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Wine Investing : Identification of macro and microeconomic factors impacting fine wines return

Author(s): Simon Pouchain
Supervisor(s): Denis Knaepen
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AI Declaration

During the preparation of this master's thesis, the author utilized ChatGPT for the following purpose :

1. Guidance on the econometric model to use and underlying hypothesis to verify

2. Assistance to build the code on R-Studio

After using ChatGPT, the author diligently reviewed and edited the content produced by the tool. We take full responsibility for the final content presented in this thesis.

By signing this declaration, we affirm that the content of this master's thesis reflects our original work, augmented by the responsible use of AI.

Simon Pouchain
Noma : 02531900

Foreword

I want to express my gratitude to my supervisor Denis Knaepen for his support and advice all along the project.

I would also like to thank my father for having made me discover the incredible Bordeaux region during the En-primeur Week 2024 which allowed me to gain meaningful knowledge about the fine wine market, as well as my mother for guiding me on my topic and helping me with English.

Finally, my siblings, Thomas, Sam, Noémie and Holly for bringing me joy and hope when I had to give the final push.

Abstract

This thesis aims to identify the macro and microeconomic drivers behind the fluctuations of fine wine returns. The first part of the research focuses on the influence of the overall economic conditions on the Liv-Ex 100, representing the benchmark for the market. Variables such as the GDP, the exports of wine, the state of the stock and bond markets are leveraged to explain the fluctuations. The second part targets the inherent characteristics of 468 Bordeaux bottles and aims to highlight the value determinants between the Growths, age, vintage, expert's scores, quality category and release price. To reach the objectives, Multiple Linear Regressions are realized to verify the statistical relevance of all variables. The results outline the significance of the traditional wine-drinking countries' economies, the S&P500, the 2008 financial crisis and the 2009-2010 China stimulus on the Liv-Ex 100. For the microeconomic perspective, the vintage appears as the key factor in explaining the expected return, followed by the Growth. The Parker score, category and release price have a rather limited impact.

Keywords : fine wine, investment-grade wines, Liv-Ex, Bordeaux, determinants factors, regression

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1. Introduction

Nowadays, names like Mouton-Rothschild, Margaux, Petrus, Romané-Conti, Opus One or Louis Roederer resonate not only in the hearts of many wine collectors but also in the minds of investors. Fine wine as an investment vehicle has grown in popularity over the last decades, driven by exceptional vineyards, whose bottles have seen their value increase over time due to scarce supply and high demand.

Between 2013 and 2023, fine wines are presented as the second highest collectible in terms of growth value (+146%) right behind rare whiskies, as shown by the Knight Frank Luxury Investment Index (2023) which compares the performance of collectibles including art, jewelry, cars and many others. Incredible bottles can generate impressive performances such as Champaign Jacques Selosse 2009 which yielded an average 42% yearly return since its release in 2020 or Bourgogne Domaine Romanée Conti, Echezaux Grand Cru 2013 which achieved a 21% annual growth over the last 8 years. The main propositions behind the popularity of the assets are the search for alternative investments, the social/emotional status attached to extraordinary bottles and qualities advanced such as positive returns and effective diversification properties. The global fine wine market which was worth $340 billion in 2021 is expected to reach $457 billion in 2028 (Ciurea, 2024).

As with any asset, the returns will depend at the same time of the general state of the fine wines market conditions, mostly driven by the demand, and by the characteristics of the assets, that are the bottles themselves. The end goal is to answer the research question **"what macro and microeconomic factors are impacting fine wine returns ?"**. It will aim at guiding investors, collectors and market analysts alike to define when it is best to purchase/sell bottles, whether emerging countries are determinants of the price growth, the influence of the state of the bond/equities markets and what fine wines should they invest in. This last axis will focus on the influence of the Growth, the quality of the vintage, the score and price using Bordeaux region as being the historical core market. Using a dual perspective will help thus to explore what are the main catalyzers and to what extent do they influence the performance.

Before heading into the main analysis, a literature review will provide information about the market, its functioning, specificities, past performances, identified determinants, and future.

After this, the methodology will be outlined as well as what data were used and where were they extracted. Finally, a discussion will aim to put in perspective the empirical results with the literature review and for the micro economic section, the preliminary trends identified in the descriptive analysis.

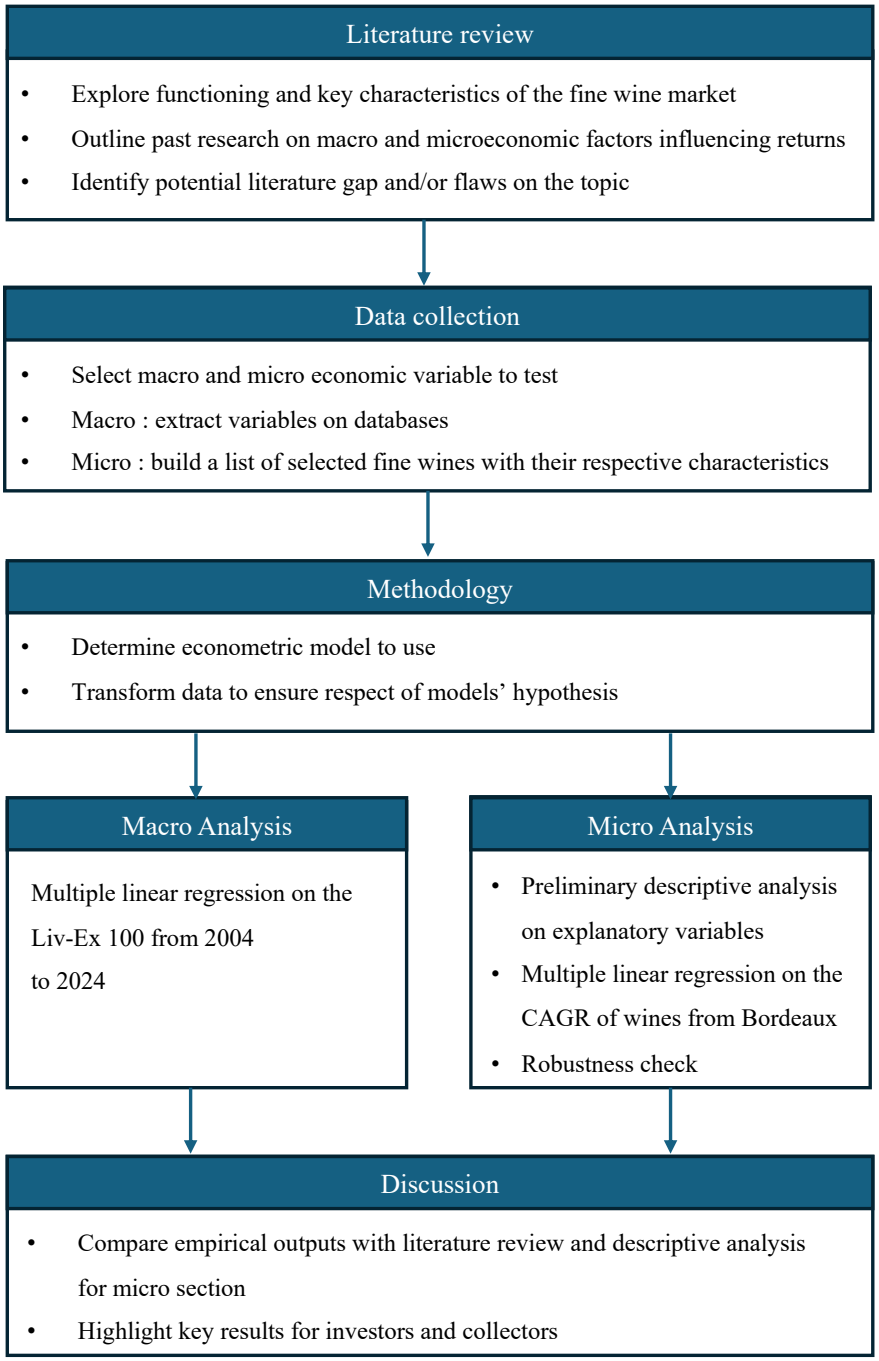

Figure 1. Summary of the methodology

2. Literature review

In the last decades, the world has seen fine wines investment gaining in popularity, moving from a "simple" beverage to a placement vehicle that attracts enthusiasts but also many investors and speculators from all over the world. The literature review starts by explaining how the precious liquid emerged as a new asset class and to what extent does it resemble or differ from traditional and alternative investment means. It continues by defining where the line can be drawn for investment-grade bottles. After this, their performances in terms of return, risk, and diversification benefits will be explored as well as the main drivers of their prices and returns. Finally, future outlook of the market will be detailed, especially by outlining future demand trends and impact of the climate change.

2.1. Fine wine as investment

2.1.1. Traditional vs alternative investments

Banks (2010) defines an investment as "the allocation of capital by an investor in real or financial assets in expectation of a fair return." Most common investment instruments are stocks, bonds, cash and real estate which can be defined as traditional financial assets (Anson et al., 2010). Investors buy them at a certain time, hoping to sell them later at a higher price and generate returns. With a similar objective of reaching satisfying yields, they also place part of their capital into other asset classes hoping to diversify their portfolio and reduce global volatility. These other types of investments gained ground in the last decades as people are looking for assets that offer at the same time low or maybe even negative correlation with equities and bonds (Campbell, 2008). As shown in Figure 1, the umbrella term "alternative investments" encompasses all these non-traditional assets such as derivatives, hedge funds, commodities, private equity and venture capital funds, derivatives and collectables (e.g., art, coin, stamps, art and wine) which can serve as new investment categories (Jureviciene, 2015).

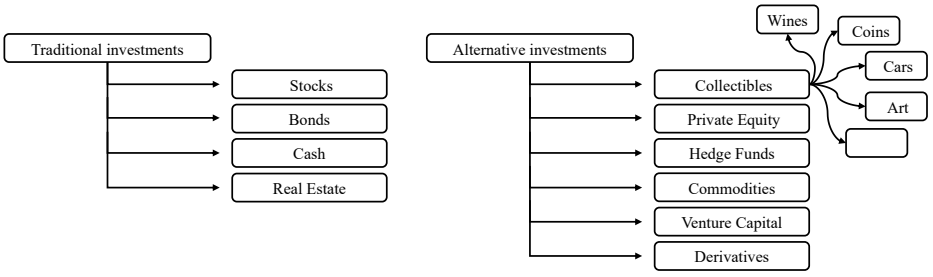

Figure 2. Categories of traditional and alternative investments (Anson et al., 2010 ; Campbell, 2008 ; Jureviciene, 2015)

The authors link their attractiveness to little interdependence and possible higher returns compared to traditional vehicles. The corollary is in general higher inherent risks, mainly caused by the unpredictability of performance, the need of specific knowledge about the asset class, illiquidity and the lack of information and data (Mulvey, 2002). Wines, which fall in the collectible class, have gained the attention of investors for these exact reasons. Investors can buy bottles, store them and then resell them later at a higher price, hoping to generate capital gains. The general belief is that fine wines provide good performance perspective in terms of return, low risk, and little correlation to other investment categories making it a high potential mean for making money (Masset et al, 2021).

2.1.2. Fine wines asset class' specificities

The asset features distinct characteristics from traditional investments. One standout attribute is its tangible nature as consumable product. In case of underwhelming returns relative to expectations, or simply for the pleasure of consumption, investors still have the flexibility to open the bottle and consume it as it was produced for that intent. However, the breakable aspect of bottles incurs storage and insurance costs. To age properly and increase in value, wine must be kept to a specific humidity level and temperature range, which requires a dedicated cellar as well as protection in case of burst. In the UK, professional storage cost is computed using yearly flat fees between £9-£15 per case including VAT and insurance while for other countries such as the USA and Switzerland, cost is based on the total value of the assets, usually the rate is around 1,5% (Liv-Ex, 2021). These additional expenses might be partly covered by a positive tax regime on capital gain. For instance, in Australia and England, wines are tax exempted (Aytaç et al., 2015) whereas France proposed a lower flat-rate tax for collectibles of 11% for any sales above 5000€, lower than the percentage for real estate (19%) and stocks/bonds (30%) (Blevins Franks, 2024).

The collectible aspect of fine wines also impacts their attractiveness. Considered as an "emotional asset", it creates a feeling of status and hedonic pleasure for the owners. As a consequence, a (non-monetary) sensory income emerges by holding on sought-after and iconic bottles, though it does not yield dividends or coupons as stocks and bonds (de Roon et al., 2008). Furthermore, as any collectibles, wine tends to be rather illiquid. Coffman and Nance (2008) highlight that investments should be made on the basis of 3 to 10 years as wine is usually ready for consumption five years after bottling but this can go up to 70 years for some

exceptional bottles. Investors must also not forget that it takes between three to five months to sell a whole collection (Masset & Weisskopf, 2017).

The last point of attention regarding wine investment is fraud. Historically, several fraudulent cases have been brought to light, where cheap wines were actually sold as investment-grade beverages. The most famous case is Rudy Kurniawan, who counterfeited some of the most sought-after bottles from the 20th century to sold them later for millions through auction houses (Cumming, 2016). For new vintages, wineries are tackling the fraud risk by using "protective labels with holograms and watermarks" however for older ones, caution is required as changing labels of similar bottles and refilling used ones are more common than expected (Coffman & Nance, 2009)

In the end, the high demand, limited supply, decreasing availability of bottles with time, status attached to vineyards and improving taste due to the aging process makes wine bottles increase in value over time. The potential positive returns create a business case for investors even though the inherent risks such as the breakable aspect, knowledge requirements, illiquidity and fraud, must be considered to see whether it is worth placing part of its capital.

2.2. Definition of fine wines

Investment worthy, or investment-grade, bottles are linked to the concept of fine wines. This term encompasses the most exceptional and sought-after wines in the world which can provide the benefits investors are looking for in investment vehicles, such as attractive return and low correlation as they hold value. However, drawing the line between normal and fine wines can be challenging as there exist no single definition, though three approaches stand out to classify wine : demand, history and quality. Overall, approximately 2% of the total wine production falls into the investment-grade category (Vinverum, 2024).

Adopting a financial point of view, some authors simply distinguish the two categories based on their potential for generating returns. In this spirit, Baldi, Peri, and Vandone (2013), along with Introvigne, Bacchiocchi, and Vandone (2017), characterize fine wine as an investment vehicle capable of yielding returns, in opposite to non-fine wines that they consider as "normal". Similarly, James Miles (2009), CEO of the London International Vintners Exchange (Liv-Ex), the leading marketplace for fine wines professionals, advances that the main difference lays in

the presence of a strong secondary marketplace giving hence the possibility to sell and buy to generate returns.

Besides the pecuniary perspective, other specialists focus on history and heritage to draw the line. For instance, Milner (2011) enclosed in the taxonomy of fine wine "the 25 best Bordeaux wines and a minority of wines from other regions." This traditional vision is mainly supported as the Bordeaux region was home to the most sought-after estates and remains the worldwide hotspot as it represented 96% of the total investment-grade market in value back in 2010 (Liv-Ex, 2021).

Finally, the quality of the drink itself can be used to categorize wines. As beverages are experience goods, their quality can only by ascertained after tasting. Due to this information void and the complexity to comprehend the taste specificities for common consumers, experts' opinions are often leveraged to guide buyers in their purchases (Storchman, 2012). Several critics exists such as Robert Parker, James Suckling, Jancis Robinson, Tim Atkin and many others. Robert Parker, one of the most influential one, publishes every year through his newsletter "The Wine Advocate" tasting scores for wines from all over the world based on a 100-point scale. The yearly release of the raking is awaited by many buyers before placing any orders as the ratings will set the trends in terms of price and demand growth in the future (Rosen, 2012). For most professionals, wines can be considered as "fine" when they score 90 or above, meaning they lay in the outstanding or extraordinary category. There is even an adage in the *vignoble bordelais* saying "Below 90, a wine is unsaleable. Above it is unfindable !" (Barthélemy, 2010)

Overall, the term "fine wines" groups extraordinary wines sourced from the most prestigious vineyards in the world. They benefit from the highest-quality grapes, exceptional winemaking expertise and historic reputation, resulting in high ratings from experts and high demand. The global appetite for these coupled with the limited supply leads to an active secondary market and investment opportunities. Throughout the time, fine wines have obtained a "kind of blue chip status" which attracts investors (Amédée-Manesme et al., 2020). In this thesis, only fine wines will be considered.

2.3. Major wine regions

Fine wines producing regions can be divided in two. On the one side, the "Old World" is composed for instance of the Bordeaux, Burgundy, Rhône Valley and Champagne in France, Tuscany and Piedmont in Italy, Ribera del Duero in Spain and Douro Valley in Portugal. On the other side, the "New World" category gathers notably wines from Australia (Barossa Valley), America (Napa Valley), Argentina, Chile and New Zealand (Lecat, 2019). The first refers to the traditional winegrowing areas which are synonym of history and cultural legacy whereas the second tends to promote innovation, modernity and exploration of new techniques (King, 2024).

2.3.1. Market

Bordeaux was considered historically as the epicenter of the fine wine market. However, in the last decade, its trade share fell down by 40 percent between 2013 and 2023, going from 80 to 40%. The year 2023 is the first time the region's market share increased in ten years as investors are turning back to a market which they know, enjoys liquidity benefits and proven value for quality (Liv-Ex , 2023) Though its fall, the region still held the gold medal among all regions following the yearly report of Liv-Ex (2021), mostly driven by Europe and Asia where it represents 72 and 46% of the trade share respectively. It is followed by Burgundy which remains very popular in the UK and in Asia, with a 30% slice in both markets. Champagne, Tuscany and California wines tend to complete the top 5 in top traded regions.

2.3.2. Bordeaux' unique Growth system

Bordeaux is divided into four main sub-regions (Figure 2) of interest for fine wines : Medoc (Margaux, Pauillac, Saint-Estephe, Saint Julien and Haut-Medoc areas), Libournais (Pomerol and Saint-Emillion villages), Graves and Sauternes. Each of these regions have their unique *Cru* system, known as Growth in English (see Figure 3.).

Figure 3. Map of Bordeaux regions (Vins de Bordeaux, 2022)

The Medoc is home to the famous five "*Cru Classé*". The term comes from the Classification of 1855, ordered by Napoleon 3rd, which ranked 58 leading wines from the area based on their quality and prestige. The Fifth Growth assembles the "least good" of today's sixty included wines whereas the first the "best" ones. The latter includes five vineyards : Haut-Brion, Lafite, Latour, Margaux and Mouton-Rotschild which was added in last in 1973 (Zimberoff, 2019). Chateau Haut-Brion is an exception of this Medoc dichotomy as officially in the Graves. Sauternes sweet white wines were also ranked in 1855 between three tiers : *Premier Cru Supérieur* (only Chateau d'Yquem), *Premier Cru* and *Deuxième Cru* (Ouvrard & Taplin, 2018).

The Graves region which includes the Pessac-Léognan *appellation*, created also a ranking system in 1953 which incorporated fourteen wines classified as *Grands Grus*. Two years later, Saint-Emilion in the Libournais also introduced a Growth system with two principal categories: *Grand Cru Classé* and the higher-level *Premier Grand Cru Classé* which is itself subdivided into tiers (A) and (B). To the contrary of the 1855 rankings, this one can be changed every decade. The A list, made up of Angelus, Ausone, Cheval-Blanc and Pavie, has been in 2021 reduced to two names, as Angelus, Ausone and Cheval-Blanc exited it and Chateau Figeac joined the club (Mustacich, 2022). Pomerol, the other famous village from the Libournais, does not have a growth system though it is home to some of the world's most famous wine such as Chateau Petrus or Le Pin (Berry Bros & Rudd, 2024).

Sub-region	Official growth ranking	Famous vineyards
Medoc	Premier Cru Classé Deuxieme Cru Classé 3ème Cru Classé 4ème Cru Classé 5ème Cru Classé	Haut-Brion, Latour, Lafite-Rothschild, Margaux, Mouton-Rothschild
Sauternes	Premier Cru Supérieur Premier Cru Deuxième Cru	Yquem, Climens, Coutet, Suduiraut
Graves	Grand Cru Classé	Carbonieux, Haut-Brion, Smith-Haut-Lafite, La mission
Saint-Emilion	Premier Grand Cru Classé A Premier Grand Cru Classé B Grand Cru Classé	Figeac, Larcis Ducasse, Pavie, Troplong Mondot

Figure 4. Growth classification in Bordeaux region (Mustachich, 2012 ; Ouvrard & Taplin, 2018 ; Zimberoff, 2019)

1st Growth, 2nd Growth, 3rd Growth, 4th Growth and 5th Growth nouns are the English translations of the *Premier* to *5ème Cru Classé* and will always refer to the Médoc region. For other areas, the names in French will be used.

2.4. Wine indexes

The popularization of wine investment led to an increased demand of transparency, traceability, and pricing accuracy. In this context, specific indexes appeared on the market to aggregate the movements of the wine market and guide investors in their placements. The indices gauge the fluctuations of actively traded fine wines from various regions to better depict dynamics within the market and act as a supporting tool to predict future performances (Liv-Ex, 2022).

One of the leading provider is the London International Vintners Exchange (or Liv-Ex) which provided its first wine indexes in 2003. The platform is used by many professionals as a reference for price fixing and its indexes as benchmarks for the global and regional markets (Maurel, 2012). They aggregate the trading price of various wines which are determined by the mid-price between the highest bid and the lowest offer on the Exchange. Next to specific regional indices, Liv-Ex (2024) presents three "major index" that portray the market of some of the most sought after-wines in the world. The Liv-ex Fine Wine 50 is the indicator of the highest-ranked Bordeaux as it aggregates the 12-bottles case price of the ten most recent vintages from the five first-Growths. The second one, Liv-ex Fine Wine 100 is considered as the industry benchmark as it monitors the prices of the 100 most coveted fine wines on the secondary market. Coffman and Nance (2009) compare it as the equivalent of the S&P500 for equities. Lastly, the Liv-ex Fine Wine 1000 is the most comprehensive measure. It reunites seven sub-indices from regions all over the world (i.e., Bordeaux, Burgundy, Champagne, Rhone, Italy and Rest of the world).

Other Wine indexes exist such as iDealWine (France) and the Australian Wine Index (AWI). The latter focuses on fine wines from Australia which showcase strong demand from the Asia Pacific region. It aims improve the representation this emerging region which currently carries a marginal position in the Liv-ex index (i.e., around 0.6%) (Coffman & Nance, 2009).

2.5.How to Invest in fine wines ?

There exists three main ways to access the market for private investors : private portfolio, wine funds, and wine futures, also called "En-Primeur" channel (Coffman & Nance, 2009).

2.5.1. Private portfolio

The first option is the most common one and consists of building its own private collection. Investors personally select and procure wines to assemble a portfolio tailored to their preferences and investment goals. In this context, most buyers turn to the secondary market to acquire their bottles, using mainly auction houses, exchanges, and brokers to secure the transaction (Baldridge, 2022). Auction houses usually hold sales every two months and propose investment-grade wines often with reference logs, acknowledging the source of the merchandises. It must be noted that to access the auction, prior registration is required and that a buyer's premium fee of 10% on average is added (Coffman & Nance, 2009). Besides auction houses, online exchanges connect buyers and sellers from all over the world. They allow ordinary individuals to purchase bottles from merchants on the marketplace in order to build their own cellar. Main trading platforms include, Wine Searcher, Vinovest and Vint ((Tach, 2022). Lastly, physical wine brokers can also be leveraged to build a private collection. Retailers help to directly acquire cases through them and can also at the end of the investment take in charge the sale of the wine to other clients (Liv-Ex, 2021).

2.5.2. Wine funds

The second way, wine funds, has gained in popularity in the recent years as they allow investors to directly own part of a wine portfolio instead of bottles physically. Indeed, pooling resources in funds with other investors helps broaden the spectrum of assets and hence get better diversification for the level of investment if well managed. Regulated entities such as The Wine Investment Fund, Wine Source Fund, Patrimoine Grands Crus and others welcome to their capital wealthy individuals and institutional investors such as banks and even university endowments (Bouri, Beyond the negative relation between return and conditional volatility in the wine market, 2014). A minimum capital is often required and the presence of management fees must be highlighted (Liv-Ex, 2021)For instance, The Wine Investment Fund requires a minimum investment of £10,000 for private investors and 1,5% annum management fees (The Wine Investment Fund, 2024).

2.5.3. Futures

The last way to access the market is through wine-futures. Also called *En-Primeur*, this purchasing method created in Bordeaux region which has extended now mainly to Burgundy, Rhone and Italy, allows buyers to buy wine that is still aging and has not been bottled yet (Berry

Bros & Rudd, 2024). The sales typically happen shortly after the harvest, and buyers have to wait usually two years before getting the bottles. The goal is twofold, for the buyer it is to secure the allocation of highly sought-after wines before they become available for general sale usually at a lower price and for the vineyard it is to lock some income before putting the beverage officially on the market (Robinson, 2018).

Depending on their preferences, wine investors can either enter the market by building a collection of physical bottles, investing in dedicated funds or buying futures which can be either resold or transformed into bottles when they reach maturity.

2.6. Fine wine performance review

2.6.1. Risk-return profile

Until the late seventies, wine experts were of the opinion that investing in the precious liquid would guarantee a positive return and they urged anyone to buy cheap bottles at release price, leave them in their cellars to sell them later once aged properly (Johnson, 1971). However, this was never confirmed by any formal study. This pushed Krasher (1979) to conduct the first research on whether fine wines provided excess returns compared to a risk-free asset. The author based his analysis on 137 Bordeaux and California wines' auction prices between 1973 and 1977 that he put in perspective with the Treasury Bill yield. The results revealed no significant difference between returns and even if storing costs of bottles were not included, fine wines would outperform the T-Bill by only 64 basis points per year on average. Nevertheless, Jaeger (1981) expressed concerns over Krasher's methodology as the period of study coincides with the 1973-1975 recession as well as two years of abundant surplus which created a drop in wine prices, especially in France. As a consequence, she extended the period of study by four years and outlined that the precious liquid actually performed better than Treasury bills. The extension of the interval highlights a significant excess return ranging from 8,25 to 16,6 percent depending on the annual storage cost per case chosen (i.e., $16,60 vs $0,449).

Since these first academic papers, many studies have analyzed the risk-return profile of wine to the one of traditional assets. Jureviciene (2015) compared the annual return of the Liv-Ex Investables, an index tracking 200 Bordeaux wines from 24 *Chateaux* to the S&P500 and the US 20-year T-bill from 1992 to 2011. In this case, wine showcased a return of 13.5% and the two others, respectively 6% and 5.30%. Even though the risk for bonds remains the lowest

(1.29%) wine demonstrates less variability than stocks, i.e. 12% vs 15.4%. This underpins a better performance for the liquid compared to equities.

Besides using wine indexes, several authors used a repeat sales regression method to compute the return of wine, this approach consists in comparing the sales prices of the same good at different points in time to estimate the average rate of appreciation or depreciation in the market. Masset and Weisskopf (2010) built their own indexes using this method from a period from 1996 to 2009, one for "General Wines" from all over the world and a second for "First Growth" and put it in perspective to the Russel 3000, a reference that benchmarks the whole US stock market. It appeared that both indices outperformed the stock metric while showing a lower volatility and that the First Growth Index performed the best among the three of them. It must be noted that the timeframe includes 2008 which was a particularly difficult year for the stock market and especially good for first growth. Lucey et Delvine (2014) performed a similar study, this time using the 1996-2006 period, excluding thus the grand financial crisis. They built a "Bordeaux" and "Rhone" wine index and compared it to the Dow Jones (DJIA). Bordeaux offered this time the lowest return (3.20%) while Rhone the highest (5.50%). DJIA return was between the two, 4.90%, but was more volatile, 17.60% vs 10.40% and 8.90% for Bordeaux and Rhone respectively. They also compared the performance of five wine funds, which should *a priori* perform better than the indexes due to active management and expert knowledge. It appeared that even though they showed a higher average return than the Dow Jones and both wine indices, their volatility was surprisingly high, around 20% for three out of the five of them.

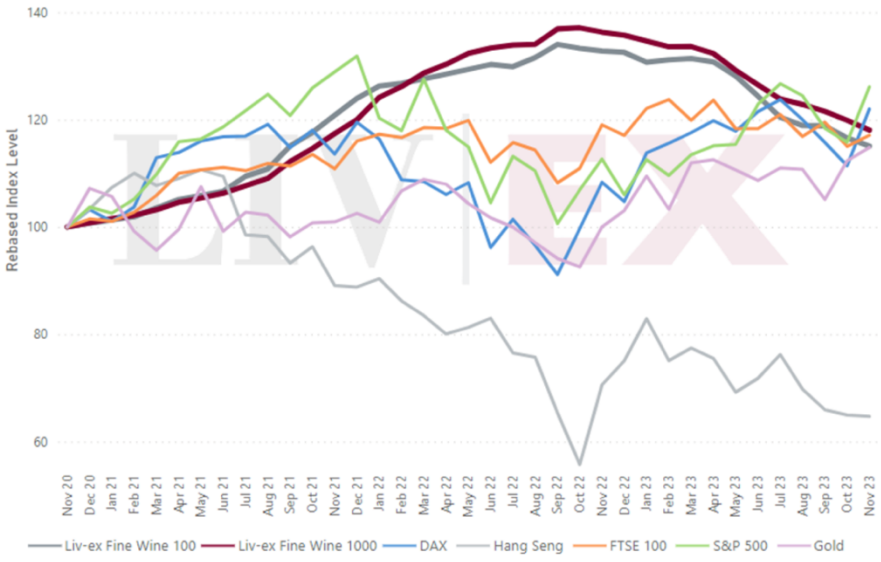

Figure 5. Liv-Ex indices compared to equities and commodities (Liv-Ex, 2024)

From then end of 2020, the fine wine market underwent a continuous growth for two years in a row. Fueled by pent-up demand during the coronavirus pandemic and a search for alternative assets as mainstream financial markets experienced downturns during the same year, the Liv-Ex indexes outperformed many stock indices (Fletcher, 2023). As seen on figure 4, volatility was way more stable.

However, after reaching a peak in the end of 2022, the fine wine market took a hit and underwent a significant fall since then. The Liv-Ex 100 and 1000 lost around 13% between November 2022 and 2023. Bordeaux, Burgundy and Champaign have seen a decrease in their value between 10 and 20%, while Italy managed to cut its losses to a single digit number, around 6% over the same period. Reasons behind will be explored in section 2.7.

2.6.2. Diversification benefit

Portfolio risk diversification is often advanced as one of the main advantages of fine wines investment. Sannin et al. (2008) leveraged the Capital Asset Pricing Model and the Fama-French Three-Factors Model to analyse fine wine excess return and its covariation with stock markets. The first model aims to estimate the excess return of an asset through its expected return, alpha, and its volatility compared to the overall market, represented by beta. The second follows the same objective but adds two variables that influence heavily traditional stocks : the outperformance of small and high book-to-value firms.

With a sample of more than 13,000 wine returns from 1996 to 2003, they underpinned that wine excess return was positive on average (positive alpha) and co-moved minimally with the stock market and the two Fama-French risk factors (negative and close to zero betas). In other words, wine returns are not impacted by the same factors as traditional stocks and hence, can provide diversification benefits. In the same idea, Fogarty (2007) studied the change in the Sharpe ratio, which measures the excess return of an asset per unit of volatility, when Australian wine was added to a mixed portfolio of shares and bonds. The inclusion of the alcoholic beverage enabled to lower the risk for the same level of return, with a risk decrease of 0.24 percent per quarter. Masset and Weisskopf (2010) also support the diversification benefits by proving that including fine wines in a conventional portfolio enabled higher returns for lower risks than the Russel 3000 index.

2.6.3. Safe haven properties

These studies focus on correlation with the stock market in general times but some researchers wanted to also investigate the behavior of wine during crisis period and whether it could act as a safe haven. An asset can be defined as such when its volatility decreases during periods of stress on the equity market and allows investors to compensate for their losses in other portfolios (Baur, 2012). Bouri (2014) studied the asymmetric volatility of fine wines to verify this proposition. His findings show that wine reacts oppositely to the stock market as positive shocks (good news) lead to higher volatility than negative ones. In other words, in turmoil periods, wine volatility decreases and responds less than during bull market. He concludes that his results are explained by the safe haven property of fine wines. In 2016, the author pursued his study with Roubaud by comparing the UK stocks to the Liv-Ex Investables index between 2001 and 2014. Results demonstrated only a weak safe haven effect of wine, meaning the asset performance does not fully counterbalance losses during crisis period. Negative correlation with the stock market was still highlighted, proving the hedging properties of wine on average (Bouri & Roubaud, 2016). Lęt and Siemaszkiewicz (2020) validate the weak safe haven properties of wine during extreme declines and highlight that the only strong haven safe among bitcoin wine and gold is the latter.

In conclusion, we observe positive results for wine returns even though they vary depending on the period location studied (Le Fur & Outreville, 2019). They usually showcase similar returns to the equity market but with a lower volatility. Compared to bonds, yields are higher but so is the standard deviation. The diversification and hedging benefits have been proven thanks to a low correlation to stock and bonds markets but only a weak safe haven behavior has been highlighted in periods of crisis.

2.7. Wine price drivers

Similar as most assets, a bottle's return is directly influenced by market conditions and its underlying characteristics. Indeed, on the one hand, specificities such as the vineyard, the grape variety, the vintage, the score and others fixed factors will affect the demand for the bottle itself. On the other hand, the status of the economy, stock markets, interest rates, disposable income, and other macroeconomic factors will impact the attractiveness of wines versus other assets. As consequence, the impact of the two types of catalyzers must be studied separately.

2.7.1. Macroeconomic factors

The fine wine market, is as any, a question of supply and demand. Though one may think they are equally relevant, Cevik and Sedik (2010) highlighted that the aggregated demand was the actual main driver for commodity price fluctuations by studying the growth of the crude oil and fine wine market prices between 1990 and 2010. They modeled the price of the commodity at time t by using the Industrial Production Index for advanced countries and emerging economies to represent the aggregated demand, the total production to depict the supply level and the global excess liquidity. The aggregated demand appeared as the main determinant of price fluctuations rather than supply. Additionally, even though developed countries represented more than half of the total consumption, the incremental demand growth rate emanating from emerging market is the actual key driver for the prices. Besides demand, excess liquidity also influences positively prices. Supply was non-significant.

Jiao (2017) built on the research of Cevik and Sedik. The data was extended from 1996 to 2015 and she included the real interest rate and the financialization of the market in the regression as well as replaced the Industrial Production index by the Gross Domestic Product (GDP) as measure of the demand. Additionally, unique political factors were added to the model to reflect announcements of new policies or worldwide unique events. The results support again the influence of the demand coming from emerging countries as BRIC's GDP appears statistically significant, which is not the case for developed countries. Production was also in this study irrelevant. Besides GDP and consumption, the state of financial markets has an impact on the fine wine demand due to positive wealth and cash effect in thriving financial environment period. Finally, the 2008 crisis, 2010 China-led boom and the 2011 demand drop did lead to a change in the investment-grade market.

Liv-Ex (2021) also put in perspective major macroeconomic trends with the fluctuations of the Liv-Ex 100 Index since 2004 (Figure 6). Five main events which impacted the popularity of the investment class where highlighted. As identified previously, the 2008 financial crisis led to the plummet of the market. By the end of the same year, the announcement of the four-trillion-yuan (US$586 billion) stimulus package enabled a two-year period of almost non-stop growth as fine wines were used for gifts for officials. In 2011, the Bordeaux market fell, dragging with him the index due to record sales on the 2010 vintage caused by large stocks and decreased demand from the Far East. Five years later, the Brexit and the devaluation of the pound helped to

dynamize the market as the UK stock was discounted for overseas buyers. Finally, a dip can be highlighted in February 2020 when the COVID crisis hit. However, four months later, fine wine was back in a bullish period for 18 months in a raw.

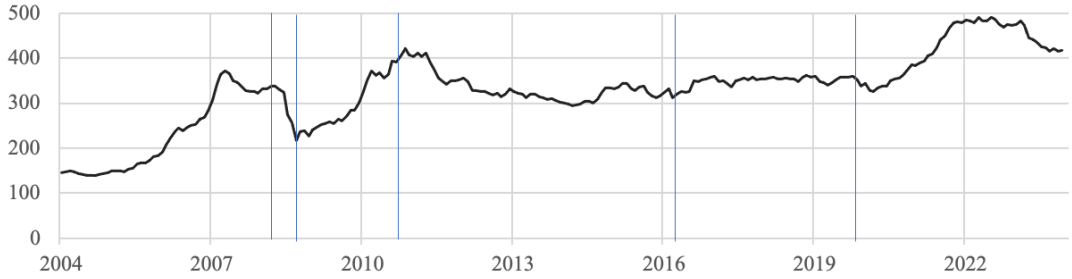

Figure 6. Liv-Ex 100 Index growth from 2004 to 2024

In an article in the Financial Times, Fletcher (2023) also links 2023's drop in the market, especially in the Champagne and Burgundy regions, due to the higher interest rate. Indeed, when the bond market is thriving, the attractiveness of the precious liquid in the eyes of investors diminished as some risk-free yields were reaching close to 5 percent, not far from the traditional 7 percent wine has provided over the long term. She also adds that the slowing Chinese economy limits growth.

2.7.2. Microeconomic factors

Ashenfelter (2008) focused on identifying the reasons behind the differences in prices among Bordeaux wines. He showcased through linear regressions that vineyards and vintages had the most impact on prices and could explain up to 90% of the variability in bottle values. This is because the best vineyards produce the highest quality wines for every vintage and exceptional years lead also the best quality beverages. History, reputation, and location are mostly responsible for the *Chateau's* influence, whereas the weather and age explain the differences in prices across vintages. Even though age of the bottle does impact the prices, weather has the largest influence across the *millésimes*, especially the average temperature during the growing season, rainfalls before the grow and during the harvest in September.

Besides weather, experts' scores are also often thought to influence prices. Ashenfelter and Jones (2012) tried to analyze whether they actually contained any private information on the vintages' attributes. When he regressed wine prices on expert ratings only, he found ratings were good predictors. However, when coupled with weather (which is also a useful variable when alone), they become insignificant. This shows that experts do not contain any private information and should not influence the prices when other significant variables are known.

These studies were mostly focusing on variables influencing prices per se but not on the ones impacting the most returns over time (i.e., if prices do not fluctuate, there is no return). Dimson and al. (2015) focused on this and underpinned the impact of aging and quality of vintage factors on price growth and hence returns. They noticed different behaviors depending on the quality of the vintage and in which period of its life-cycle the bottle is. In the 113 years sample (1899-2012), it appeared low-quality vintage prices tend to appreciate little during the maturation period (first 20 years after bottling), with an annual growth rate of 0.6%, and only start rising once wines reached maturity, showcasing then a return of 2% annually. Oppositely, exceptional *millésimes* increase in value during the two first decades of their life and then stabilize after, going from an average yearly yield of 4% to 2%. The authors explain this difference as lesser good bottles are more likely to be consumed early, decreasing their availability and making them become rarities quicker which hence explains the return increase. For great vintages, the supply remains stable during their maturation period (up to 40 years) as owners wait most favorable time to drink it. Price appreciation is thus not explained by scarcity but rather because wine is getting closer to its optimal consumption state. Past optimal age, the difference in return levels between low- and high-quality vintages becomes smaller, as the price growth no longer resides in the consumption value but rather in the status of owning such collectible asset.

There are overall very few papers regarding factors at a producer level which impact wine returns. It can still be outlined that the Chateau and vintages seem to have the highest impact, followed by age and finally scores.

2.8. Impact of climate change

In 2023, global wine production is expected to significantly decline due to adverse weather conditions affecting major wine-producing regions suggests the International Organization of Vine and Wine (OIV, 2023). The EU, particularly Italy and Spain, faces notable decreases because of downy mildew and droughts, while France emerges as the largest producer with a slightly above-average volume. In contrast, the USA anticipates higher production than in recent years. The Southern Hemisphere, except for New Zealand, also experiences substantial reductions, with countries like Australia, Argentina, Chile, South Africa and Brazil heavily impacted. The projected global wine production ranges between 241 and 246 million hectoliters, marking a 7% decrease from the already low 2022 figures and the smallest yield since 1961.

Though climate change will reduce the quantity of wine produced, the impact on quality is less clear. Jones et al. (2005)explored the significant role climate plays in viticulture, examining historical data from 1950 to 1999. They found that most of the world's highest-quality wine-producing regions have experienced growing season warming trends, leading to improved vintage quality and reduced year-to-year variation. The study highlights that climate change impacts will vary across regions and grape varieties. European wine regions are currently at optimal growing temperatures, but further warming could exceed climatic thresholds, challenging existing wine styles. Conversely, some regions may become more suitable for viticulture, potentially expanding wine production to more poleward areas.

2.9. Summary

To summarize, the key learnings of the literature review are the following:

1. Fine wine returns varied throughout the time and period studied, average yearly return can be considered around 7%, below equities but higher than bonds; volatility is also lower than stocks but higher than the debt market.
2. The asset class provides diversification benefits as low correlation with the stock market and low volatility in crisis periods.
3. Main macroeconomic factors identified are emerging countries' demand, thriving stock market, excess liquidity, and low interest rates ; data used is up to 2015 from all the sources that have been found.
4. Main microeconomic factors identified are the vineyard, vintage (mostly driven by weather conditions whether than age) and scores when alone. Studies have been realized on static prices and not on returns; there is a literature gap on this aspect.
5. Climate change likely to decrease production but impact on taste and quality could differ depending on the regions' weather (e.g., temperatures and humidity/rain).

Based on this, the econometric analysis will aim to :

- Update the findings of the macroeconomic factors with more recent data and new variables
- Fill the literature gap on the microeconomic side by using annual returns of Bordeaux fine wines as the dependent variables, with a focus on the region's Growth system's impact.

3. Data collection

3.1. Macroeconomic factors

The dependent variable is the growth of the Liv-Ex 100. Professionals often consider it as the benchmark for the market as it aggregates the movement of the 100 most sought-after wines from France, Italy, USA, Australia and Chile. This particular index will serve as measurement of the global investment-grade wines market. All its values have been retrieved on Bloomberg and cover a period from April 2004 to end of March 2023, which represents in total 240 observations.

Six explanatory variables were selected to explain the variation of the fine wine market : total exports of Bordeaux Protected Designation of Origins (PDO) wines to the USA, total exports of Bordeaux PDO wines to China, the GDP of China, the GDP of the European Union, the S&P500, the 1-month Treasury Bill, and the inflation rate. Other specific key events will also be included as dummy variables. All of these have an impact on the demand side which, as mentioned in the literature review, is the key driver of price movements ; supply conditions have no significant influence.

The first macroeconomic variables are the exports of Bordeaux wines from Protected Designation of Origins to the USA and to China. They aim to measure the aggregated demand of these two countries for quality wines, hence the PDO specificity. Once again Bordeaux region was chosen as a proxy as representing the most exchanged region. Data used was found on the Wine Trade section of Eurostat and is measured in monthly hectoliters exported. The period stretches from April 2004 to April 2024.

Next, the Gross Domestic Products of the European Union and China are supposed to represent the state of the economy of traditional wine-drinking countries and emerging countries. As the GDP of Europe and the US co-move similarly, the choice was to use the metric of the Old Continent as a proxy for both. The quarterly values were extracted from the National Bureau of Statistics of China and the Federal Reserve of St-Louis. The data goes from Q2 2004 to Q1 2024, which represents a period of 20 years. As the Liv-Ex works monthly, the assumption was made that the GDP increased linearly during the three months, thus the quarterly metric was divided by three to obtain a monthly value.

Besides the general state of the economy, the influence of the bond and equity market is quantified through the S&P500 and the 1-month Treasury bill, considered as a risk-free asset. The former should translate the positive wealth effect of a thriving/declining market whereas the latter the decreasing attractiveness of alternative assets in case of higher rates. The S&P500 monthly values were sourced on Bloomberg and the risk-free asset on the Federal Reserve of St-Louis. Both metrics assemble 240 observations ranging from April 2004 to March 2023.

The impact of the inflation was measured through the growth rate of the Harmonised Index of Consumer Prices (HICP) within the European Union. The aim is to model whether a high inflation shifts consumption on necessary products and hence reverberates on fine wine demand. Data was retrieved from the Eurostat and covers the same period.

Finally, dummy variables will also be added in the equation to depict specific events that may have had an impact on the expansion/decrease of the fine wine market. The effects are modelized by binary variables where a 1 is given for every month from the moment the event started up to a year, except for the 2009 dummy which goes up to two years. In total, there are five dummies that translate the following events :

- D2008 : financial krach of the stock market caused by Leeman Brothers' collapse
- D2009 : Investment of a four-trillion Yuan stimulus package in China in 2009 and 2010
- D2011 : Fine wines bubble burst due to too high En-Primeur prices
- D2016 : Brexit and devaluation of the British pound
- D2020 : Corona virus crisis

3.2. Microeconomic factors

The term microeconomic gathers all inherent characteristics of the wine that will not change throughout time and that are determined at the producer level. For the purpose of this research, six variables have been selected for every bottle : the Growth (or le "*Cru*"), the vintage, the age, the release price, the Parker score, and the score category. They will be used to model the dependent variable, the compound annual growth rate (CAGR), of the selected fine wines.

The first step of data collection was to build a list of investment-grade bottles. The focus will be put on the region of Bordeaux as being the hotspot for fine wine exchange. Keeping this in mind, the components of the Liv-Ex Bordeaux 500 served as a base as it is considered as one

of the most comprehensive benchmarks for the region. It includes the last 10 vintages of the 50 most sought-after wines from the Medoc, Libournais, Graves and Sauternes areas. The initial components were slightly modified to include the 2021 vintage and deleted all the ones below 2012. In total, 468 wines were selected - the list of all bottles can be found in Appendix 10.3.

Then, the vintage and the age were added. Directly attached to the year of harvest, they will contain different information as the age is only linked to how old is the wine whereas vintages also include underlying weather and production particularities of the year. The vintages go from 2012 to 2021 and consequently the age from 3 to 12 years.

Regarding the Growth categories, it was incorporated in the name. In total nine Growths have been chosen as explained in Table 1. 2nd Vin Premier Cru Classé (second wine produced by first growth vineyards) and Pomerol are not official Growth but were added in the aim to model accurately their impact.

Sub-region		Growth variables
Medoc	1	Premier Cru Classé
	2	Deuxieme Cru Classé
	3	3ème Cru Classé
	4	4ème Cru Classé
	5	5ème Cru Classé
	6	2nd Wine for 1st Growth
Sauternes	7	Premier Cru de Sauternes
Graves	8	Grand Cru Classé de Graves
Pomerol	9	Pomerol
Saint-Emilion	10	Premier Grand Cru Classé A
	11	Premier Grand Cru Classé B

Table 1. Growth categories used as explanatory variables in the regressions

After this, the release price, release date, and current price were manually extracted on the platform "Wine Searcher" for every wine around the 25th of June 2024 in order to compute the average yearly growth. This website is the leading search engine and comparison tool for all alcohol related products in the world. The website provides for all products the average value which is calculated daily by aggregating the prices (excluding taxes) proposed by worldwide retailers for a particular bottle. For this study, release price and date were chosen when more than ten retailers offered the product to avoid errors, outliers, and unrepresentative unique sales. For the 2012 and 2013 vintages, it was not possible to extract the actual release date/price as Wine Searcher's prices go up to ten years – in these cases the earliest date available was chosen.

Bottles on the market for less than three months were also excluded from the analysis. To obtain the CAGR, the compound monthly growth rate was first computed. The relationship between the two is as follows:

$$CMGR = \left(\frac{Current\ Price}{Release\ Price}\right)^{\frac{1}{N}} - 1$$

$$CAGR = (CMGR + 1)^{12} - 1$$

where N represents the number of months the bottle has been on the market, that is the period between the release date and the June 2024.

The last variables added, Parker score and score category, translate the quality of the wine. The Parker Score of every bottle consists of a score from 50 to 100 given by the Wine Advocate – Roger Parker. The score category is directly linked to the attributed number : between 80 and 89, vintage is considered as above average, between 90 and 95 as outstanding and above 96, extraordinary.

The same data collection was performed for Burgundy and regions for the robustness check. The lists were based on the Burgundy 150 and the Italy 100 Liv-Ex indexes.

4. Methodology

4.1. Macroeconomic analysis

A Multiple Linear Regression using the Ordinary Least Squares (OLS) approach will be employed to identify the drivers behind the fine wines market movements, as measured by the monthly returns of the Liv-Ex 100 index.

To prepare the data for the model, all variables were transformed into logarithms. This helps to stabilize the variance and linearize the relationships between the variables. Furthermore, as our data are time series, the stationarity hypothesis (i.e., the respective mean and variance of all variables must remain constant over time) needs to be ensured in order to apply a linear regression. To respect this condition, a first-order difference (between month t and month t-1) was applied to the Liv-Ex 100, wine exports, S&P500, 1-month T-Bill, and HICP. A third-order difference was realized on the European GDP as its values were expressed quarterly.

By performing a logarithmic transformation and a difference between t and t-1 (or t-3) values, we obtain a very close approximation of the growth rate of the variable between the two periods. For instance, if an asset goes from 100 to 105 in a month, the monthly yield will be worth 5% and the difference of the logarithms, which is ln(105) – ln(100), 4,9%. In the end, all variables are thus expressed in monthly growth rates. As consequence, coefficients can be interpreted as elasticities, meaning they represent the percentage change in the dependent variable (Liv-Ex 100 monthly return) resulting from a one percent change in the independent one.

Finally, to portray the past influence of the fine wines market state on itself as well as to solve the issue of autocorrelation of the dependent variable, a "LagLLX" variable has been implemented. It will measure the impact of the t-1 month's Liv-Ex 100 return on the one from month t. Model 1 is obtained in the end :

$$\Delta LXX_t = \alpha + \beta_1 \times \Delta GDPEu_t + \beta_2 \times \Delta GDPChina_t + \beta_3 \times \Delta TBill_t + \beta_4 \times \Delta SP500_t + \beta_5 \times \Delta HICP_t + \beta_6 \times LagLXX_{t-1} + \beta_7 \times DV + \varepsilon_t$$

After realizing the regression, six hypothesis were verified through diagnostics tests : (i) independence, (ii) normality and (iii) homoscedasticity of the residuals, (iv) linearity between

the independent and dependent variables, (v) absence of multicollinearity between the independent variables and (iv) stationarity of the variables (as it is a time series).

4.2. Microeconomic analysis

For the econometric modeling, a Multiple Linear Regression using the Ordinary Least Squares (OLS) approach will also be used to measure the impact of the inherent characteristics of wine on its annual growth. Before diving into the analysis, a descriptive review of the collected data will be developed. The aim is to identify potential trends and propositions on the Growths, vintages and parker score to put in perspective to the results in the discussion.

The CAGR of 468 bottles will be regressed using the Growth, the age, the vintage, the parker score, the equivalent score category, and the release price as explanatory variables. As the age and the vintage covary heavily, two regressions will be conducted, each one including one of the two variables. In this situation, the vintage will be considered as a category (not numerical) which thus captures at the same time the impact of the age and the general opinion on the quality of the *millésimes* and as a number. Similarly, both the Parker score and category will be analyzed separately to get a more accurate grasp of their influence, whether it is about the number itself, the classification or none of them. The reference variables in the intercept are the 2012 Vintage and the *2eme Cru Classe*. The models used are the following :

- Model 1 :

  $$CAGR_i = \alpha + \beta_1 Growth_i + \beta_2 Age_i + \beta_3 Parker.Score_i + \beta_4 Release.Price_i + \varepsilon_t$$

- Model 2 :

  $$CAGR_i = \alpha + \beta_1 Growth_i + \beta_2 Vintage_i + \beta_3 Category_i + \beta_4 Release.Price_i + \varepsilon_t$$

- Model 3 :

  $$CAGR_i = \alpha + \beta_1 Growth_i + \beta_2 Vintage_i + \beta_3 Parker.Score_i + \beta_4 Release.Price_i + \varepsilon_t$$

- Model 4 :

  $$CAGR_i = \alpha + \beta_1 Growth_i + \beta_2 Age_i + \beta_3 Category_i + \beta_4 Release.Price_i + \varepsilon_t$$

Here, the coefficients of the explanatory variables can be interpreted as the number by how much the CAGR of a bottle will increase or decrease. If the variable is categorical (Growth, vintages, parker category), the coefficient will be the incremental return if the wine showcases that characteristic whereas if the variable is numerical (age, release price, parker score), it will the change in the yield by additional number (i.e., + one year, + one euro, + one point).

A robustness check will be performed on the Italy and Burgundy regions using the same models to see whether results can be expanded to other regions and are not unique to the Bordeaux regions. However the Growth variable, proper to Bordeaux, will not be checked.

The diagnostics tests the five following hypotheses were also performed to ensure the validity of the model : (i) independence, (ii) normality and (iii) homoscedasticity of the residuals, (iv) linearity between the independent and dependent variables, and (v) absence of multicollinearity between the independent variables. The stationary hypothesis must not be checked as the data is not time series.

5. Macroeconomic results

Two regressions were performed, the first one excluding the dummy variables on the specific events and the second taking them into account. Table 2 below summarizes the output of the first model. As reminder, the coefficients represent the elasticity : by how much the Liv-Ex 100 index will increase or decrease if the independent variable increases by one percent.

Three variables appear to have a significant impact on the Liv-Ex 100 monthly yield namely the S&P500, the European GDP and the previous return of the wine index. All of them have a positive correlation with the dependent variable, meaning they will move in the same direction (i.e., increase or decrease together). Overall, this model explains slightly less than 20% of the total variation of the Liv-Ex 100 monthly returns, though it is a satisfying number is does not totally grasp all the movements.

	Model 1	
Variable	**Coef.**	**t-Stat.**
Intercept	3E-04	0.1
grTBill	0.004	1.0
grSP	0.2	4.2 ***
grinflation	0.03	0.1
grGDPChina	-0.01	-0.7
grGDPEu	0.25	2.4 *
grExChina	-0.001	-0.7
grExUsa	-0.003	-0.4
LXX_lag1	0.25	4.0 ***
Multiple R-squared	0.19	
Adjusted R-squared	0.17	

Significance code : * p < 0.1, **p <0.05, ***p < 0.01

Table 2. Output macroeconomic model

Looking closer at the coefficients in Table 2, an increase of 1% of the stock market will lead to an additional 0,2% growth for the fine wines market. The bond market seems irrelevant as the coefficient is not statically different from zero though. Regarding the influence of economies, only the GDP of Europe will change the precious liquid movements, driving the expansion to 0,25% when the metric gains one percent. The GDP of China, which serves a proxy for emerging countries, does not appear impactful as proven by a p-value way higher than 10%. Same results for the exports of Bordeaux wines, which are irrelevant both for America and Asia. Finally, the past state (LXX_lag1 variable) of the overall fine wines market also affects the current return. This is often the case in time series, where a variable tends to vary similarly as the previous ones. In this case, 25% of the t-1 growth rate will be added to the present month.

Including specific events in the model helps to improve the accuracy of the model, as shown by the 7% and 4% increase of the multiple and adjusted r-squared respectively. As shown in Table 3, the three previous significant variables remained and two new ones appeared, d2008 and d2009.

	Model 1		Model 1 incl. events	
Variable	**Coef.**	**t-Stat.**	**Coef.**	**t-Stat.**
Intercept	3E-04	0.1	0.002	0.7
grTBill	0.004	1.0	0.004	1.0
grSP	0.2	4.2 ***	0.18	3.8 ***
grinflation	0.03	0.1	0.07	0.1
grGDPChina	-0.01	-0.7	-0.02	-1.0 *
grGDPEu	0.25	2.4 *	0.2	2.0
grExChina	-0.001	-0.7	-0.001	-0.5
grExUsa	-0.003	-0.4	-0.004	-0.6
LXX_lag1	0.25	4.0 ***	0.16	2.5 *
d2008			-0.02	-2.9 **
d2009			0.02	3.6 ***
d2011			-0.01	-1.4
d2016			-0.003	0.3
d2020			0.008	0.8
Multiple R-squared	0.19		0.26	
Adjusted R-squared	0.17		0.21	

Significance code : * p < 0.1, **p <0.05, ***p < 0.01

Table 3. Output of macroeconomic model which includes specific events

The significance of d2008 and d2009 is a sign the Liv-Ex 100 was impacted by the financial crisis of 2008 and by the Chinese stimulus package from 2009 to 2010. The first variable had a negative influence on the fine wines market as its value decreased by 0,03% on average for every month of the crisis. Oppositely, the money fueled in Chinese's economy led to a positive impact on the wine exchanges, growing by an additional 0,02% every month during the two years. It must be noted that even though these values remain small compared to the three other significant coefficients, they still prove the influence of these kind of events on the investment-grade wines market. The 2011 Bordeaux shock (d2011), 2016 Brexit (d2016) and 2020 coronavirus crisis (d2020) do not seem to have significantly changed the Liv-Ex 100's growth.

As mentioned, the previously identified variables stay impactful though coefficients went slightly down. In conclusion, five significant variables have been identified in this regression. Their impact and interpretation will be further pursued in the discussion section.

6. Microeconomic results

6.1. Descriptive statistics

In this section, a dive-in the region of Bordeaux will outline the preliminary trends regarding the influence of the Growth, vintage and scores on the performance.

6.1.1. Growth

As explained in the literature review, the Growth system classifies officially the quality of the vineyards of every sub-region into categories. In that instance, Premier Cru Classé (Medoc), Premier Grand Cru Classé A (Saint-Emilion), and Pomerol, which tend to be considered as the best ones historically speaking, do not seem to lead to best performance. The podium is held by three growths from the left bank with as 1st place the *4eme Cru Classé* showcasing an average yearly return 9%, followed by 2nd wines of 1st growth with 8% and finally *3eme Cru Classé* around 7%. Though the 1st and 2nd Growths are located in the same ballpark as the bronze medal. In Table 3, which summarizes hence the average CAGR for every Growth, it appears the left bank tends to provide higher returns than other sub-regions. Additionally, in Saint-Emillion, lower-ranked growth (*Premier Grand Cru Classé B*) brings larger gains than its upper tier which stays at the bottom of the ranking.

Growth categories	Avg CAGR	Sub-regions
4eme Cru	9,2%	Medoc
2nd Vin Grand Cru	8,0%	Medoc
3eme Cru	7,0%	Medoc
Premier Cru	6,9%	Medoc
2eme Cru	6,9%	Medoc
Premier Grand Cru Classe B	6,0%	Libournais (St-Emilion)
Pomerol	5,7%	Libournais (Pomerol)
Cru Classe de Graves	5,5%	Graves
Premier Cru Classe de Sauternes	5,3%	Sauternes
Premier Grand Cru Classe A	4,6%	Libournais (St-Emilion)

Table 4. Ranking average CAGR for growth variables

6.1.2. Vintage

Besides Growths, the overall quality of the vintages can influence fine wines values. Figure 6 presents for the last 10 *millésimes* the average yearly return and highlights in green extraordinary years. The vintage is categorized as such when the average parker score of all wines from that year exceeds 95. Overall, “extraordinary” vintages seem to provide higher

returns than outstanding ones, with average CAGR going from 5,7% to 11,3% versus 3,1% to 5,9%. The four highest CAGR are awarded to the higher tier of vintages.

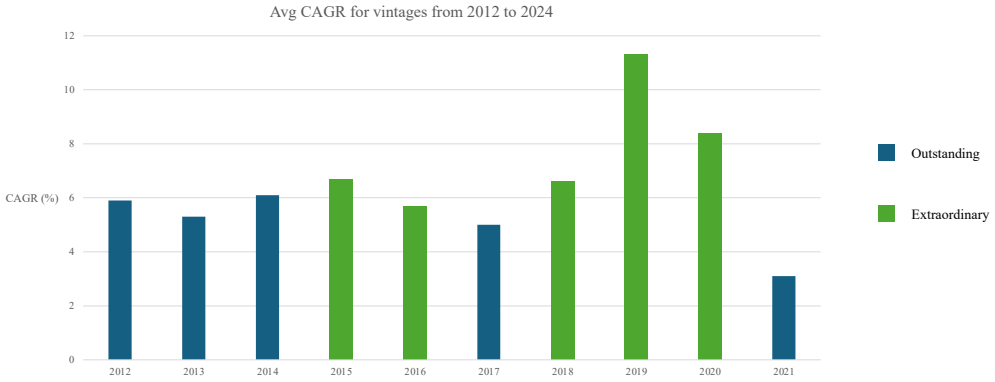

Figure 7. Average CAGR for 2012 to 2021 vintages

6.1.3. Parker score and score category

The Parker scores do not seem to impact the average return as no clear upward trends can be observed on Figure 7 as grade increases. For instance, wines obtaining an 89 had on average a higher yield than the ones scoring a 98. However, bottles which obtained a 100 do seem to generate higher returns, as shown by the almost 9% average CAGR.

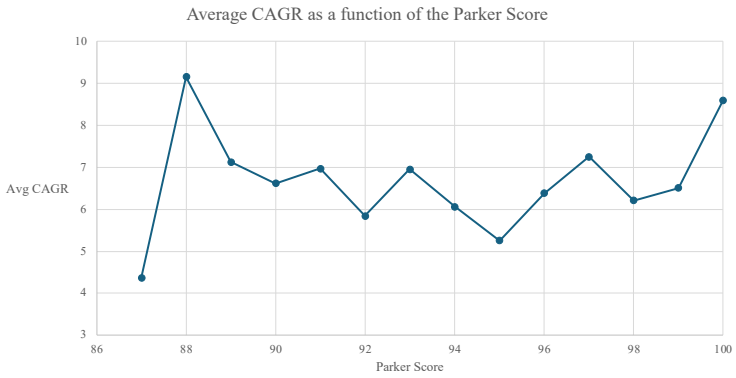

Figure 8. Average CAGR per Parker score

The score categories do not depict a difference between extraordinary and above average bottles. The outstanding category remains slightly behind though. Overall, preliminary trends highlight that higher scores, whether as number or category, do not incur higher yields.

Score Category	Avg CAGR
Above Average	7,0%
Outstanding	6,1%
Extraordinary	6,8%

Table 5. Average CAGR per score category

6.2. Empirical results

As mentioned in the methodology, several regressions were undertaken to picture the different ways to measure the effect of the year (age or vintage) and of the score (number itself or category attached).

6.2.1. Models using the vintage

Table 6 details the results of four regressions. The first model explains the CAGR using only the Growths, the second includes on top the vintage as category and finally, the two last ones model the impact of the quality, represented respectively by the score and the category.

Models	Growth		Growth and Vintage		Growth, Vintage, Price, Score		Growth, Vintage, Price, Category	
Variable	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.
Intercept	0.07	18.4 ***	0.07	12.5 ***	0.081	1.3	0.068	7.7 ***
Premier Cru Classe	0.007	1.1	0.008	1.5	0.009	1.6	0.008	1.5
3eme Cru Classe	0.001	0.1	2E-05	0.003	2E-04	0.03	2E-04	0.02
4eme Cru Classe	0.02	2.4 *	0.02	2.6 **	0.02	2.5 *	0.02	2.5 *
5eme Cru Classe	-0.007	-1.0	-0.007	-1.2	-0.007	-1.25	-0.007	-1.2
2nd Wine Premier Cru Classe	0.015	2.4 *	0.016	3.1 **	0.016	2.8 **	0.016	3.0 **
Cru Classe de Graves	-0.01	-2.2 *	-0.01	-2.7 **	-0.01	-2.65 **	-0.01	-2.7 **
Premier Cru Classe de Sauternes	-0.02	-2.3 *	-0.02	-3.2 **	-0.02	-3.6 ***	-0.02	-3.6 ***
Pomerol	-0.01	-2.1 *	-0.01	-2.8 **	-0.01	-2.3 *	-0.01	-2.3 *
Premier Grand Cru Classe A	-0.02	-3.4 ***	-0.02	-4.1 ***	-0.02	-3.9 ***	-0.02	-3.9 ***
Premier Grand Cru Classe B	-0.009	-1.0	-0.009	-1.3	-0.009	-1.29	-0.009	-1.2
Vintage2013			-0.006	-1.0	-0.006	-1.03	-0.006	-1.0
Vintage2014			0.002	0.3	0.002	0.31	0.002	0.4
Vintage2015			0.008	1.4	0.009	1.50	0.009	1.5
Vintage2016			-0.001	-0.2	-4E-04	-0.07	-0.001	-0.2
Vintage2017			-0.009	-1.4	-0.008	-1.30	-0.008	-1.3
Vintage2018			-0.008	1.3	0.009	1.37	-0.008	1.3
Vintage2019			0.05	9.0 ***	0.05	8.77 ***	0.05	8.6 ***
Vintage2020			0.03	4.3 ***	0.03	4.24 ***	0.03	4.3 ***
Vintage2021			-0.03	-4.7 ***	-0.03	-4.85 ***	-0.03	-4.8 ***
Release.Price					-2E-06	-0.67	-2E-06	-0.8
Parker.Score					-0.0002	-0.27		
CategoryExtraordinary							-0.004	-0.5
CategoryOutstanding							-0.006	-0.7
Multiple R-squared	0.10		0.42		0.43		0.43	
Adjusted R-squared	0.08		0.39		0.40		0.40	

Significance code : * p < 0.1, **p <0.05, ***p < 0.01

Table 6. Output of microeconomic models using the year variable as vintage

Looking only at the Growths' impact in the first model, the independent variable manages to explain 10% of the total variability of the yearly yield. From the coefficients, it can be observed that the 2nd Growth (2eme Cru Classé), which can be found in the intercept, is significantly different from 0 and provides on average a return of 7%. Only 4th Growths and 2nd wines from 1st Growth are able to generate better performance, with a respective 2% and 1.5% incremental yearly return. Oppositely, Graves, Sauternes, Pomerol Growths and *Grand Cru Classé A* wines

engendered lower gains vs. 2nd Growth, as shown by the coefficients ranging from -0.01 to -0.02. All other *crus* do not provide statistically different returns compared to the intercept.

The addition of the vintage variable in the second model enabled a 30% jump in the quality of the regression as shown by the adjusted R-squared of 0.39. Coefficients for the Growths remain similar. Regarding vintages, only the 2019, 2020, and 2021 provide significantly distinct yields. The two former years brought on an additional five and three percent respectively whereas the latter led to a decrease of three percent compared to the reference vintage of 2012.

The impact of the quality is rather limited as translated by the additional percentage point in the R-squared in the last two models. Both the Parker score and the category of the bottles stay insignificant, which means an additional rating point or outstanding/extraordinary wines do not provide statistically higher or lower returns. The release price is also irrelevant in the two models.

As conclusion, the vintage seems the key factor in explaining the expected CAGR, followed by the Growth. The Parker score, category and release price have a rather limited impact.

6.2.2. Models using the age

In this section, the harvest year will directly be linked to the age of the wine. Similarly, as above, first the age variable was added to the first model, then the release price and the quality, the latter being modeled by the Parker score and the categories.

Models	Growth		Growth and Age		Growth, Age, Price, Score		Growth, Age, Price, Category	
Variable	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.
Intercept	0.07	18.4 ***	0.08	6.0 ***	0.08	-1.3	0.07	6.0 ***
Premier Cru Classe	0.007	1.1	0.007	0.6	0.005	0.8	0.004	0.6
3eme Cru Classe	0.001	0.1	3E-04	-0.07	6E-04	-0.06	6E-04	-0.07
4eme Cru Classe	0.02	2.4 *	0.02	2.8 **	0.03	2.6 **	0.02	2.8 **
5eme Cru Classe	-0.007	-1.0	-0.007	-0?8	-0.005	-0.07	-0.006	-0?8
2nd Wine Premier Cru Classe	0.015	2.4 *	0.02	3.1 **	0.02	3.1 **	0.02	3.1 **
Cru Classe de Graves	-0.01	-2.2 *	-0.01	-2.5 *	-0.015	-2.4 *	-0.015	-2.5 *
Premier Cru Classe de Sauternes	-0.02	-2.3 *	-0.02	-2.3 *	-0.02	-2.4 *	-0.02	-2.3 *
Pomerol	-0.01	-2.1 *	-0.01	-2.2 *	-0.01	-2.1 *	-0.01	-2.2 *
Premier Grand Cru Classe A	-0.02	-3.4 ***	-0.02	-3.6 ***	-0.025	-3.6 ***	-0.025	-3.6 ***
Premier Grand Cru Classe B	-0.009	-1.0	-0.009	-1.0	-0.009	-1.0	-0.008	-1.0
Age			-0.001	-1.4	8E-04	-1.3	8E-04	-1.4
Release.Price					-2E-06	-0.5	-2E-06	-0.6
Parker.Score					0.001	2.5 *		
CategoryExtraordinary							0.01	1.1
CategoryOutstanding							-0.002	-0.2
Multiple R-squared	0.10		0.12		0.13		0.14	
Adjusted R-squared	0.08		0.09		0.10		0.11	

Significance code : * p < 0.1, **p <0.05, ***p < 0.01

Table 7. Output microeconomic models using the year variable as age

The age variable does not seem to bring statistical evidence that older wines generate larger returns. However compared to the previous section, the Parker score becomes relevant when the age is included and leads to an additional 0.1% return by incremental rating point. Here again, the categories and the release price do not provide significant different return versus the intercept.

Finally, this model predicts less precisely the CAGR than when using the vintage with an adjusted R-squared around 10%. Vintage as category is hence a better explaining factor than age.

6.3. Robustness check

The robustness check will help to extend the results found previously to Burgundy and Italy to check veracity. The econometric leverage will include the vintage, release price, and categories as variables. This model ensured the highest r-squared and number of significant variables for the Bordeaux region.

Models	Burgundy Vintage		Burgundy All		Italy Vintage		Italy All	
Variable	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.	Coef.	t-Stat.
Intercept	0.1	3.7 ***	0.12	4.3 ***	0.1	3.0 **	0.1	2.3 *
Vintage2013	0.003	0.07	0.002	0.05	-0.03	-0.7	-0.04	0.9
Vintage2014	0.002	0.04	0.003	0.07	0.01	0.3	-0.002	-0.04
Vintage2015	0.007	0.2	0.012	0.4	0.004	0.1	-0.005	-0.1
Vintage2016	-0.03	-0.5	-0.01	-0.3	0.001	0.03	-0.01	-0.2
Vintage2017	0.01	°.2	0.015	0.4	-0.002	-0.04	-0.003	-0.1
Vintage2018	-0.009	0.2	9E-04	-0.02	-0.02	-0.4	-0.03	-0.6
Vintage2019	-0.09	-2.2 *	-0.06	-1.5	-0.1	-2.4 *	-0.1	-2.3 **
Vintage2020	-0.16	-4.0 ***	-0.14	-3.8 ***	-0.06	-1.1	-0.07	-2.3
Vintage2021	-0.21	-4.2 ***	-0.2	-4.48 ***	0.2	2.9 **	0.2	2.6 *
Release.Price			-6E-06	-4.36 ***			-2E-04	-4.1 ***
CategoryExtraordinary			0.014	0.06			0.06	1.3
CategoryOutstanding			0.046	0.2			0.03	0.6
Multiple R-squared	0.29		0.38		0.24		0.39	
Adjusted R-squared	0.24		0.33		0.15		0.28	

Significance code : * p < 0.1, **p <0.05, ***p < 0.01

Table 8. Output microeconomic model for Bordeaux and Italy

As for Bordeaux, the vintage variable manages to explain a large part of the variability alone as shown by the R-squared of almost 30 and 25% for Burgundy and Italy respectively in Table 8. In the French region, the 2019, 2020, and 2021 vintages are significant and showcase all negative coefficients while for Bordeaux they were positive in 2019 and 2020. Regarding the Italian part, only 2019 and 2021 are relevant years. Here again, the signs are opposite to Bordeaux's area for the same *millésime*. Besides vintages, release price became significant in

both places with negative coefficients. Though the Burgundy one is small (-6.10^4% per additional euro), the one of Italy has more impact : a decrease of 0.02% by incremental euro, meaning a loss of 1% in the yearly return per additional 50 euros for the bottle.

Overall, the full model succeeds in explaining slightly below 40% of the total variation, which is close to what was obtained for Bordeaux, though not having a Growth variable. It can be concluded that the model can be extended for other regions.

7. Discussion

7.1. Macroeconomic interpretations

Importance of emerging economies

The GDP of Europe and China variables served as a proxy to represent how the economy is performing in developed and emerging countries. In the literature review, it was advanced that the success of China and emerging markets was driving the demand of the fine wine market.

Opposite to these findings, the results did not prove the significant importance of the state of the Chinese economy on the Liv-Ex 100 index but highlighted the one of the Old Continent. A growth of one percent of the EU metric generates an increase of 0.25% of the fine wine index. However, when looking at specific periods of time, the influence of China was revealed significant in the growth of the market. Especially in 2009-2010, when the country invested massively in its economy and the gift culture among officials led to a boom in fine wines purchasing. This showcases that over the longer term, China's influence is rather limited but was the main driver during these two years. The surge after the 2020 Covid crisis also suggests the importance of traditional wine-drinking countries as Asian economies were put on hold during the thriving period. In the end, emerging countries' financial state was significant in a point of time but cannot be proven consistent over the last twenty years.

When looking at the monthly export of Bordeaux wines, neither developed countries nor China have an impact on the fine wine market. The foreign demand of Bordeaux PDO wines might not be accurate enough to be relevant on the fluctuations of the fine wine market due low proportion of investment-grade bottles in all these exports, which as a reminder represents approximately two percent of the total volume.

Cash effect linked to the stock and bond markets

The success of traditional assets may have an influence on the Liv-Ex 100. Jiao (2017) identified a wealth effect on the fine wine market when financial markets were thriving. Indeed, when the net worth of investors increases thanks to traditional assets, they tend to spend their newly acquired money on alternative assets, including wine. This positive relationship was observed in our results as seen with the significant 0.25 coefficient of the S&P500 variable. In that instance, a bullish stock market will strengthen positive growth on the Liv-Ex 100 index. It is also advanced by research that the fine wine market was actually decorrelated to equities'

growth. Though the coefficient is not that high (closer to 0 than 1), it cannot be said the Liv-Ex 100 evolves independently to the stock market.

On top of the stock market, the previous state of the fine wine market as an effect on itself. Indeed, 25% of the previous return is added to the month. This is often the case in time series data. What must be remembered here, is that period of high volatility will last for several periods and conversely for booming periods.

Regarding the bond market, the link has not been proven statistically. As mentioned by Fletcher (2023), the idea was that the higher the rate, the less appealing alternative assets are. Indeed, when the yield increases and becomes close to the expected one of wines, investors should normally turn towards bonds thanks to lower risk and no insurance/storage costs. Additionally, as the cost of borrowing is higher, investors are pickier on their investment and lower consumption. A possible reason why the factor was not meaningful in the regression is that over the last 20 years, the T-Bill was historically low and started to grow from the end of 2022. The recent growth effect has thus maybe not been significantly materialized yet.

Another non-observed determinant factor is inflation. The postulate was that the HIPC might affect the consumables market and lower spending on luxury items. The variable being considered irrelevant can be due to investors being more price-insensitive.

After this discussion, four key points can be outlined. Though most research advanced flourishing economies of emerging countries and especially China were the driving the fine wine market, it appears only traditional wine-drinking countries have a significant impact on the growth of the market on the long term. Nonetheless, the relevance of the 2009-2010 China stimulus on the Liv-Ex 100 showcased the country's influence at that time. Besides GDP, the S&P500 was also a key determinant. A successful stock market generates a cash effect that increases the popularity of wines. Finally, interest rates are not statistically significant, but this might be due to the timeline as high interest should theoretically lower consumption and decrease the attractivity of alternative assets.

7.2. Microeconomic interpretation

Vintage as main determinant

The year of harvest of a bottle can be interpreted as a numerical variable, giving hence information only the age, or as categorical. In the case of the latter, on top of the age, the vintage will include information about weather conditions and the overall quality of all wines for that region. From the results, it appears that the vintage as a category is the key determinant for explaining returns. Including this factor helps to predict 30% more accurately the returns. When considering only the age, an additional year will not bring statistically different earnings.

In the end, three vintages generated significantly different returns than the reference year of 2012 : 2019, 2020 and 2021. Looking at the two first ones, they enabled additional 5 and 3% gains respectively whereas the latter a drop of 3%. As shown in Table 6 in the descriptive analysis, the year 2019 and 2020 were considered as extraordinary *millésimes*. Though 2015, 2016 and 2018 were also classified similarly, their returns were not statically different from 2012, even though their average CAGR was higher. For 2021, it was considered as one of the worst vintages of the last twenty years which might explain the low yield. 2012 and 2013 were also subject to very difficult weather conditions which led to historically low ranked wined but managed to reach better results. The research of Dimson and al. (2015) highlighted that low-quality vintages will tend to reach higher returns closer to maturity whereas high-quality ones, would grow mostly during their first twenty years. This might also explain the reason behind the difference in returns depending on the vintages.

For the year variable, the cornerstone to remember is that vintage should be integrated as whole, as it includes other factors that cannot be represented by the age such as the weather conditions, quantity produced, experts' expectations and overall popularity of that particular year.

Best growth does not mean best return

The Growth system, unique to the Bordeaux region, is the second key determining factor as it explains 10% of the returns' fluctuations.

Results from the regressions outlined the same trend as in the descriptive statistics : the Medoc region provided higher returns than the three other regions, Libournais, Graves and Sauternes. The best wines often considered (*Premier Cru Classé*, *Grand Cru Classé A* and specific

Pomerol such as Petrus or Le Pin) did not bring the highest return. Though Premier Cru Classé (1st Growth) was not far from the best performers, Grand Cru Classé A incurred the smallest yield. Surprisingly 4th Growth and 2nd wines from 1st growth generated the best performance. The reason behind might be a better quality for value.

In the end, a better *cru* might not lead necessarily to higher returns and less regarded wines can actually provide better performances while being easier to purchase. The downside is their liquidity in the secondary market as Premier Cru Classé and Grand Cru Classé A attract the most demand.

Parker scores irrelevant versus vintage opinion

The Parker score does not seem to have a particular influence on the return, whether is it the score itself as number or the category associate (above average, outstanding and extraordinary). The score becomes significant though when the age is included. That means when there is no extra information about the vintage quality of that particular year, looking at the score becomes relevant. An additional point will lead to an increase of 0,1% return. This joins Ashenfelter and Jones (2012) ideas that experts' scores do not contain any private information and thus when quality of the vintage and growth is known, they have little impact on the price fluctuation.

Every region is different

From the robustness check, it appeared the vintage is also the key determinant to explain the expected CAGR. However, as seen by the difference in the sign of the coefficients, a successful vintage in one region might not be in another. Next to this, the release price actually became significant for Burgundy and Italy and the coefficients highlighted that a higher price was linked to a lower return. These regions often offer more expensive wines than Bordeaux (can reach 20,000€ per bottle in Burgundy) which can thus offer less space for growth.

Overall, it must be remembered that the vintage is the key catalyzer of price growth. High-quality vintage will tend to increase in value during their maturity while low-quality ones near their consumption state. The Growths are the second determinants and better *crus* do not necessarily mean higher yield, though the Medoc area tends to bring larger gains. Finally, every region has its specificities as weather changes and can also be impacted by the price.

8. Limitations

In the first part of the study, more specific data could improve the accurateness of the model. For instance, the aggregated demand was defined by total exports of Bordeaux DPO wines which does not completely depict the fine wines sales (exact numbers are usually kept secret by the vineyards). Besides, the quarterly disposable income could replace the GDP to represent the actual purchase power of inhabitants. Finally, using another index to realize a robustness check would be necessary. Indeed, though many professionals consider the Liv-Ex 100 as the market benchmark, it is only aggregating 100 different bottles. Realizing the same research on larger indices such as the Liv-Ex 1000 could help validate data. However, membership access is required to obtain data.

Regarding the Microeconomic analysis, the coefficients should not be considered as fixed values (e.g., 2nd growth wine will always provide a 7% return) but rather as a scale to compare past performances with others. Further studies on other part of the world would also help to finetune and expand results.

Moreover, realizing qualitative interviews with professionals would have helped to deepen the results and add granularity to the interpretation, both at the macro and micro levels.

9. Conclusion

Fine wines appear as a complex asset class. Though returns are positive on the long-term, they fluctuate heavily depending on the period, sometimes over-performing the stock markets, for instance from 2008 to 2011 and in 2022, but can also showcase not-so-high excess returns versus bonds and lower performance than stocks, such as in 2023. Compared to other collectibles, the alcoholic beverage became financialized through the emergence of exchange places such as Liv-Ex which helped to gain in liquidity and transparency, though these two points remain the areas that need improvements.

Still growing in popularity, the market is expected to go from $340 billion in 2021 is expected to reach $457 billion in 2028. As its development continues, investors, collectors, and professionals are eager to understand the drivers behind it and the determinants of price fluctuations, both at the general market and bottle levels. The research was thus focused on two perspectives, the macroeconomic, and microeconomic one.

For the first path, the main determinants which impacted the Liv-Ex 100 are the state of the EU economy, the S&P500 and the previous fine wine market. Two additional events have led to statistical significance : the 2008 financial crisis and 2009-2010 China's economic stimulus. For the second, vintages (considered as category) and Growth helped to explain respectively 30 and 10% of the total variation in the CAGR of 458 Bordeaux wines. This highlights the importance of the *millesime* which contains more granular information about the age, the overall demand and weather conditions of that particular year. The results about the growth were also interesting as they outlined wines from the Medoc sub-region overperformed the others. Additionally, first growths did not provide excess return compared to second growth and performances were even lower versus fourth growth and second wines. When extended to Italy and Burgundy, vintages explained also 30% of the returns while a negative relationship with the release price was also pointed out.

As consequence, buying in turmoil periods and selling in bull market can help achieve good performance. To pick up the right bottles, exceptional vintages from the Medoc appear as a wise choice. Though 1st growths do not provide the highest return, their popularity should ensure relatively high liquidity on the secondary market. As vintage quality changes depending on the area, diversifying into several regions should also be part of the strategy to lower risk

and be able to compensate for underwhelming results. In case of holding a lesser good wine, selling it around its consumption state is the solution.

Finally, there is always an opportunity to open the bottle with some friends to enjoy it as intended if it is not the right time to sell.

Cheers !

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11.3. Selected bottles for the Bordeaux region

Chateau Coutet Premier Cru Classe 2020	Chateau Montrose 2eme Cru Classe 2015
Chateau Coutet Premier Cru Classe 2019	Chateau Montrose 2eme Cru Classe 2014
Chateau Coutet Premier Cru Classe 2018	Chateau Montrose 2eme Cru Classe 2013
Chateau Coutet Premier Cru Classe 2017	Chateau Montrose 2eme Cru Classe 2012
Chateau Coutet Premier Cru Classe 2016	Chateau Mouton Rothschild Premier Cru Classe 2021
Chateau Coutet Premier Cru Classe 2015	Chateau Mouton Rothschild Premier Cru Classe 2020
Chateau Coutet Premier Cru Classe 2012	Chateau Mouton Rothschild Premier Cru Classe 2019
Carruades de Lafite 2021	Chateau Mouton Rothschild Premier Cru Classe 2018
Carruades de Lafite 2020	Chateau Mouton Rothschild Premier Cru Classe 2017
Carruades de Lafite 2019	Chateau Mouton Rothschild Premier Cru Classe 2016
Carruades de Lafite 2018	Chateau Mouton Rothschild Premier Cru Classe 2015
Carruades de Lafite 2017	Chateau Mouton Rothschild Premier Cru Classe 2014
Carruades de Lafite 2016	Chateau Mouton Rothschild Premier Cru Classe 2013
Carruades de Lafite 2015	Chateau Mouton Rothschild Premier Cru Classe 2012
Carruades de Lafite 2014	Chateau Palmer 3eme Cru Classe 2021
Carruades de Lafite 2013	Chateau Palmer 3eme Cru Classe 2020
Carruades de Lafite 2012	Chateau Palmer 3eme Cru Classe 2019
Chateau Angelus Premier Grand Cru Classe A 2021	Chateau Palmer 3eme Cru Classe 2018
Chateau Angelus Premier Grand Cru Classe A 2020	Chateau Palmer 3eme Cru Classe 2017
Chateau Angelus Premier Grand Cru Classe A 2019	Chateau Palmer 3eme Cru Classe 2016
Chateau Angelus Premier Grand Cru Classe A 2018	Chateau Palmer 3eme Cru Classe 2015
Chateau Angelus Premier Grand Cru Classe A 2017	Chateau Palmer 3eme Cru Classe 2014
Chateau Angelus Premier Grand Cru Classe A 2016	Chateau Palmer 3eme Cru Classe 2013
Chateau Angelus Premier Grand Cru Classe A 2015	Chateau Palmer 3eme Cru Classe 2012
Chateau Angelus Premier Grand Cru Classe A 2014	Chateau Pape Clement Cru Classe 2021
Chateau Angelus Premier Grand Cru Classe A 2013	Chateau Pape Clement Cru Classe 2020
Chateau Angelus Premier Grand Cru Classe A 2012	Chateau Pape Clement Cru Classe 2019
Chateau Ausone Premier Grand Cru Classe A 2021	Chateau Pape Clement Cru Classe 2018
Chateau Ausone Premier Grand Cru Classe A 2020	Chateau Pape Clement Cru Classe 2017
Chateau Ausone Premier Grand Cru Classe A 2019	Chateau Pape Clement Cru Classe 2016
Chateau Ausone Premier Grand Cru Classe A 2018	Chateau Pape Clement Cru Classe 2015
Chateau Ausone Premier Grand Cru Classe A 2017	Chateau Pape Clement Cru Classe 2014
Chateau Ausone Premier Grand Cru Classe A 2016	Chateau Pape Clement Cru Classe 2013
Chateau Ausone Premier Grand Cru Classe A 2015	Chateau Pape Clement Cru Classe 2012
Chateau Ausone Premier Grand Cru Classe A 2014	Chateau Pavie Premier Grand Cru Classe A 2021
Chateau Ausone Premier Grand Cru Classe A 2013	Chateau Pavie Premier Grand Cru Classe A 2020
Chateau Ausone Premier Grand Cru Classe A 2012	Chateau Pavie Premier Grand Cru Classe A 2019
Chateau Beychevelle 4eme Cru Classe 2021	Chateau Pavie Premier Grand Cru Classe A 2018
Chateau Beychevelle 4eme Cru Classe 2020	Chateau Pavie Premier Grand Cru Classe A 2017
Chateau Beychevelle 4eme Cru Classe 2019	Chateau Pavie Premier Grand Cru Classe A 2016
Chateau Beychevelle 4eme Cru Classe 2018	Chateau Pavie Premier Grand Cru Classe A 2015
Chateau Beychevelle 4eme Cru Classe 2017	Chateau Pavie Premier Grand Cru Classe A 2014
Chateau Beychevelle 4eme Cru Classe 2016	Chateau Pavie Premier Grand Cru Classe A 2013
Chateau Beychevelle 4eme Cru Classe 2015	Chateau Pavie Premier Grand Cru Classe A 2012
Chateau Beychevelle 4eme Cru Classe 2014	Chateau Pichon Baron 2eme Cru Classe 2021
Chateau Calon Segur 3eme Cru Classe 2021	Chateau Pichon Baron 2eme Cru Classe 2020
Chateau Calon Segur 3eme Cru Classe 2020	Chateau Pichon Baron 2eme Cru Classe 2019
Chateau Calon Segur 3eme Cru Classe 2019	Chateau Pichon Baron 2eme Cru Classe 2018
Chateau Calon Segur 3eme Cru Classe 2018	Chateau Pichon Baron 2eme Cru Classe 2017
Chateau Calon Segur 3eme Cru Classe 2017	Chateau Pichon Baron 2eme Cru Classe 2016
Chateau Calon Segur 3eme Cru Classe 2016	Chateau Pichon Baron 2eme Cru Classe 2015
Chateau Calon Segur 3eme Cru Classe 2015	Chateau Pichon Baron 2eme Cru Classe 2014
Chateau Cheval Blanc Premier Grand Cru Classe A 2021	Chateau Pichon Baron 2eme Cru Classe 2013
Chateau Cheval Blanc Premier Grand Cru Classe A 2020	Chateau Pichon Baron 2eme Cru Classe 2012
Chateau Cheval Blanc Premier Grand Cru Classe A 2019	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2021
Chateau Cheval Blanc Premier Grand Cru Classe A 2018	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2020
Chateau Cheval Blanc Premier Grand Cru Classe A 2017	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2019
Chateau Cheval Blanc Premier Grand Cru Classe A 2016	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2018
Chateau Cheval Blanc Premier Grand Cru Classe A 2015	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2017
Chateau Cheval Blanc Premier Grand Cru Classe A 2014	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2016
Chateau Cheval Blanc Premier Grand Cru Classe A 2013	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2015
Chateau Cheval Blanc Premier Grand Cru Classe A 2012	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2014
Chateau Climens Premier Cru Classe 2016	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2013
Chateau Climens Premier Cru Classe 2015	Chateau Pichon Longueville Comtesse de Lalande 2eme Cru Classe 2012
Chateau Climens Premier Cru Classe 2014	Chateau Pontet-Canet 5eme Cru Classe 2021
Chateau Climens Premier Cru Classe 2012	Chateau Pontet-Canet 5eme Cru Classe 2020
Chateau Clinet 2021	Chateau Pontet-Canet 5eme Cru Classe 2019
Chateau Clinet 2020	Chateau Pontet-Canet 5eme Cru Classe 2018
Chateau Clinet 2019	Chateau Pontet-Canet 5eme Cru Classe 2017
Chateau Clinet 2018	Chateau Pontet-Canet 5eme Cru Classe 2016
Chateau Clinet 2017	Chateau Pontet-Canet 5eme Cru Classe 2015
Chateau Clinet 2016	Chateau Pontet-Canet 5eme Cru Classe 2014
Chateau Clinet 2015	Chateau Pontet-Canet 5eme Cru Classe 2013
Chateau Clinet 2014	Chateau Pontet-Canet 5eme Cru Classe 2012

Chateau Clinet 2014	Chateau Pontet-Canet 5eme Cru Classe 2012
Chateau Clinet 2013	Chateau Rieussec Premier Cru Classe 2021
Chateau Clinet 2012	Chateau Rieussec Premier Cru Classe 2020
Chateau Duhart-Milon 4eme Cru Classe 2021	Chateau Rieussec Premier Cru Classe 2019
Chateau Duhart-Milon 4eme Cru Classe 2020	Chateau Rieussec Premier Cru Classe 2018
Chateau Duhart-Milon 4eme Cru Classe 2019	Chateau Rieussec Premier Cru Classe 2017
Chateau Duhart-Milon 4eme Cru Classe 2018	Chateau Rieussec Premier Cru Classe 2016
Chateau Duhart-Milon 4eme Cru Classe 2016	Chateau Rieussec Premier Cru Classe 2015
Chateau Duhart-Milon 4eme Cru Classe 2015	Chateau Rieussec Premier Cru Classe 2014
Chateau Duhart-Milon 4eme Cru Classe 2014	Chateau Rieussec Premier Cru Classe 2013
Chateau Duhart-Milon 4eme Cru Classe 2012	Chateau Smith Haut Lafitte, Rouge Cru Classe 2021
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2021	Chateau Smith Haut Lafitte, Rouge Cru Classe 2020
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2020	Chateau Smith Haut Lafitte, Rouge Cru Classe 2019
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2019	Chateau Smith Haut Lafitte, Rouge Cru Classe 2018
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2018	Chateau Smith Haut Lafitte, Rouge Cru Classe 2017
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2017	Chateau Smith Haut Lafitte, Rouge Cru Classe 2016
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2016	Chateau Smith Haut Lafitte, Rouge Cru Classe 2015
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2015	Chateau Smith Haut Lafitte, Rouge Cru Classe 2014
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2014	Chateau Smith Haut Lafitte, Rouge Cru Classe 2013
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2013	Chateau Smith Haut Lafitte, Rouge Cru Classe 2012
Chateau Grand-Puy-Lacoste 5eme Cru Classe 2012	Chateau Suduiraut Premier Cru Classe 2021
Chateau Gruaud Larose 2eme Cru Classe 2021	Chateau Suduiraut Premier Cru Classe 2020
Chateau Gruaud Larose 2eme Cru Classe 2020	Chateau Suduiraut Premier Cru Classe 2019
Chateau Gruaud Larose 2eme Cru Classe 2019	Chateau Suduiraut Premier Cru Classe 2018
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Chateau Gruaud Larose 2eme Cru Classe 2016	Chateau Suduiraut Premier Cru Classe 2015
Chateau Gruaud Larose 2eme Cru Classe 2015	Chateau Suduiraut Premier Cru Classe 2014
Chateau Gruaud Larose 2eme Cru Classe 2014	Chateau Suduiraut Premier Cru Classe 2013
Chateau Gruaud Larose 2eme Cru Classe 2013	Chateau Troplong Mondot Premier Grand Cru Classe B 2021
Chateau Gruaud Larose 2eme Cru Classe 2012	Chateau Troplong Mondot Premier Grand Cru Classe B 2020
Chateau Haut-Bailly Cru Classe 2021	Chateau Troplong Mondot Premier Grand Cru Classe B 2019
Chateau Haut-Bailly Cru Classe 2020	Chateau Troplong Mondot Premier Grand Cru Classe B 2018
Chateau Haut-Bailly Cru Classe 2019	Chateau Troplong Mondot Premier Grand Cru Classe B 2017
Chateau Haut-Bailly Cru Classe 2018	Chateau Troplong Mondot Premier Grand Cru Classe B 2016
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Chateau Haut-Bailly Cru Classe 2013	Chateau d Yquem Premier Cru Superieur 2020
Chateau Haut-Bailly Cru Classe 2012	Chateau d Yquem Premier Cru Superieur 2019
Chateau Haut-Brion Premier Cru Classe 2021	Chateau d Yquem Premier Cru Superieur 2018
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Chateau La Conseillante 2020	Clos Fourtet Premier Grand Cru Classe B 2016
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Chateau La Conseillante 2018	Clos Fourtet Premier Grand Cru Classe B 2014
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Chateau La Conseillante 2015	Cos d Estournel 2eme Cru Classe 2021
Chateau La Conseillante 2014	Cos d Estournel 2eme Cru Classe 2020
Chateau La Conseillante 2013	Cos d Estournel 2eme Cru Classe 2019
Chateau La Conseillante 2012	Cos d Estournel 2eme Cru Classe 2018
Chateau La Fleur-Petrus 2021	Cos d Estournel 2eme Cru Classe 2017
Chateau La Fleur-Petrus 2020	Cos d Estournel 2eme Cru Classe 2016
Chateau La Fleur-Petrus 2019	Cos d Estournel 2eme Cru Classe 2015
Chateau La Fleur-Petrus 2018	Cos d Estournel 2eme Cru Classe 2014
Chateau La Fleur-Petrus 2017	Cos d Estournel 2eme Cru Classe 2013
Chateau La Fleur-Petrus 2016	Cos d Estournel 2eme Cru Classe 2012
Chateau La Fleur-Petrus 2015	Ducru-Beaucaillou 2eme Cru Classe 2021
Chateau La Fleur-Petrus 2014	Ducru-Beaucaillou 2eme Cru Classe 2020
Chateau La Fleur-Petrus 2013	Ducru-Beaucaillou 2eme Cru Classe 2019
Chateau La Fleur-Petrus 2012	Ducru-Beaucaillou 2eme Cru Classe 2018
Chateau La Mission Haut-Brion Cru Classe 2021	Ducru-Beaucaillou 2eme Cru Classe 2017
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Chateau La Mission Haut-Brion Cru Classe 2016	Ducru-Beaucaillou 2eme Cru Classe 2012
Chateau La Mission Haut-Brion Cru Classe 2015	Le Clarence de Haut-Brion 2021

Chateau La Mission Haut-Brion Cru Classe 2014	Le Clarence de Haut-Brion 2020
Chateau La Mission Haut-Brion Cru Classe 2013	Le Clarence de Haut-Brion 2019
Chateau La Mission Haut-Brion Cru Classe 2012	Le Clarence de Haut-Brion 2018
Chateau Lafite Rothschild Premier Cru Classe 2021	Le Clarence de Haut-Brion 2017
Chateau Lafite Rothschild Premier Cru Classe 2020	Le Clarence de Haut-Brion 2016
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Chateau Lafite Rothschild Premier Cru Classe 2015	Le Petit Mouton de Mouton Rothschild 2021
Chateau Lafite Rothschild Premier Cru Classe 2014	Le Petit Mouton de Mouton Rothschild 2020
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Chateau Lafleur 2021	Le Petit Mouton de Mouton Rothschild 2017
Chateau Lafleur 2020	Le Petit Mouton de Mouton Rothschild 2016
Chateau Lafleur 2019	Le Petit Mouton de Mouton Rothschild 2015
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Chateau Lafleur 2017	Le Petit Mouton de Mouton Rothschild 2013
Chateau Lafleur 2016	Le Petit Mouton de Mouton Rothschild 2012
Chateau Lafleur 2015	Le Pin 2021
Chateau Lafleur 2014	Le Pin 2020
Chateau Lafleur 2013	Le Pin 2019
Chateau Lafleur 2012	Le Pin 2018
Chateau Latour Premier Cru Classe 2015	Le Pin 2017
Chateau Latour Premier Cru Classe 2014	Le Pin 2016
Chateau Latour Premier Cru Classe 2013	Le Pin 2015
Chateau Latour Premier Cru Classe 2012	Le Pin 2014
Chateau Leoville Barton 2eme Cru Classe 2021	Le Pin 2012
Chateau Leoville Barton 2eme Cru Classe 2020	Les Forts de Latour 2017
Chateau Leoville Barton 2eme Cru Classe 2019	Les Forts de Latour 2016
Chateau Leoville Barton 2eme Cru Classe 2018	Les Forts de Latour 2015
Chateau Leoville Barton 2eme Cru Classe 2017	Les Forts de Latour 2014
Chateau Leoville Barton 2eme Cru Classe 2016	Les Forts de Latour 2013
Chateau Leoville Barton 2eme Cru Classe 2015	Les Forts de Latour 2012
Chateau Leoville Barton 2eme Cru Classe 2014	Pavillon Rouge du Chateau Margaux 2021
Chateau Leoville Barton 2eme Cru Classe 2013	Pavillon Rouge du Chateau Margaux 2020
Chateau Leoville Barton 2eme Cru Classe 2012	Pavillon Rouge du Chateau Margaux 2019
Chateau Leoville Las Cases 2eme Cru Classe 2021	Pavillon Rouge du Chateau Margaux 2018
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Chateau Leoville Las Cases 2eme Cru Classe 2015	Pavillon Rouge du Chateau Margaux 2012
Chateau Leoville Las Cases 2eme Cru Classe 2014	Petrus 2020
Chateau Leoville Las Cases 2eme Cru Classe 2013	Petrus 2019
Chateau Leoville Las Cases 2eme Cru Classe 2012	Petrus 2018
Chateau Leoville Poyferre 2eme Cru Classe 2021	Petrus 2017
Chateau Leoville Poyferre 2eme Cru Classe 2020	Petrus 2016
Chateau Leoville Poyferre 2eme Cru Classe 2019	Petrus 2015
Chateau Leoville Poyferre 2eme Cru Classe 2018	Petrus 2014
Chateau Leoville Poyferre 2eme Cru Classe 2017	Petrus 2013
Chateau Leoville Poyferre 2eme Cru Classe 2016	Petrus 2012
Chateau Leoville Poyferre 2eme Cru Classe 2015	Vieux Chateau Certan 2021
Chateau Leoville Poyferre 2eme Cru Classe 2014	Vieux Chateau Certan 2020
Chateau Leoville Poyferre 2eme Cru Classe 2013	Vieux Chateau Certan 2019
Chateau Leoville Poyferre 2eme Cru Classe 2012	Vieux Chateau Certan 2018
Chateau Lynch-Bages 5eme Cru Classe 2021	Vieux Chateau Certan 2017
Chateau Lynch-Bages 5eme Cru Classe 2020	Vieux Chateau Certan 2016
Chateau Lynch-Bages 5eme Cru Classe 2019	Vieux Chateau Certan 2015
Chateau Lynch-Bages 5eme Cru Classe 2018	Vieux Chateau Certan 2014
Chateau Lynch-Bages 5eme Cru Classe 2017	Vieux Chateau Certan 2013
Chateau Lynch-Bages 5eme Cru Classe 2016	Vieux Chateau Certan 2012
Chateau Lynch-Bages 5eme Cru Classe 2015	Chateau L Eglise Clinet 2021
Chateau Lynch-Bages 5eme Cru Classe 2014	Chateau L Eglise Clinet 2020
Chateau Lynch-Bages 5eme Cru Classe 2013	Chateau L Eglise Clinet 2019
Chateau Lynch-Bages 5eme Cru Classe 2012	Chateau L Eglise Clinet 2018
Chateau Margaux Premier Cru Classe 2021	Chateau L Eglise Clinet 2017
Chateau Margaux Premier Cru Classe 2020	Chateau L Eglise Clinet 2016
Chateau Margaux Premier Cru Classe 2019	Chateau L Eglise Clinet 2015
Chateau Margaux Premier Cru Classe 2018	Chateau L Eglise Clinet 2014
Chateau Margaux Premier Cru Classe 2017	Chateau L Eglise Clinet 2013
Chateau Margaux Premier Cru Classe 2016	Chateau L Eglise Clinet 2012
Chateau Margaux Premier Cru Classe 2015	Chateau L Evangile 2021
Chateau Margaux Premier Cru Classe 2014	Chateau L Evangile 2020
Chateau Margaux Premier Cru Classe 2013	Chateau L Evangile 2019
Chateau Margaux Premier Cru Classe 2012	Chateau L Evangile 2018
Chateau Montrose 2eme Cru Classe 2021	Chateau L Evangile 2017
Chateau Montrose 2eme Cru Classe 2020	Chateau L Evangile 2016
Chateau Montrose 2eme Cru Classe 2019	Chateau L Evangile 2015
Chateau Montrose 2eme Cru Classe 2018	Chateau L Evangile 2014
Chateau Montrose 2eme Cru Classe 2017	Chateau L Evangile 2013
Chateau Montrose 2eme Cru Classe 2016	Chateau L Evangile 2012

UNIVERSITÉ CATHOLIQUE DE LOUVAIN
Louvain School of Management

Place des Doyens, 1 bte L2.01.01, 1348 Louvain-la-Neuve
Boulevard Emile Devreux 6, 6000 Charleroi, Belgique
Chaussée de Binche 151, 7000 Mons, Belgique

www.uclouvain.be/lsm