.86%	198.15%	190.98%	296.21%	125.75%	63.29%	170.62%	119.30%	146.96%	284.10%	447.91%	42.24%
Period 1	58.30%	88.44%	27.06%	90.11%	35.73%	36.39%	62.54%	57.05%	58.71%	57.04%	119.89%	142.16%
Period 2	0.10%	-2.05%	10.07%	5.55%	10.84%	0.25%	9.84%	0.94%	-3.22%	7.76%	-0.26%	-41.27%
Period 3	51.42%	59.11%	67.02%	65.63%	44.27%	16.46%	37.02%	34.09%	66.29%	105.92%	108.04%	72.11%
Period 4	-3.00%	-5.48%	18.89%	17.26%	3.76%	-0.55%	6.51%	2.51%	-11.00%	2.35%	11.32%	-42.67%
Volatility	8.23%	10.33%	14.71%	11.88%	9.09%	12.73%	6.84%	6.73%	11.20%	13.61%	18.72%	17.89%
Period 1	8.34%	12.77%	7.41%	11.39%	9.78%	17.57%	7.79%	8.44%	13.02%	14.51%	17.93%	15.56%
Period 2	5.28%	6.77%	4.69%	5.29%	4.41%	10.52%	3.86%	4.58%	5.55%	9.69%	11.49%	16.97%
Period 3	6.42%	6.68%	12.70%	7.47%	6.66%	10.76%	5.64%	5.70%	6.85%	11.69%	21.00%	8.63%
Period 4	14.26%	15.14%	34.16%	24.85%	16.68%	5.29%	10.50%	7.23%	19.81%	20.70%	24.34%	31.15%

Table 3
Asset allocation for different investor types

Allocation of different asset classes depending on the risk aversion of a typical investor. Fixed Income denotes savings that are invested at the 3-months LIBOR rate, bonds are represented by the CGBI USBIG overall AAA index, blue chips by the S&P500, mid caps by the S&P400, small caps by the S&P600 and international stocks by the MSCI World ex-USA.

	Conservative	Moderatly Conservative	Balanced	Moderatly Aggresive	Aggresive
Fixed Income	40%	25%	0%	0%	0%
Bonds	40%	35%	40%	20%	0%
Blue Chips	20%	20%	30%	40%	40%
Mid Caps	0%	10%	10%	15%	20%
Small Caps	0%	10%	10%	15%	20%
International	0%	0%	10%	10%	20%

Table 4
Return, volatility, skewness and kurtosis for different portfolios

Panel A shows total returns, volatility, skewness and kurtosis for the period 1996-2008. Investors are categorised according to their risk aversion and hold portfolios that are either conservative, moderately conservative, balanced, moderately aggressive or aggressive. Each investor type can further choose to invest in the initial portfolio consisting of different financial assets but no wine, a portfolio consisting of financial assets and the General Wine Index, of financial assets and first growths wines from the Bordeaux region or of financial assets and first growths wines from the Bordeaux region for top vintages only. Panel B shows the same for the period of the financial crisis (from mid-2007 onwards).

		Conservative	Moderatly Conservative	Balanced	Moderatly Aggresive	Aggresive
Panel A: Period 1996-2008						
Inital Portfolio	Total returns	77.1237	81.437	87.3863	79.2411	67.3985
	Volatility	0.041	0.0848	0.108	0.1426	0.1761
	Skewness	-0.3347	-1.6096	-1.5141	-1.7208	-1.9434
	Kurtosis	5.4556	10.7716	10.4198	11.3909	12.817
Portfolio with the General Wine Index	Total returns	101.3297	104.7804	109.5399	103.0237	93.5496
	Volatility	0.0368	0.0641	0.0813	0.1074	0.1321
	Skewness	0.0173	-1.0583	-1.1524	-1.39	-1.6252
	Kurtosis	3.287	5.7762	6.3917	7.6735	9.0966
Portfolio with 1st growth wines	Total returns	137.3675	140.8182	145.5777	139.0615	129.5874
	Volatility	0.0483	0.0643	0.0781	0.1005	0.1219
	Skewness	0.226	-0.3646	-0.4889	-0.7282	-0.9537
	Kurtosis	3.0868	3.2889	3.208	3.7384	4.5558
Portfolio with 1st growth from top vintages	Total returns	151.2819	154.7325	159.492	152.9758	143.5017
	Volatility	0.0619	0.072	0.0827	0.1021	0.1214
	Skewness	0.3077	-0.3729	-0.4978	-0.686	-0.8616
	Kurtosis	4.4406	4.1372	3.5315	3.5559	3.9366
Panel B: Financial Crisis Period (since mid-2007)						
Inital Portfolio	Total returns	-4.2401	-20.6806	-26.2372	-36.1765	-44.9145
	Volatility	0.0617	0.1561	0.1984	0.2669	0.3412
	Skewness	-0.3348	-1.1962	-1.105	-1.225	-1.2634
	Kurtosis	5.8931	5.8785	5.8379	5.8293	5.7703
Portfolio with the General Wine Index	Total returns	-3.0023	-15.583	-20.2723	-28.5779	-36.0587
	Volatility	0.0461	0.0998	0.1306	0.1793	0.2315
	Skewness	-0.1748	-1.0759	-1.0835	-1.2398	-1.298
	Kurtosis	2.8868	3.8564	4.3089	4.797	5.0137
Portfolio with 1st growth wines	Total returns	3.5804	-8.8442	-13.657	-21.8397	-29.2053
	Volatility	0.0715	0.0852	0.1054	0.1427	0.1851
	Skewness	0.1282	-0.3417	-0.3035	-0.5575	-0.7333
	Kurtosis	1.9148	2.236	2.0085	2.4715	2.9637
Portfolio with 1st growth from top vintages	Total returns	3.7613	-8.103	-12.7556	-20.6651	-27.8108
	Volatility	0.0977	0.1012	0.1134	0.1429	0.1789
	Skewness	-0.0056	-0.7098	-0.5305	-0.5685	-0.6351
	Kurtosis	2.3208	3.4196	2.8416	2.5156	2.5003

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Table 5
Market model regressions for different portfolios

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Panel A shows alphas and betas of market model regressions for the period 1996-2008 for different investor types and portfolios with and without wine. Panel B shows the same market model regressions with dummies for the financial crisis. The asterisks show significance levels of 1% (***), 5% (**) and 10% (*)

		Conservative	Moderately Conservative	Balanced	Moderately Aggressive	Aggressive
Panel A: Market model regressions						
Initial Portfolio	Alpha	0.0008*	0.0015***	0.0019***	0.0020***	0.0018**
		(1.74)	(3.05)	(3.38)	(3.02)	(2.02)
	Beta	0.2124***	0.4787***	0.6135***	0.8138***	1.0006***
		(24.41)	(52.03)	(57.53)	(65.06)	(56.97)
Portfolio with the General Wine Index	Alpha	0.0014**	0.0019***	0.0022***	0.0023***	0.0022***
		(2.02)	(2.85)	(3.23)	(3.15)	(2.59)
	Beta	0.1337***	0.3355***	0.4426***	0.5986***	0.7395***
		(9.91)	(25.98)	(33.35)	(42.28)	(44.29)
Portfolio with the 1st growths wines	Alpha	0.0025**	0.0030***	0.0032***	0.0033***	0.0033***
		(2.21)	(2.79)	(3.07)	(3.10)	(2.88)
	Beta	0.0902***	0.2786***	0.3804***	0.5260***	0.6554***
		(4.11)	(13.59)	(18.69)	(25.35)	(29.75)
Portfolio with the 1st growths wines from top vintages	Alpha	0.0028*	0.0033**	0.0035**	0.0036***	0.0036**
		(1.87)	(2.30)	(2.54)	(2.59)	(2.48)
	Beta	0.0766***	0.2571***	0.3556***	0.4958***	0.6197***
		(2.62)	(9.39)	(13.29)	(18.39)	(22.20)
Panel B: Market model regressions with financial crisis dummies						
Initial Portfolio	Alpha	0.0004	0.0014***	0.0017***	0.0020***	0.0021**
		(0.90)	(2.74)	(2.92)	(2.87)	(2.29)
	Beta	0.2395***	0.4717***	0.6095***	0.7962***	0.9467***
		(21.28)	(37.96)	(42.28)	(47.39)	(41.52)
	Alpha-Crisis	0.0014	0.0010	0.0015	0.0010	0.0011
		(1.01)	(0.65)	(0.85)	(0.49)	(0.39)
	Beta-Crisis	-0.0557***	0.0194	0.0144	0.0434*	0.1254***
		(-3.17)	(1.00)	(0.64)	(1.66)	(3.52)
Portfolio with the General Wine Index	Alpha	0.0014**	0.0021***	0.0023***	0.0025***	0.0027***
		(1.99)	(3.00)	(3.25)	(3.27)	(2.87)
	Beta	0.1736***	0.3565***	0.4681***	0.6219***	0.7429***
		(9.96)	(20.80)	(26.64)	(33.09)	(33.07)
	Alpha-Crisis	-0.0031	-0.0034	-0.0031	-0.0037	-0.0041
		(-1.42)	(-1.61)	(-1.40)	(-1.59)	(-1.46)
	Beta-Crisis	-0.1010***	-0.0598**	-0.0686**	-0.0660**	-0.0227
		(-3.71)	(-2.24)	(-2.50)	(-2.25)	(-0.65)
Portfolio with the 1st growths wines	Alpha	0.0023**	0.0028***	0.0030***	0.0032***	0.0033***
		(1.96)	(2.63)	(2.87)	(2.97)	(2.82)
	Beta	0.1666***	0.3458***	0.4556***	0.6065***	0.7249***
		(5.94)	(13.14)	(17.69)	(23.31)	(25.60)
	Alpha-Crisis	-0.0032	-0.0039	-0.0037	-0.0045	-0.0050
		(-0.93)	(-1.18)	(-1.15)	(-1.38)	(-1.42)
	Beta-Crisis	-0.1837***	-0.1654***	-0.1827***	-0.1974***	-0.1746***
		(-4.19)	(-4.03)	(-4.54)	(-4.86)	(-3.95)
Portfolio with the 1st growths wines from top vintages	Alpha	0.0027*	0.0032**	0.0034**	0.0035**	0.0036**
		(1.72)	(2.20)	(2.40)	(2.50)	(2.45)
	Beta	0.1528***	0.3296***	0.4381***	0.5872***	0.7042***
		(3.98)	(9.21)	(12.68)	(17.07)	(19.56)
	Alpha-Crisis	-0.0043	-0.0051	-0.0050	-0.0059	-0.0065
		(-0.91)	(-1.14)	(-1.16)	(-1.37)	(-1.46)
	Beta-Crisis	-0.1872***	-0.1817***	-0.2037***	-0.2272***	-0.2140***
		(-3.13)	(-3.25)	(-3.78)	(-4.23)	(-3.81)

Table 6
Conditional CAPM regressions for different portfolios

This table presents the average conditional alpha(s), the coefficient estimates for the conditional alpha function and the average conditional beta(s) for the general wine index, price category sub-indices and first growths from top vintages wines using a conditional CAPM model. The information variables are the Spread of BAA- and AAA-rated bonds, the USD/EUR foreign exchange rate and the autocorrelation of the respective wine index (ACWI). R2 is the coefficient of determination, expressed in percentage. The asterisks show significance levels of 1% (***), 5% (**) and 10% (*).

	GWI	Price <99 USD	Price 100-199 USD	Price 200-399 USD	Price >400 USD	1st growths top vintage
Alpha	0.0606***	0.0338***	0.0303**	0.0757***	0.0721***	0.1183***
	(4.21)	(2.74)	(2.45)	(3.79)	(2.87)	(3.65)
Alpha (Spread)	-0.3861***	-0.4231***	-0.1353	-0.4835***	-0.3010***	-0.2840***
	(-4.90)	(-3.07)	(-0.97)	(-5.00)	(-2.60)	(-2.93)
Alpha (USD/EUR)	-0.6023**	-0.4586	-0.7690*	-0.5271**	-0.6852**	-0.7109***
	(-2.56)	(-1.30)	(-1.88)	(-2.05)	(-1.98)	(-2.62)
Alpha (ACWI)	-3.7046***	-2.5296	-6.2574**	-4.6050***	0.0055	-2.6593***
	(-2.61)	(-0.95)	(-2.13)	(-4.14)	(0.00)	(-3.93)
Beta*Rm	6.5660	-8.3550	10.0759	3.8151	11.5409	5.0034
	(1.22)	(-1.03)	(1.08)	(0.64)	(1.47)	(0.81)
Beta*Rm(Spread)	-2.9290***	-1.5592	-1.4323	-2.6539***	-2.5007**	-1.8090*
	(-3.73)	(-1.31)	(-0.98)	(-2.96)	(-1.96)	(-1.93)
Beta*Rm(USD/EUR)	-4.3828	8.0148	-9.4257	-2.6539	-8.9293	-4.2849
	(-0.84)	(1.02)	(-1.03)	(-0.46)	(-1.16)	(-0.71)
Beta*Rm(ACWI)	-50.5660**	40.3136	-53.6898	-8.2761	-15.1290	11.5959
	(-2.14)	(0.91)	(-1.27)	(-0.50)	(-0.56)	(0.96)
R2	0.2295	0.1928	0.0665	0.2759	0.084	0.2077