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Wine: To Drink or Invest In?
A Study of Wine as a Financial Asset in French Portfolios*

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Abstract

This paper aims to assess the role of wine as a financial asset in the diversification of French investors' portfolios. Our 2007-2013 monthly database is composed of Liv-ex indexes and the WineDex indexes from iDealwine, an online platform for wine investment in France. We also include stocks, bonds and a risk-free asset and constitute several portfolios based on the degree of investor risk aversion, as proposed by Canner et al. (1997). Moreover, we compare wine to another alternative asset, gold. Using both mean-variance (Markowitz 1952) and mean value-at-risk (Favre and Galeano 2002) portfolio optimization, we find that portfolios with wine (or gold) are more efficient than portfolios without it. Moreover, we use the Sharpe (1964) and modified Sharpe (Gregoriou and Gueyie 2003) ratios to calculate performance and find that the higher the proportion of wine (or gold), from 5% to 50%, the higher the portfolio performance is. We also find that French wine indexes, particularly WineDex Bordeaux, are more profitable than gold or Liv-ex indexes. This suggests that French investors should invest in wine through iDealwine and not through Liv-ex.

Keywords: Wine, gold, alternative investments, portfolio diversification

JEL code: G11

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1. Introduction

It might seem that investing in grade wine is a recent practice but in fact the first investments date back over 150 years. The first investments in fine wine were made in the 18th century, when advances in conservation methods and the advent of glass bottles and cork stoppers allowed the wine trade to expand its horizons. These advances would particularly benefit the Bordeaux nobility, who would go on to seduce and conquer the English with the high quality of their wines. The wine trade with Great Britain through the port of Bordeaux marked the beginning of the French fine wine trade, especially trade in the Bordeaux wines. Then in 1855 at the Paris Universal Exhibition, the Bordeaux wines were classified for the first time ever¹ based on the chateau's reputation and the trading price, which was directly tied to the wine's quality. Thus, collectors gradually began to see wine as an investment, and it eventually came to be considered as a speculative asset or a safe-haven asset: a hedge against inflation, interest rate variations, and so on. Although in the 1960s the sale and resale of wine was prohibited between individuals, particularly in the United States, by the early 1970s, US investors began to see wine as a savings and investment vehicle. Today and throughout the world, wine is not only a consumer good but also an investment opportunity.

There are many ways to invest in wine. First, we can create our own wine cellar by buying wine in bottles directly from wineries just after bottling or "*en primeur*," which means buying wine immediately after the harvest when it is still in barrels. Second, we can buy bottles through wine auctions². Third, we can invest in wine companies³ as part of a collective of investors, with each investor having a "turnkey" cellar managed and sold by a professional. Fourth, wine investment funds, like traditional mutual funds, are another way to invest. In this case, each fund is a kind of portfolio, containing several types of wine⁴.

¹ Wines were ranked from first to fifth growths.

² Many auction houses such as Drouot, Christie's, Sotheby's, Morell Wine Auctions, and Acker Merall & Condit regularly organize fine wine sales. For several years now, online auctions have also been held. For example, the prestigious *Hospice de Beaune* wine auctions, organized since 2005 by Christie's, also allow participants to bid online since 2007.

³ For example, in France, Patriwine.fr, Cavissima.com, Cavedepargne.com, labergereinvestment.com, idealwine.com, Emlindex.com and Rscorp.fr manage wine portfolios just as they would any other financial portfolio. These companies offer investors either an "unsupervised cellar" or a "turnkey cellar." In the first one, investors can choose their bottles. In the second one, the wine investment company instead of the investor chooses the bottles.

⁴ To our knowledge, Ascot Wine Management Fine Wine Fund, launched in the Bahamas in the early 1990s, was the first such fund. Thereafter, many other wine funds emerged, such as Int'l Wine Investment Fund

Fifth, investors can buy shares in a wine investment group⁵. In this case, the investor group buys vineyard parcels, which are then managed by a professional wine grower. The individual investor thus becomes the owner of a part of the vineyard proportional to the share held in the wine investment group.

Despite its attractiveness as an investment asset, wine is first of all a consumer good. Traditionally, buying fine wine has been linked to emotional factors rather than to purely speculative factors. However, because wine shows a low correlation with standard financial assets⁶, this tangible asset can be complementary or substitutable in a traditional stock portfolio, even though the emotional aspect of the investment is also present. Moreover, unlike traditional financial assets, wine can be consumed. Nevertheless, wine is less liquid than traditional financial assets: an estimated 15 days⁷ are needed to sell wine, whereas an order for traditional financial assets is executed almost instantly. Furthermore, wine is an “agricultural” good. Thus, its quality and profitability depend to the winegrower’s know-how, climate variations, the institutional framework, production technology and economic conditions (Kourtis et al., 2012). Moreover, compared with investment in traditional financial assets, wine investment implies non-negligible storage, insurance and transaction costs. According to Masset and Henderson (2010), the total cost of wine investment is higher than the cost of investment in financial assets, in great part because the latter have no storage costs and their transaction costs are low. However, wine investments have more tax advantages⁸ than financial assets.

The growth in wine investment has led to a new research area that focuses on wine as a financial asset. Krasker (1979) was the first to empirically study the returns from wine investment and showed that it was not more profitable than the riskless asset. Since this pioneering study, many other authors have continued research in this direction (e.g., Jaeger 1981, Weil 1993, Graeser 1993, Byron and Ashenfelter 1995, Burton and Jacobsen 2001,

(Australia), Orange Wine Fund (the Netherlands), the Wine Investment Fund (Great Britain), and Uzès Grand Crus (France).

⁵ For example, “UFG Group”, “Saint Vincent Group” or “La Française AM Group” are French wine investment groups.

⁶ See, for example, Fogarty (2010) or Masset and Henderson (2010).

⁷ Interview with Franck Noguers, founder of Patriwine, *Les Echos Bourse*, December 20, 2013.

⁸ For example, in Australia and England, wine investments are exempted from tax. In France, gains from wine investments are taxed at a flat-rate of 34.5%. Nevertheless, this rate is applicable when the sale value is higher than 5,000 euros per invoice. Thus, it is possible to sell below this threshold several times per year and not be subjected to any tax.

Fogarty 2006, Masset and Henderson 2010, Masset and Weisskopf 2010, Storchmann 2012), with most using wine prices from auction houses or from Liv-ex⁹.

In this article, we investigate wine as both an individual asset and a portfolio diversifier from the French investors' point of view. Our paper extends the above literature in two ways. First, in addition to the four Liv-ex indexes, we also use four French indexes from iDealwine, an online platform for wine investment in France. We have chosen to study wine investment in France because France is one of the biggest wine producers in the world and most of the investable grade wines are French (e.g., Bordeaux and Burgundy wines). In addition, the number of online platforms for wine investment has increased in France in the last few years (e.g., iDealwine, Cavissima, etc.). Second, we compare wine to another well-known alternative asset: gold. For this comparison, we use the Napoleon coin¹⁰ because of its popularity with French investors. We also use French and international data on stocks (Cac 40, Cac Mid 60, Small Cac and MSCI World), bonds (the EMTX index) and the risk-free asset (Euribor 1 month) to build the different portfolios. Our database is monthly and ranges from January 2007 to December 2013.

To answer our research question, we use two approaches to portfolio optimization. The first is the classical mean-variance analysis proposed by Markowitz (1952) and the second is the value-at-risk method from Favre and Galeano (2002). The portfolios are built to include investor risk profiles¹¹ based on the work of Canner et al. (1997). We then add from 5% to 50% of wine (or gold) and measure its impact on portfolio performance (using the Sharpe and modified Sharpe ratios).

The rest of the paper is organized as follows. Section 2 presents a review of the literature on the profitability of wine investment. Section 3 introduces our database. Section 4 presents the results, and section 5 concludes.

⁹ In 1999, the London Vintners Exchange (Liv-ex) was created in London. Since the early 2000s, other indexes have emerged [iDealwine and WineDex Indexes, Langton's Classification of Australian Wine Indexes (LCAWI), Australian Wine Index (AWI), Winedecider Indexes or Vinfolio Indexes].

¹⁰ This is the old 20 francs coin during the gold standard in France from 1803 to 1914.

¹¹ These are conservative, moderately conservative, balanced, moderately aggressive, and aggressive. This approach was also used by Masset and Weisskopf (2010).

2. Wine as a financial asset: a literature review

As stated above, Krasker (1979) was the first to conduct an empirical study on the rate of return on investments in wine. He used the repeat-sales regression method to analyze wine prices from Heublein Wine Auctions from 1973 to 1977 (for red Bordeaux and Cabernet Sauvignon produced since 1950). The author showed that the rate of return on wine investment was not significantly different from that of the risk-free asset (Treasury Bills). Jaeger (1981) extended Krasker's study (1979) by examining a longer period, from 1969 to 1977. Using the repeat-sales regression method, the author found that the rate of return on wine investments was higher than that of Treasury Bills. The gap ranged from 8.5% to 16.6% depending on the storage cost. According to Jaeger (1981), the negative result of wine investments reported by Krasker (1979) was due to the decrease in wine prices in 1974 and 1975 because of a large surplus in wine stocks. Furthermore, Jaeger (1981) assumed that storage costs were lower than Krasker did (1979), i.e., \$0.449 per 12-bottle case versus \$16.80. Jaeger (1981) also explained that wine cannot be considered as a riskless asset because it is a living substance and the maturation process can last 20-40 years for some red wines. Thus, the price of wine will change over time due to unanticipated changes in its quality or the demand for it.

Weil (1993) carried out the first study comparing wine and stocks over the 1976-1992 period. The author was interested in various Bordeaux, Burgundy and Northern Rhone wines. He analyzed 68 transactions and found a 9.9% average annual rate of return, which dropped to 7.2% when transaction and storage costs were taken into account. Weil (1993) also found that wine was less profitable than stocks quoted on the New York Stock Exchange (19.3% per year). Byron and Ashenfelter (1995) found that Grange Hermitage, Australia's premier wine, had a 3.3% to 4.6% rate of return over the 1966-1991 period. Based on London auction prices in 1990 and 1991 for ten vintages from 1960 to 1969 from six Bordeaux chateaux, Ashenfelter et al. (1995) found a 2.4% rate of return, which was lower than that of the Dow Jones. However, according to Graeser (1993), fine wine provided a higher return as a long-term investment than traditional financial assets.

Burton and Jacobsen (2001) conducted a study on the 1986-1996 period for red Bordeaux wines produced from 1960 onward, using data drawn essentially from William Edgerton's Wine Price File. Their objective was to determine the profitability of holding red Bordeaux wine using the repeat-sale regression method. They showed that the rate of return was 7.9%

per year on average, while that of the Dow Jones Industrial Average (DJIA) was 13.5%. Wine nevertheless outperformed Treasury Bills (T-bills), whose rate of return was 5.8%. Overall, the authors concluded that the wine returns were more volatile ($SD = 0.133$) than stocks or T-bills (respectively, $SD=0.079$ and $SD=0.008$) during the same period.

Fogarty (2006) analyzed the premium Australian wine returns from 1989 to 2000 with data provided by Langton's auction house. Using the adjacent period hedonic price regression method, he showed that these wines provided a return similar to that of Australian standard financial assets, but with lower volatility. Furthermore, Fogarty (2006) showed that the more expensive the wine was, the more profitable and less risky it was. The explanation was that auction transactions on the most expensive wines were more frequent than those on less expensive wines, resulting in lower standard deviations for the expensive wines. However, Fogarty (2006) also noted that, according to the traditional risk-return relationship, a higher return should have been expected from the less expensive wines to offset their higher risk level. These contradictory results were explained by the relative newness of the Australian wine market.

Sanning et al. (2008) studied Bordeaux wine returns using the 1996-2003 auction prices from The Chicago Wine Company for red Bordeaux vintages ranging from 1893 to 1998. They used the Fama-French three-factor model and the capital asset pricing model (CAPM) and found that grade wine investments were yielding excess returns of 7.5% to 9.5% per year. They also showed that wine had zero betas and was little exposed to common market risk factors. Their analysis of the covariance between wine and stock returns showed that it was near zero. They thus concluded that grade wine investment should be considered as a potential diversification asset for investors seeking to reduce portfolio risk. In a more recent study on Australian fine wines, Fogarty (2010) found similar results. Because of the lack of correlation between wine and standard financial assets, Fogarty (2010) concluded that wine provided an opportunity for portfolio diversification despite its lower rate of return than conventional financial assets.

Like Fogarty (2010), Masset and Henderson (2010) focused on Bordeaux fine wine prices from the Chicago Wine Company's auctions over the 1996-2007 period and constructed their wine indexes on the basis of the weighted average of the observed wine prices. Their results also confirmed the diversification benefit of fine wine. Thanks to its low correlation with standard financial assets, wine can be used to diversify a portfolio in order to reduce its

risk. In their mean-variance analysis, the authors derived the efficient frontier for four portfolios composed in the first case only of equities and then diversified by art assets and different wine category assets in the three other cases. This allowed them to observe the effect of the wine and art assets on the efficient frontiers. They reported that the standard deviation of the optimal portfolio¹² was much lower due to the low correlation of wines and art works with the standard financial assets. Moreover, they noted that the correlation between standard financial assets and wine changed over time. For example, during the 2007 financial crisis¹³, the correlation increased significantly, reflecting the rapid decrease in wine prices. However, the fall in stock indexes was greater than in wine indexes¹⁴ and they ultimately concluded that wine may be a less efficient portfolio diversifier during crisis periods. Moreover, this situation was not stable because, by the end of 2008, the correlation had decreased and stayed close to zero.

In a similar study covering the 1996-2009 period, Masset and Weisskopf (2010) examined wine returns, especially during financial crises. Their data were collected from Chicago Wine Company auctions and included more than 340,000 transactions. They then constructed their own wine indexes by applying the repeat-sales regression method to these auction prices. They also used the Russell 3000 equity index to capture the market evolution in the same period. They confirmed the conclusion of Masset and Henderson (2010) and characterized the wine returns during crisis times, as in the 2001-2003 and 2007-2009 periods, as “shockproof,” noting that they were more resistant and decreased less than other financial assets. To further analyze the portfolio performance and diversification attributes of wine, the authors built several portfolios¹⁵, without and with wine in differing proportions based on the degrees of investors’ risk aversion. They showed that including wine in a portfolio increased its returns and decreased its volatility. Furthermore, they also ran CAPM regressions for these portfolios and showed that the portfolios with wines had higher alphas and lower betas. They also noted that the alphas and betas were time-varying and that economic conditions cyclically impacted the wine returns. The authors concluded

¹² They observed that wines and art works were highly weighted in the optimal portfolio.

¹³ To study the impact of financial crisis on wine prices, Masset and Henderson (2010) used the Liv-ex 100 and Liv-ex 500 indexes because information on *Chicago Wine Company* auctions was missing for the 2007-2009 period.

¹⁴ Between September and December 2008, the S&P 500 index decreased by more than 40%, whereas the drop was only 25% and 6% for the Liv-ex 100 and 500 indexes, respectively.

¹⁵ Portfolios were denoted as conservative, moderately conservative, balanced, moderately aggressive and aggressive as a function of the investor’s risk aversion.

that wine could be used as a portfolio diversifier due to its risk-return profile and low correlation with traditional financial assets.

Similar results were obtained by Kumar (2010) in a study over the 1983-2002 period. He compared the profitability and diversification benefits of the Fine Wine 50 Index (with FTSE 100, DJIA, UK Government Bonds and US 30 Year Treasury Bonds) and showed that investing in wine was more profitable (12.3% per year) than investing in equities (respectively, 9.2% and 11.7% for FTSE 100 and DJIA) or bonds (respectively, 1.2% and 0.3% for UK Government Bonds and US Treasury Bonds). Wine volatility was higher (13.9% per year) compared with bonds (respectively, 6.2% and 1.1%), but lower compared with equities (respectively, 16.5% and 15.9%). For the correlation coefficients between wine and equities, and between wine and government bonds, the author showed either a weak negative correlation or a correlation close to zero. Thus, fine wine was a better hedge against the volatility of financial markets than traditional financial assets and provided significant diversification benefits by reducing the portfolio risk. According to the author, the optimal risk-return efficient portfolio was composed of either 91% fine wines and 9% equities quoted on UK markets or 58% fine wines and 42% equities quoted on US markets. The portfolios with the highest rates of return for both UK and US markets were composed of 100% fine wines. As for the minimum-risk portfolio, it was composed of 18% (respectively, 1%) fine wines, 4% (respectively, 1%) equities, and 78% (respectively, 98%) government bonds in the case of UK markets (respectively, US markets). Kumar (2010) stated that the portfolios with fine wines had higher Sharpe ratios than portfolios with only equities and bonds. The CAPM analysis confirmed the optimal risk-return portfolio analysis and recommended investing in fine wine.

Kourtis, Markellos and Psychoyios (2012) highlighted the benefits of international diversification for wine portfolios. Their first dataset was composed of nine fine wine indexes from WinePrices.com in the 2005-2010 period. The second one was composed of four Liv-ex indexes in the 2001-2010 period. They used correlation and principal component analyses and stated that diversification with international wines (such as Australian, Italian and Portuguese fine wines) was more profitable than with only French wines.

In parallel to these studies on the profitability of wine investment, others have focused on the determinant factors of wine prices.

Ashenfelter (1986, 1987a, 1987b) was the first to conduct a quantitative analysis on the determinants of wine quality and pricing, using a model applied to Bordeaux vintages. He showed that the age of the wine and the climate conditions during the growth season impacted the auction prices. Subsequently, Gladstones (1992), Ashenfelter et al. (1995), Byron and Ashenfelter (1995), Jones and Storchmann (2001), Haeger and Storchmann (2006), Hadj Ali and Nauges (2007), Ashenfelter (2008), Ashenfelter and Storchmann (2010), Chevet et al. (2011), Ginsburgh et al. (2013), and Ashenfelter and Jones (2013) also analyzed the factors influencing wine prices. According to these studies, weather conditions comprised the main factor. More generally, Outreville (2010) summarized the determinant factors as follows: ① geographical and viticulture factors (climate, soil, region, grape variety), ② temporal factors (age, vintage), ③ production costs (fixed and variable costs, types of wine, returns), ④ information (label, designation, reputation), and ⑤ supply and demand (scarcity, culture). More recently, Le Fur et al. (2013) conducted a study on the 2000-2012 period through a hedonic price analysis of the top five chateaux in Bordeaux. Their data came from 30 auction houses operating in six countries (China, France, Switzerland, the UK, and the Netherlands). These authors showed that wine prices were significantly influenced by the markets where the wines were traded, a finding that they explained by differences in transaction costs.

This literature review suggests that wine investments are profitable but that the profitability is not stable over time. Moreover, it appears to be more profitable to invest in international wines than only in French wines. Overall, wine is a good portfolio diversifier since its correlation with other assets is low; however, this is not always true over time. In our study, we examine wine as both an individual financial asset and a portfolio diversifier using wine price indexes from Liv-ex and iDealwine. Details about our database are presented in the next section.

3. Database and descriptive statistics

Our database is monthly. We study the period from January 2007 to December 2013 because iDealwine wine prices are available only from January 2007.

Wine and gold prices

For wine price indexes in France, we use the indexes from iDealwine, a French online platform for wine investment¹⁶. Its indexes are cited by prestigious professional journals in France, such as “*Le Figaro Vin*” and “*Le Monde*”¹⁷. The iDealwine indexes are calculated on the basis of prices collected from wine auctions in France, about 300 per year. The four indexes that we use are WineDex Bordeaux, WineDex Bourgogne, WineDex Rhône and WineDex 100. WineDex Bordeaux is calculated from 40 well-known wines of the Bordeaux region within the last ten vintages. WineDex Bourgogne is composed of 40 well-known wines from the Burgundy region, and WineDex Rhone is constituted from 25 well-known wines of the Rhone region. The WineDex 100 summarizes the above three indexes. It contains the most representative grade wines in France and provides general information about the market¹⁸. The last vintage included in the indexes is systematically four years prior to the current year. Thus, for 2013, the vintages in the indexes are from 2000 to 2009.

We use four Liv-ex indexes: Liv-exFine Wine 50, Liv-ex Fine Wine 100, Liv-ex Bordeaux 500 and Liv-ex Fine Wine Investables. The studied period is the same as for French wine indexes, from January 2007 to December 2013. The Liv-ex Fine Wine 50 is composed of 50 wines from the last ten “physical” vintages (meaning not “*en primeur*”) of the first five growths in the Bordeaux region: Haut Brion, Lafite, Latour, Margaux and Mouton Rothschild. The second index, Liv-ex Fine Wine 100, has been declared the “fine wine industry’s leading benchmark” by Reuters. It is composed of 100 wines, not only from Bordeaux but also from the Burgundy, Rhone, Champagne regions and Italy. Liv-ex Bordeaux 500 is the most comprehensive index. It is composed of 500 wines of the last ten “physical” vintages. Finally, Liv-ex Fine Wines Investable takes into account the most “investable” wines with around 200 wines from 24 top Bordeaux chateaux. The component wines date back to 1982 vintages and are chosen based on Robert Parker’s ranking. Wines must have scored 95 points or above. However, the top eight “brands” of Bordeaux (the first five growths mentioned in Liv-ex 500 plus Ausone, Cheval Blanc and Petrus) are included if the score is over 90.

¹⁶ Other wine price indexes also exist. See Appendix for a more complete presentation.

¹⁷ Monthly comments about the evolution of WineDex indexes are published in “*Le Figaro Vin*”. See for example the article published on February 2014, <http://avis-vin.lefigaro.fr/connaitre-deguster/o110771-les-indices-winedex-idealwine-debutent-lannee-2014-dans-le-vert>, or in “*Le Monde*”, on July 27, 2013, http://www.lemonde.fr/argent/article/2013/07/27/l-euphorie-contrariee-du-marche-du-vin_3454487_1657007.html.

¹⁸ For each index, the list of the composing wines is available on the iDealwine’s website or on request from the authors.

For gold prices in France, we use the most representative gold asset, the Napoleon coin. This coin was used as currency during the last gold standard period in France from 1803 to 1914. Its gross weight is 6.4 grams and its gold net weight is 5.8 grams. Daily prices are available from the Bank of France website. In this article, the periodicity is monthly from January 2007 to December 2013.

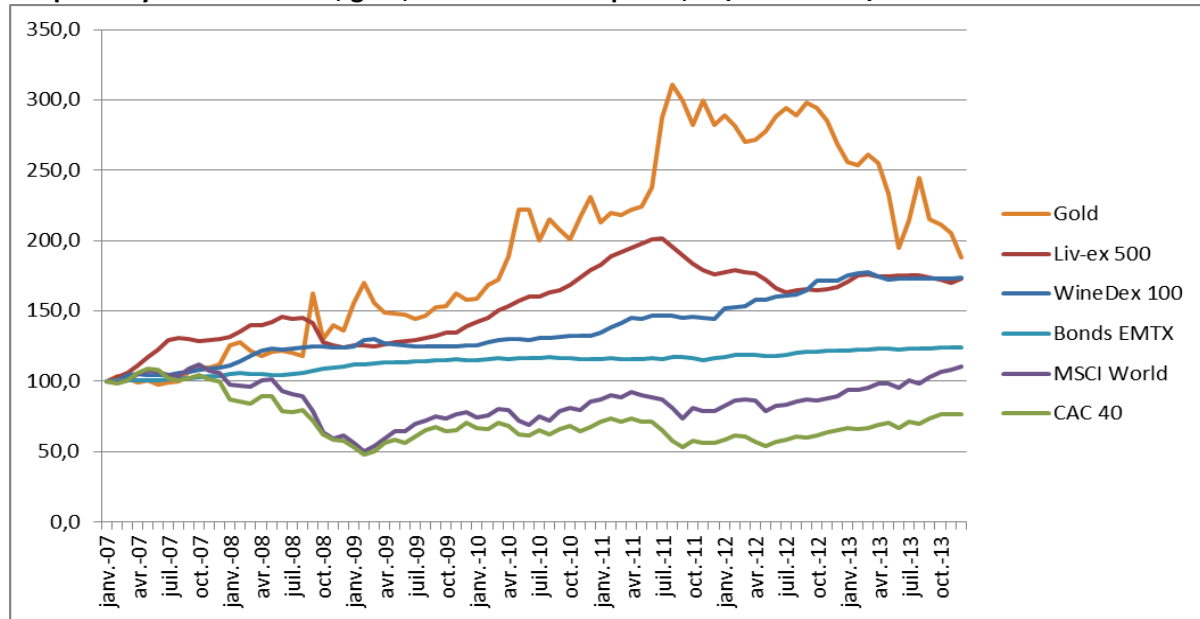
Stocks, bonds and risk-free assets

To constitute portfolios that reflect the French investors' point of view, we use the approach of Canner et al. (1997)¹⁹, who assessed portfolio composition in terms of investors' degree of risk aversion. The assets considered by Canner et al. (1997) are fixed assets, bonds, blue chips, mid-cap, small-cap and international stocks. In our study, the fixed asset is the risk-free asset: the 1-month Euribor rate (Euro Interbank Offered Rate), which is the reference interest rate of the Eurozone. Data are available on the website of the Bank of France. For bonds, we use the EMTX index, which is composed of sovereign bonds of the Eurozone with all maturities. These data are available on the website of MTS Indices, which is in charge of calculating Eurozone bond indexes. For French blue chips, we use the CAC 40 index. For mid-cap and small-cap stocks, we use the CAC Mid 60 and CAC Small, for which data are available on the website of Yahoo Finance. For international stocks, we use the MSCI World index.

The following graphs present the evolution of the above series from January 2007 to December 2013. For optimal clarity, we present only the most representative wine indexes (WineDex 100 for iDealwine and Liv-ex Bordeaux 500 for Liv-ex) in parallel with French stocks (CAC 40), international stocks (MSCI World), Eurozone bonds (EMTX index) and gold (Napoleon coin).

¹⁹ This method is also used in Masset and Weisskopf's study (2010).

Graph 1: Dynamics of wine, gold, stock and bond prices, 01/2007 to 12/2013



With the same base of 100 at the beginning of the period, we observe that gold prices are the highest for almost the entire study period. This is followed by wines and bonds. The Liv-ex 500 and WineDex 100 are equivalent over the study period, except from April 2009 to August 2012. Stock values are the lowest and always under 100. This graph therefore shows that the recent financial crises were favorable for investments in alternative assets such as gold and wine, as opposed to stocks. Bonds were less profitable than either gold or wine but still more profitable than stocks.

The following table presents the principal descriptive statistics of our database.

Table 1: Descriptive statistics

	Average	SD	Skewness	Kurtosis	Jarque-Bera	KS
Wine						
WineDex 100	8.00% ^{***}	4.48%	0.94 ^{***}	1.75 ^{***}	22.85 ^{***}	0.15 ^{***}
WineDex Bordeaux	9.18% ^{***}	5.81%	1.13 ^{***}	1.55 ^{***}	25.85 ^{***}	0.16 ^{***}
WineDex Bourgogne	8.83% ^{***}	6.47%	1.86 ^{***}	5.89 ^{***}	167.37 ^{***}	0.19 ^{***}
WineDex Rhône	2.41%	3.90%	1.87 ^{***}	9.06 ^{***}	333.81 ^{***}	0.14 ^{***}
Liv-ex 50	8.26%	13.63%	-0.76 ^{***}	4.74 ^{***}	85.66 ^{***}	0.1 ^{**}
Liv-ex 100	5.48%	11.90%	-1.13 ^{***}	7.43 ^{***}	208.56 ^{***}	0.11 ^{***}
Liv-ex 500	7.92% ^{***}	7.79%	-1.19 ^{***}	4.94 ^{***}	103.49 ^{***}	0.09 [*]
Liv-ex F.W. Investables	7.23% [*]	10.56%	-0.95 ^{***}	5.27 ^{***}	108.59 ^{***}	0.12 ^{***}
Gold						
Napoleon coins	9.12%	25.94%	0.63 ^{**}	3.87 ^{***}	57.44 ^{***}	0.11 ^{***}
Stocks						
CAC 40	-3.85%	18.97%	-0.54 ^{**}	-0.01	4	0.11 ^{**}
CAC Mid 60	1.47%	20.17%	-0.89 ^{***}	1.96 ^{***}	24.11 ^{***}	0.11 ^{**}
CAC Small	-2.95%	21.76%	-0.98 ^{***}	1.78 ^{***}	24.06 ^{***}	0.12 ^{***}
MSCI World Standard	1.47%	18.81%	-1.00 ^{***}	2.04 ^{***}	28.28 ^{***}	0.12 ^{***}
Bonds						
EMTX	3.13% ^{***}	1.78%	0.09	0.20	0.25	0.06
Fixed asset						
Euribor 1 month	1.60% ^{***}	0.48%	0.92 ^{***}	-0.90	14.41 ^{***}	0.24 ^{***}

Notes: The values for average and SD (standard deviation) are annualized (monthly values x12 for the average and x $\sqrt{12}$ for the SD). *** means that the value is significantly different from 0 at a 1% threshold, ** at 5% and * at 10%. Jarque-Bera and Kolmogorov-Smirnov (KS) tests of the normality of the distribution. *** means that it is not normal at a 1% threshold, ** at 5% and * at 10%.

The above table confirms our observations from the graph. Gold is more profitable than wine, with a 9% annual rate of return (but not more profitable than the WineDex Bordeaux index, which is slightly more profitable than gold). However, it also has the highest volatility, almost 26% per year, which is why the average gold return is not significantly different from 0, similar to the Liv-ex 50 and Liv-ex 100 returns. The WineDex rates of return are higher than the Liv-ex returns and close to that of gold, mostly with WineDex Bordeaux (more than 9%). The standard deviation differs considerably between the wine indexes in France and London, being much higher in London (around 10%) than in France (around 5%). During the same period, the rate of return for stocks is much lower than wine and gold: negative for the CAC 40 and Small Cap and about 1.5% for the CAC Mid 60 and MSCI World. The volatility of all the stock indexes (from 18% to 22% per year) is significantly higher than the wine indexes

(from 4% to 14%). Moreover, their average returns are not significantly different from 0. The bond rate of return is about 3% per year (significantly different from 0) and the standard deviation is much lower than stocks and wines, only about 2% per year. The rate of return of the fixed asset is very low, only 1.6% per year but significantly different from 0 because its volatility is very low, about 0.5% per year.

The skewness coefficient is significantly negative for the Liv-ex indexes and stocks. This means that there are more returns under the average value than over it. For the iDealwine indexes, gold, bonds and the fixed asset, however, the coefficient is significantly positive, indicating more returns over the average than under it. Most of the kurtosis excess coefficients are significantly different from 0, except for bonds and the risk-free asset. Most of the significant coefficients are positive, except for the CAC 40 index, indicating more negative or positive extreme values (located in the right or left queues of the distribution) than with a normal distribution. We also note that the highest coefficients are for the Liv-ex indexes, followed by WineDex and gold. This means that Liv-ex indexes have the most extreme returns (positive or negative). The tests for distribution normality confirm the skewness and kurtosis values. Most of return series are not normal, except for the risk-free asset.

With these first analyses, we observe that from 2007 to 2013, gold is the most profitable (but not more than the WineDex Bordeaux index). However, it had the highest volatility, whereas wine volatility is much lower with almost the same rate of return. The return for stocks is very low, even negative. However, its volatility is very high, much higher than for wine and not far from gold.

4. Are wine and gold good for French portfolios?

To test whether wine (or gold) is good for portfolio diversification, we use the following methods:

- First, we use Markowitz's classical mean-variance theory (1952) to assess correlation coefficients and Markowitz efficient frontiers;
- Second, we also use the mean-modified Value-at-Risk (MVaR) portfolio optimization proposed by Favre and Galeano (2003) to circumvent the limitations of the mean-variance approach.

- Third, we compare the performances (measured by Sharpe (1964) and modified Sharpe (Gregoriou and Gueyie 2003) ratios for portfolios with wine (or gold) and without it.

4.1 The correlation between wine (or gold) and other assets

The following table presents the correlations between wine (or gold) and stocks, bonds or the risk-free asset.

Table 2: Correlation coefficients

	CAC 40	CAC Mid 60	CAC Small	MSCI World	EMTX	Euribor
WineDex 100	-0.01%	5.96%	3.90%	1.89%	1.92%	14.61%
WineDex Bordeaux	-4.11%	-0.93%	4.02%	-4.81%	-12.07%	27.14%**
WineDex Bourgogne	0.50%	6.26%	1.89%	2.47%	9.63%	6.04%
WineDex Rhône	10.82%	11.88%	9.72%	15.09%	-8.81%	4.88%
Liv-ex 50	25.34%**	41.87%**	44.80%***	30.62%***	-26.18%**	0.36%
Liv-ex 100	28.66%***	44.95%***	46.93%***	35.10%***	-27.96%***	-0.20%
Liv-ex 500	22.22%*	39.59%***	40.48%***	31.18%***	-26.99%**	4.47%
Liv-ex Investable	28.55%***	44.50%***	48.00%***	34.32%***	-27.46%**	-1.06%
Napoleon	-34.10%***	-23.38%**	-25.07%**	-26.89%**	10.28%	11.57%

Notes: *** means that the value is significantly different from 0 at a 1% threshold, ** at 5% and * at 10%.

The above table shows that French wine indexes are not significantly correlated with other assets, except for WineDex Bordeaux which is positively correlated with Euribor at a 5% threshold. The results for the Liv-ex indexes are completely different as they are positively correlated with stocks (both French and international ones), negatively correlated with bonds, and not significantly correlated with Euribor (both in a significant manner). Thus, in terms of correlations, WineDex indexes are better portfolio diversifiers than Liv-ex indexes, especially with stocks. However, gold is better than WineDex indexes because it is negatively correlated with all stock indexes and not correlated with bonds or Euribor.

Following the Markowitz theory, a low or negative correlation between assets indicates low portfolio risk. Thus, we can conclude that WineDex indexes are better than Liv-ex indexes and gold is better than wine. To verify this, we will analyze the efficient frontiers in the next sub-sections. The first concerns the mean-variance efficient frontier and the second concerns the MVaR efficient frontier.

4.2 Mean-variance efficient frontiers with wine (or gold)

To constitute efficient frontiers, we first determine the minimal variance portfolio with the following program²⁰:

$$\text{Min}[V(R_p)]$$

With

$$V(R_p) = \sum_{i,j=1}^n w_i w_j \text{cov}(i, j) \quad (1)$$

$$w_i \geq 0 \quad (2)$$

$$\sum_{i=1}^n w_i = 1 \quad (3)$$

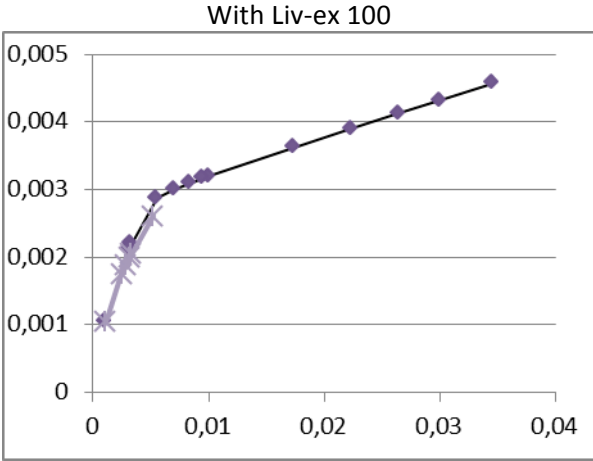
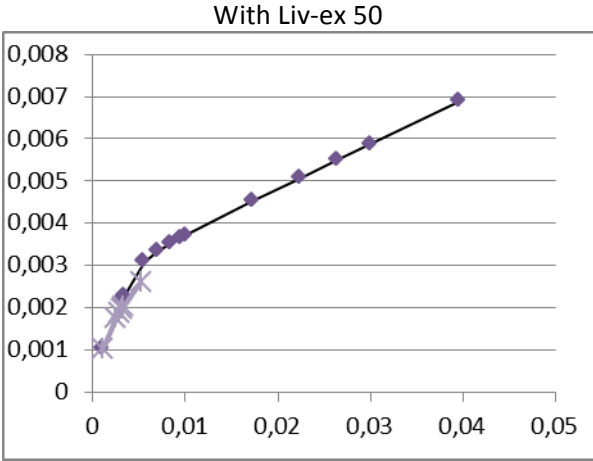
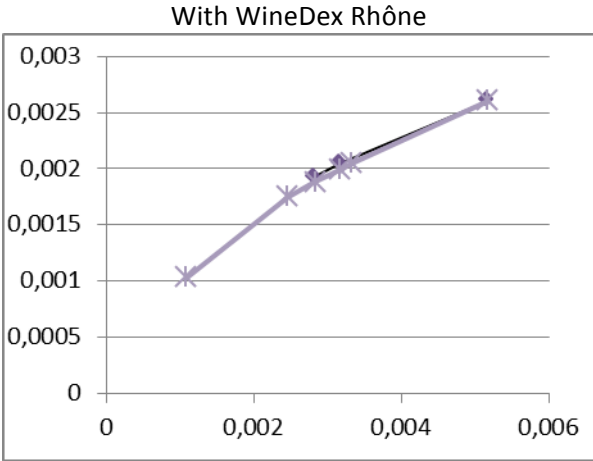
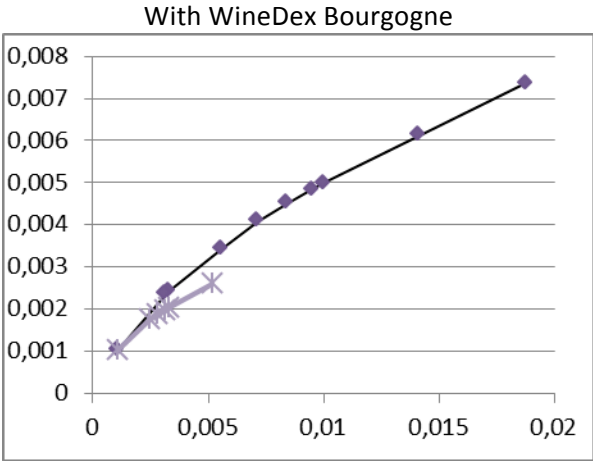
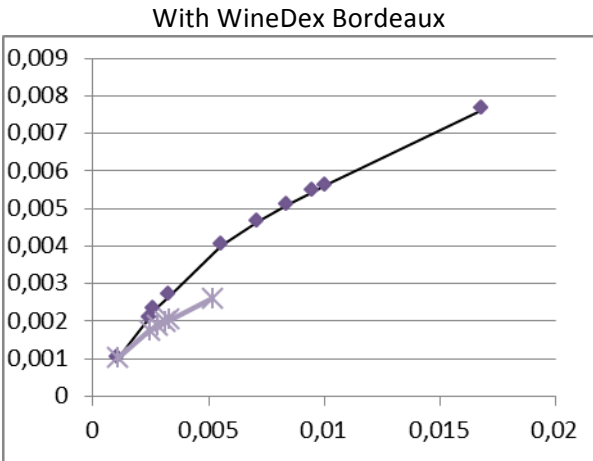
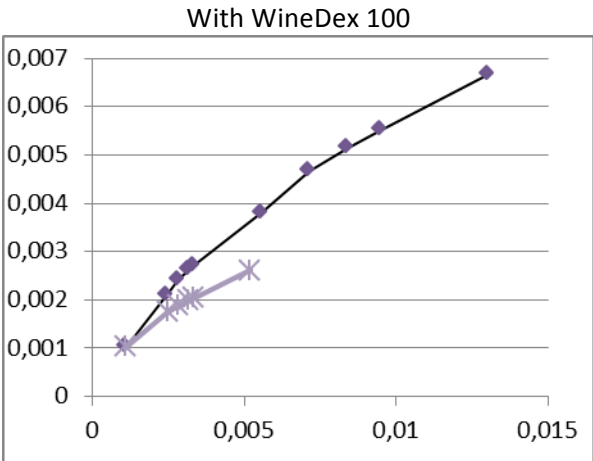
To draw the efficient frontier curve, we determine other efficient portfolios by minimizing the variance for other rates of return that are higher than that of the minimal variance portfolio. The last efficient portfolio on the curve is the one of the maximal return portfolio.

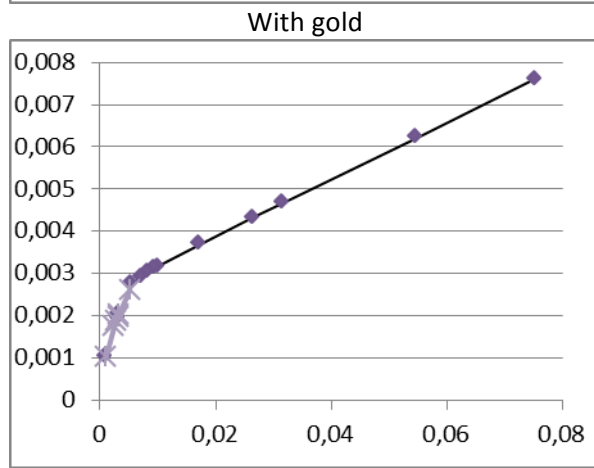
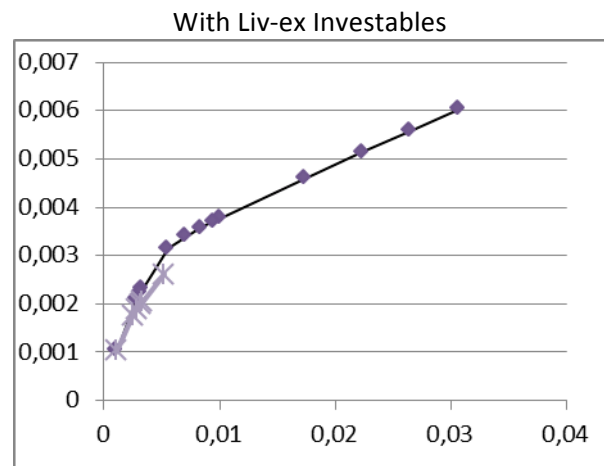
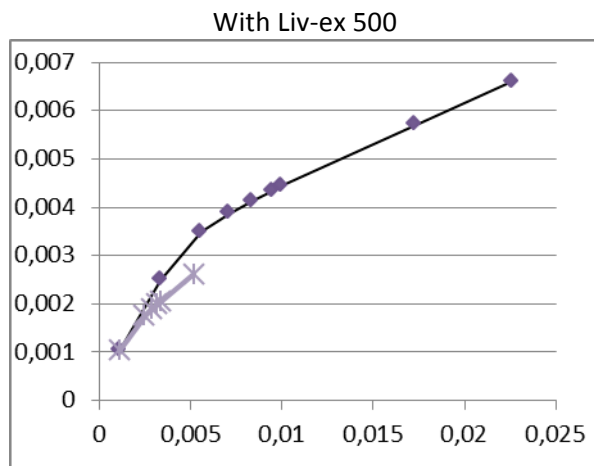
Based on the above principles, we constitute efficient frontiers for the reference portfolio and the portfolios diversified with alternative assets (wine or gold). The reference portfolio is composed of CAC 40, Mid Cac 60, Cac Small, MSCI World, EMTX and Euribor 1 month. The diversified portfolios are composed of the above assets and one wine index or the gold asset. As there are eight wine indexes, there will be eight portfolios diversified with wine and one portfolio diversified with gold. If diversification with wine (or gold) is profitable, the efficient frontiers will be higher than those without it. In this case, for a given risk level, the portfolios with wine (or gold) will have a higher rate of return than the portfolio without it; and for a given return, they will have lower risk.

The results that we obtain are presented in the following graphs.

²⁰ To solve this program, we use the function "solve" in Excel.

Graphs 2: Mean-variance efficient frontiers of portfolios with and without wine (or gold)





Notes: The curves with square points represent efficient portfolios with wine (or gold). The curves with asterisk points represent efficient portfolios without wine (or gold). The x axis represents the monthly standard deviation and the y axis represents the monthly return of portfolios.

The above graphs show that efficient frontiers with wine are higher than those without it (except for the WineDex Rhone index), meaning that investors can obtain a higher return for the same level of risk or a lower risk for the same rate of return by including wine in the reference portfolio. We also note that the gap between the two efficient frontiers is larger with iDealwine indexes than with Liv-ex indexes (except with WineDex Rhône). Moreover, gold is not really efficient in diversifying French portfolios because there is no gap between the two efficient frontiers. The difference is that when gold is included, investors may have a much higher rate of return but also higher risk. We also note that the portfolios with the highest rates of return always contain 100% alternative assets (wine or gold), while those with the lowest risk always contain about 98% of the fixed asset and 2% of bonds²¹.

²¹ Our results are similar to those of Kumar (2010) for the UK and US markets.

4.3. Mean-MVaR portfolio optimization with and without wine (or gold)

To constitute efficient frontiers with the MVaR (Favre and Galeano, 2002) as the risk measure, we follow the same steps as for the mean-variance approach presented above. The only exception concerns the risk measure, which is not the variance but the modified Value-at-Risk calculated as follows:

$$MVaR = W \left[\mu - \left\{ z_c + \frac{1}{6}(z_c^2 - 1)S + \frac{1}{24}(z_c^3 - 3z_c)K - \frac{1}{36}(2z_c^3 - 5z_c)S^2 \right\} \sigma \right]$$

$MVaR$ is the modified value-at-risk

W the value of portfolio which is exposed to risk (we consider that it is 1 in our calculations)

μ the average return

z_c the statistical value of the normal law, at 5% $z_c = -1,96$

S the skewness

K the kurtosis excess compared to 3

σ the standard deviation of returns.

In general, the VaR measures the potential loss which can be exceeded only with a given probability. In our study, we use the 5% threshold. This means that the MVaR measures the potential loss which can be exceeded with a 5% probability. Based on this definition, the MVaR of a portfolio is simply the weighted sum of the MVaR of the assets composing the portfolio. In other words, the potential loss of a portfolio is the weighted sum of the loss of the assets composing it. The higher the MVaR, the higher the risk of the portfolio will be. The MVaR is preferred to the variance because it takes into account not only the standard deviation but also higher moments of the distribution such as skewness and kurtosis.

To constitute the efficient frontiers, we will minimize the MVaR of the portfolio under several constraints.

$$\text{Min}[MVaR(P)]$$

With

$$MVaR(P) = \sum_{i=1}^n w_i MVaR(i) \quad (1)$$

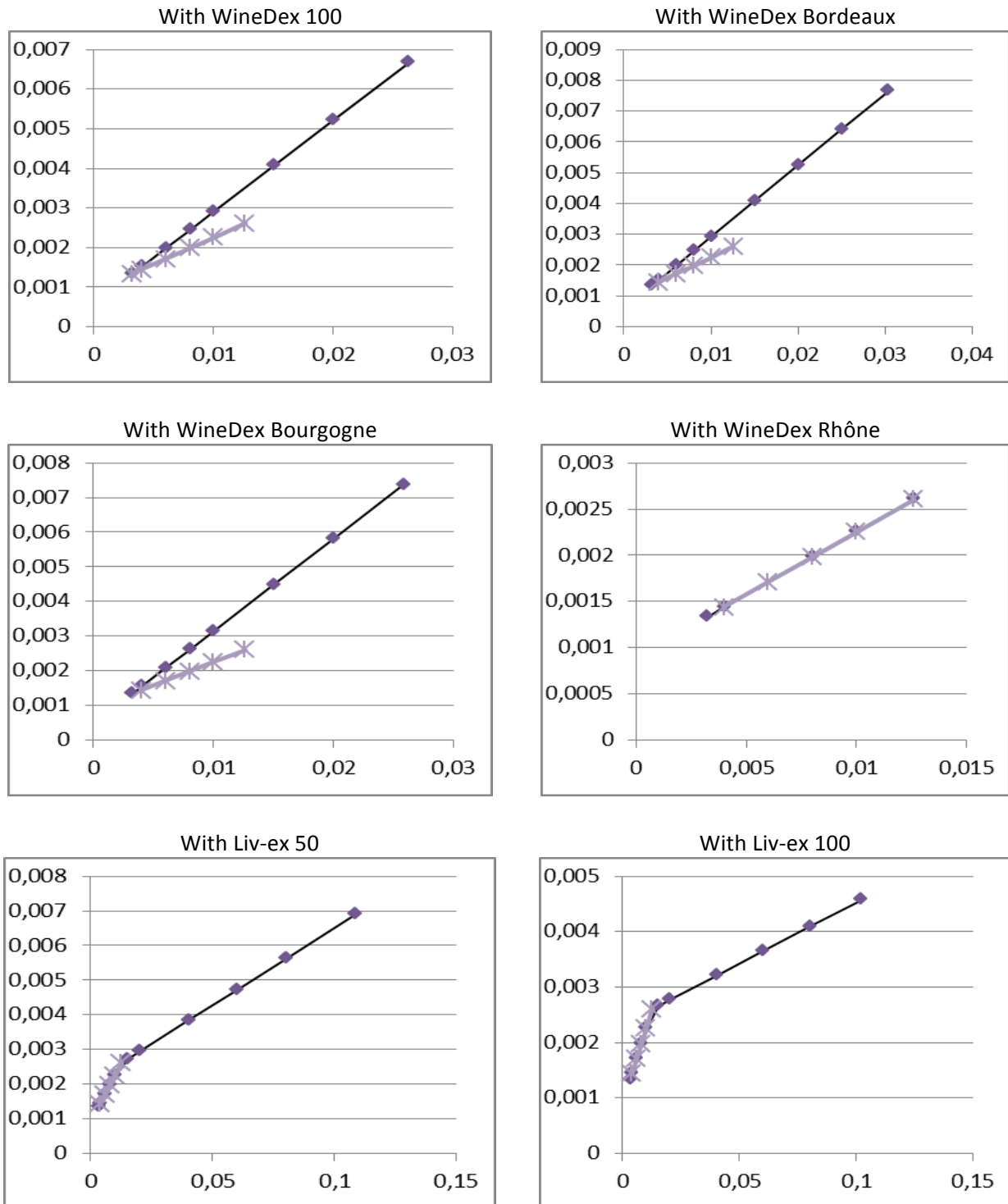
$$MVaR(i) = W_i \left[\mu_i - \left\{ z_c + \frac{1}{6}(z_c^2 - 1)S_i + \frac{1}{24}(z_c^3 - 3z_c)K_i - \frac{1}{36}(2z_c^3 - 5z_c)S_i^2 \right\} \sigma_i \right] \quad (2)$$

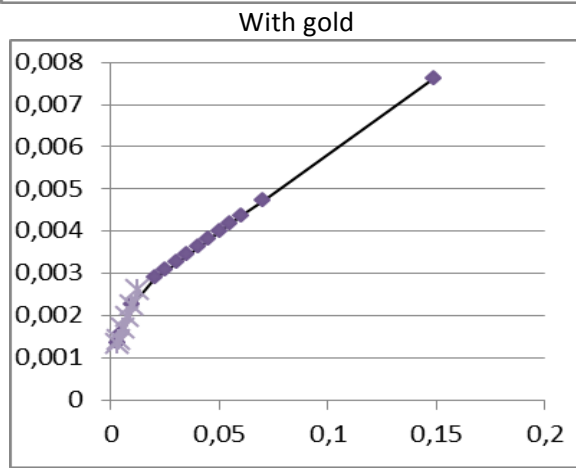
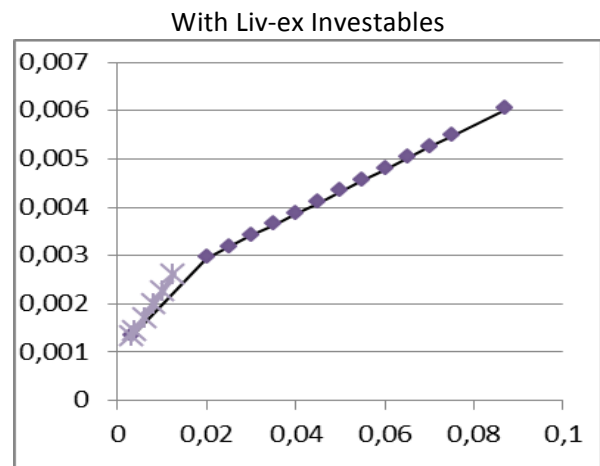
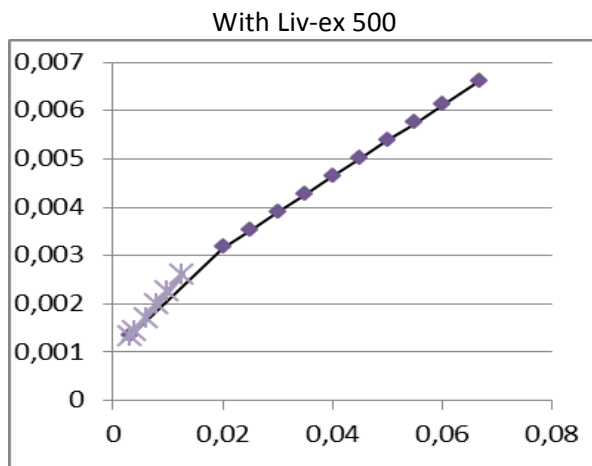
$$w_i \geq 0 \quad (3)$$

$$\sum_{i=1}^n w_i = 1 \quad (4)$$

As in the previous section, we will constitute efficient frontiers for both the reference portfolio and the diversified portfolios with wine or gold. The results that we obtain are presented in the following graphs.

Graphs 4: Mean-MVaR efficient frontiers of portfolios with and without wine (or gold)





Notes: The curves with square points represent efficient portfolios with wine (or gold). The curves with asterisk points represent efficient portfolios without wine (or gold). The x axis represents the monthly modified Value-at-Risk and the y axis represents the monthly return of portfolios.

With the modified MVaR as the risk measure, the results for the WineDex indexes are the same as with the variance. The efficient frontiers with wine are higher than the ones without wine (except for the WineDex Rhone index).

The results for the Liv-ex indexes are different when the modified MVaR is used. The efficient frontiers with wine are either at the same level as or lower than the ones without it. This means that when risk is measured by the modified MVaR, the Liv-ex indexes become unprofitable for diversifying French portfolios. With gold, the result is the same with the variance as with the modified MVaR. This means that gold does not really improve the efficient frontier of portfolios.

In order to verify the results with efficient frontiers, we also compare the performance of portfolios with wine (or gold) to those without it.

4.4. The performance of portfolios with and without wine (or gold)

In line with the methods used in the last two subsections, we calculate portfolio performance using the Sharpe ratio (Sharpe 1964) and the modified Sharpe ratio (Favre and Galeano 2002). The calculation of these two performance ratios is as follows.

- Sharpe ratio:

$$Sh = \frac{R_P - R_f}{\sigma_P}$$

with Sh , the Sharpe ratio; R_P , the portfolio return; R_f , the return of the risk-free asset; and σ_P , the standard deviation of the portfolio returns.

- Modified Sharpe ratio:

$$Sh_m = \frac{R_P - R_f}{MVaR}$$

with Sh_m , the modified Sharpe ratio; R_P , the portfolio return; R_f , the return of the risk-free asset, and $MVaR$, the modified Value-at-Risk presented in the previous section.

The Sharpe and modified Sharpe ratios both measure the excess of portfolio returns compared with the risk-free asset for one unity of risk. This latter is measured by the variance in the Sharpe ratio and the $MVaR$ in the modified Sharpe ratio. The higher the ratios, the higher the portfolio performance is.

To constitute several French investors' portfolios, we follow the method of Canner et al. (1997), according to which composition is determined by the degree of investors' risk aversion. There are five risk aversion profiles, from the most risk-averse to the least risk-averse: conservative investors, moderately conservative investors, balanced investors, moderately aggressive investors and aggressive investors. The following table indicates the composition of portfolios for each kind of investor.

Table 3: Asset allocation following investors' risk profiles (figures are in %)

	Conservative	Moderately conservative	Balanced	Moderately aggressive	Aggressive
Fixed income <i>Euribor 1 month</i>	40	25	0	0	0
Bonds <i>EMTX</i>	40	35	40	20	0
Blue chips <i>CAC 40</i>	20	20	30	40	40
Mid Caps <i>CAC Mid 60</i>	0	10	10	15	20
Small Caps <i>CAC Small</i>	0	10	10	15	20
International <i>MSCI World</i>	0	0	10	10	20

In these portfolios, we will include 5%, 10%, 20%, 30%, 40% and 50% of wine²² (or gold) by excluding the same percentage of each of the other assets composing the portfolios. There are thus ten kinds of portfolios: one reference portfolio (without any alternative asset), eight portfolios with wine indexes, and one portfolio with gold. We therefore calculate the two performance ratios for 300 portfolios²³. The results are presented in the following table.

According to the following table, the performance of portfolios with wine (or gold) is in all cases higher than that of the portfolio without it. The portfolio performance is higher for all investors' risk profiles (conservative, moderately conservative, balanced, moderately aggressive and aggressive), all percentages of wine (or gold), all wine indexes (or gold asset), and all performance measures. However, the higher the proportion of alternative assets (wine or gold), the greater the rise in performance is. The higher the degree of risk aversion (from conservative to aggressive), the more the performance increases. This means that the magnitude of the performance increase is always greater for conservative portfolios than for aggressive portfolios. WineDex Bordeaux is the most profitable way to diversify a portfolio as the performance rise is the highest (from 12% to 1016%). This is followed by WineDex Bourgogne (from 12% to 995%), WineDex 100 (from 10% to 863%), Liv-ex 500 (from 11% to 455%), Liv-ex Investable (from 10% to 349%), gold (from 11% to 313%), Liv-ex 100 (from 8% to 243%), Liv-ex 50 (from 12% to 346%) and WineDex Rhône (from 2% to 145%). To summarize, the above results show that wine and gold are both profitable ways to diversify

²² Each time, we include only one wine index out of the eight wine indexes of our database.

²³ 6 proportions x 10 kinds of portfolios x 5 risk profiles.

French portfolios. However, iDealwine indexes are more efficient than Liv-ex indexes and also gold (except for the WineDex Rhône index).

Table 4: The performance gap (in %) between portfolios with and without wine (or gold)

	5%		10%		20%		30%		40%		50%	
	Sharpe	M-Sharpe	Sharpe	M-Sharpe	Sharpe	M-Sharpe	Sharpe	M-Sharpe	Sharpe	M-Sharpe	Sharpe	M-Sharpe
WineDex 100												
Conservative portfolios	70.34	70.95	147.81	145.90	322.98	306.74	517.01	479.89	711.03	665.06	881.52	862.74
Moderately conservative portfolios	33.01	33.59	69.61	70.14	155.47	153.53	261.56	253.28	361.73	346.77	545.08	518.00
Balanced portfolios	22.44	22.91	47.36	48.01	106.27	106.10	180.73	177.45	273.02	263.34	399.21	379.34
Moderately aggressive portfolios	13.05	13.43	27.56	28.20	61.96	62.68	105.85	105.67	163.22	160.50	240.04	232.27
Aggressive portfolios	10.76	11.05	22.71	23.25	51.09	51.81	87.40	87.70	135.22	134.01	200.28	195.67
WineDex Bordeaux												
Conservative portfolios	83.19	83.66	175.19	171.35	379.73	357.78	590.90	558.39	776.38	780.19	914.44	1016.68
Moderately conservative portfolios	38.99	39.78	82.33	82.78	183.88	179.92	307.45	294.54	420.64	401.33	611.10	596.23
Balanced portfolios	26.47	27.15	55.96	56.77	125.79	124.85	213.79	207.69	320.50	305.66	462.23	438.22
Moderately aggressive portfolios	15.38	15.94	32.52	33.42	73.24	73.98	125.19	124.13	192.61	187.47	281.03	269.38
Aggressive portfolios	12.68	13.12	26.80	27.56	60.38	61.23	103.38	103.26	159.81	157.05	235.66	227.94
WineDex Bourgogne												
Conservative portfolios	79.48	79.83	165.93	163.91	351.22	341.53	531.41	532.07	681.46	749.43	790.62	995.01
Moderately conservative portfolios	37.33	37.75	78.64	78.91	174.33	172.67	288.09	283.76	388.90	387.82	551.93	584.61
Balanced portfolios	25.38	25.75	53.54	54.00	119.78	119.40	202.00	199.34	299.73	294.06	424.59	422.42
Moderately aggressive portfolios	14.76	15.06	31.17	31.67	70.03	70.46	119.20	118.79	182.16	180.08	262.92	259.49
Aggressive portfolios	12.16	12.41	25.69	26.11	57.76	58.25	98.62	98.64	151.73	150.57	222.01	219.14
WineDex Rhône												
Conservative portfolios	9.50	10.64	20.18	22.17	45.37	47.87	75.62	76.98	109.74	109.28	145.10	144.72
Moderately conservative portfolios	4.48	4.91	9.49	10.32	21.50	22.92	36.88	38.50	48.85	50.11	82.15	82.61
Balanced portfolios	3.05	3.35	6.46	7.06	14.63	15.75	25.16	26.65	42.17	43.76	57.86	59.07
Moderately aggressive portfolios	1.81	2.02	3.84	4.25	8.69	9.53	15.01	16.23	23.49	24.97	35.28	36.79
Aggressive portfolios	1.49	1.64	3.16	3.46	7.15	7.75	12.33	13.23	19.28	20.42	29.01	30.26
Liv-ex 50												
Conservative portfolios	74.57	75.73	146.93	142.34	265.32	235.44	342.81	289.45	390.67	323.20	420.79	346.23
Moderately conservative portfolios	36.60	38.29	74.51	75.90	150.79	145.32	222.06	203.71	271.01	241.43	333.55	288.56
Balanced portfolios	25.02	26.64	51.71	53.86	109.32	108.47	170.34	160.77	229.93	207.68	288.00	250.92

Moderately aggressive portfolios	15.02	16.35	31.26	33.50	67.51	69.75	108.56	107.64	153.44	145.74	200.25	182.70
Aggressive portfolios	12.41	13.55	25.90	27.91	56.42	58.93	92.03	92.75	132.83	128.73	178.17	165.92
Liv-ex 100												
Conservative portfolios	45.53	47.62	91.20	91.97	171.83	158.78	230.86	199.61	270.80	225.49	297.63	243.26
Moderately conservative portfolios	22.63	24.45	46.38	49.03	95.71	96.16	144.53	137.68	179.28	164.60	228.77	200.57
Balanced portfolios	15.42	17.05	31.99	34.73	68.44	71.15	108.49	107.36	150.70	141.85	192.33	172.82
Moderately aggressive portfolios	9.38	10.65	19.59	21.94	42.66	46.32	69.48	72.61	99.95	99.96	133.41	127.34
Aggressive portfolios	7.76	8.83	16.22	18.26	35.55	38.97	58.54	62.11	85.66	87.41	117.09	114.37
Liv-ex 500												
Conservative portfolios	70.19	71.20	143.65	140.46	289.84	260.35	418.33	348.29	518.23	410.14	590.06	454.62
Moderately conservative portfolios	33.75	35.08	69.93	71.18	149.14	144.80	235.66	217.33	306.28	271.63	413.69	347.65
Balanced portfolios	23.02	24.25	48.05	49.77	104.75	104.41	171.04	163.04	245.04	222.77	331.41	286.38
Moderately aggressive portfolios	13.63	14.63	28.54	30.28	62.84	64.81	104.28	103.91	154.29	147.61	214.08	195.59
Aggressive portfolios	11.26	12.12	23.61	25.15	52.20	54.30	87.20	88.12	130.46	127.30	184.16	172.43
Liv-ex Investables												
Conservative portfolios	63.47	64.78	127.18	125.04	242.16	219.27	329.49	280.34	390.03	320.41	430.96	348.36
Moderately conservative portfolios	31.04	32.54	63.62	65.25	131.78	128.84	200.55	186.81	251.70	226.77	323.71	279.92
Balanced portfolios	21.19	22.58	43.96	46.00	94.12	94.58	149.84	143.92	208.41	191.42	270.06	237.69
Moderately aggressive portfolios	12.71	13.83	26.50	28.46	57.67	60.10	94.02	94.57	135.75	131.18	182.34	168.94
Aggressive portfolios	10.50	11.45	21.95	23.67	48.06	50.55	79.20	80.81	116.21	114.44	159.65	151.16
Gold - Napoleon coins												
Conservative portfolios	81.57	83.43	170.73	156.25	270.36	232.98	301.13	271.87	312.26	296.53	317.26	312.95
Moderately conservative portfolios	36.23	39.69	80.85	83.36	175.39	158.65	241.37	210.21	269.25	238.70	292.50	273.84
Balanced portfolios	23.98	26.87	53.34	57.73	125.11	119.99	196.75	173.08	248.05	213.07	278.07	245.59
Moderately aggressive portfolios	13.19	15.49	29.34	33.96	71.46	76.06	123.34	118.03	173.33	155.44	210.92	186.34
Aggressive portfolios	10.86	12.86	23.93	28.00	57.94	63.61	102.58	102.05	152.30	139.73	196.51	173.68

Note: The figures of this table show the difference (in percentage) in performance of portfolios with wine (or gold) and without wine (or gold).

5. Conclusion

In using mean-variance and mean-Modified Value-at-Risk methods on monthly data from 2007 to 2013, we demonstrate that wine is profitable both as an individual asset and as a portfolio diversifier. Bordeaux wines are the most profitable and Rhone wines are the least profitable. The higher the proportion of wine, the better the portfolio performance is. We also find that iDealwine wine indexes are more profitable than Liv-ex ones, which suggests that French investors would do better to invest in wines through iDealwine than through Liv-ex. We also find evidence that gold is as profitable as Liv-ex indexes for portfolio diversification but less profitable than iDealwine indexes.

From these results, we conclude that wine and gold are profitable both as individual assets and as portfolio diversifiers, despite their evident differences: wine is a consumer good but gold is not; wine can be consumed only one time and gold is eternal; gold was a monetary standard for centuries but wine was not; and the quality of gold does not change over time while the quality of wine does. In our opinion, the high return on wine investment is linked to the cultural aspects of wine and the belief of investors that the value of grade wines will always increase. However, not all kinds of grade wines are profitable. Our results show that Rhone grade wines are not good portfolio diversifiers and Bordeaux wines are still the most profitable.

It should nevertheless be noted that the above results pertain to the period from 2007 to 2013, during which financial markets were in crisis times. Moreover, the 2009 vintage for the WineDex Bordeaux index, which is included in the index of 2013, was exceptionally good. These two elements partially explain the good performance of wine during our study period.

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Appendix: Wine price indexes

Name of indexes	Started	Provider / Country	Website
Liv-ex Fine Wine 50	Dec-99	Liv-ex / UK	http://www.liv-ex.com
Liv-ex Fine Wine 100	Jul-01		
Liv-ex Bordeaux 500	Dec-03		
Liv-ex Fine Wine Investables	Jan-88		
iDeal Bordeaux	2001	iDealwine / France	www.idealwine.com/fr
iDeal Bourgogne	2001		
iDeal Rhône	2001		
WineDex Bordeaux	2007		
WineDex Bourgogne	2007		
WineDex Rhône	2007		
WineDex 100	2007		
Langton's Classification of Australian Wine Index (LCAWI)	2002	Langton's/Australia	www.langtons.com.au
Australian Wine Index (AWI)	2003	Australia	http://www.australianwineindex.com/awi.html
WD Bordeaux	2007	Winedecider Pro/ France	www.winedecider.com
WD Bordeaux 1CC	2007		
WD DRC	2007		
WD Rhône	2007		
Fine Wine 100	2009	WinePrices / US	http://wineprices.vinfoлио.com/do/wineprices/home
Fine Wine 250	2009		
Bordeaux 100	2009		
California 100	2009		
Rhone 50	2009		
Burgundy 50	2009		
Italy 25	2009		
Australia 20	2009		
Port 10	2009		