“Art as a Diversifier – The ever-green value of art masterpieces.
Is it a good investment decision?”

Jasmin Zucaro

Dissertation written under the supervision of Professor Ivan Alfaro

Dissertation submitted in partial fulfilment of requirements for the International MSc in Finance, at Universidade Católica Portuguesa and for the MSc in Business at BI Norwegian Business School, June 2024.

“Art as a Diversifier – The ever-green value of art masterpieces. Is it a good investment decision?”

Jasmin Zucaro

Resumo

Esta tese considera as crescentes alterações subjacentes aos padrões de preços da arte, tanto ao longo do tempo como entre diferentes obras de arte, que não são evidentes devido ao desempenho aparentemente constante do mercado da arte.

Argumenta-se, de acordo com a literatura anterior, que a implementação de um índice para os retornos das obras de arte poderia ser uma abordagem útil para compreender melhor a direção da tendência que o mercado está atualmente a seguir.

A nossa contribuição para a literatura existente reside, nomeadamente, na inclusão de um conjunto de dados mais recente. Ao desenvolvermos a nossa análise centrada na arte contemporânea e moderna, pretendemos melhorar e alargar os conhecimentos sobre o mercado das obras de arte do pós-guerra e sobre a forma como estas podem contribuir como um diversificador de activos válido em relação a uma carteira padrão composta apenas por activos financeiros tradicionais.

Palavras-chave: Arte Contemporânea & Moderna, Implementação de Índices, Estratégia de Diversificação de Activos, Tendências de Mercado, Activos Financeiros Tradicionais, Activos Alternativos.

“Art as a Diversifier – The ever-green value of art masterpieces. Is it a good investment decision?”

Jasmin Zucaro

Abstract

This thesis considers the increasing underlying changes in art price patterns, both over time and amongst different artworks, which are not evident due to the apparently overall constant performance of the art market.

It argues, in line with previous literature, that implementing an index for masterpieces’ returns, could be a useful approach in order to understand better what trend direction the market is currently pursuing.

Notably, our contribution to the existing literature lies in the inclusion of a more recent dataset. Developing our analysis focusing on Contemporary and Modern art, we aim to enhance and broaden insights regarding the market for Post-War artworks, and how they can contribute as a valid asset diversifier against a standard portfolio only composed of traditional financial assets.

Keywords: Contemporary & Modern Art, Index Implementation, Asset Diversification Strategy, Market Trends, Traditional Financial Assets, Alternative Assets.

Acknowledgments

I want to thank my parents for never placing limits on my potential, and for all the love and support they have always given me, for which I am incredibly grateful.
My lovely Nonni and Leo for the purest love and much-needed encouragement.

I would like to thank Professor Ivan Alfaro, for the support he has given me in drafting this thesis, as well as all the inspiring academics I had the pleasure to learn from in these two enriching years, both from Catòlica Lisbon and BI Norwegian Business School.

I would love to thank Ale, Anna, Ceci, Giulia, and Julia, you, like a street poet by the Thames said last winter, are the links to my chain, that would not snap should it be stretched twice around the world.

And lastly, I would love to thank my new Amici, meeting you felt much like luck. From finding me the room at Rosalia's, and coming to learn how to ski and not slip in Olso, to finally wander together by the canals in Venice.
You have given me so much to look back to, but mostly to look forward to.

Contents

Introduction

The landscape of art investment has become an enticing alternative for investors seeking portfolio diversification. With the continuous evolution and growth of art markets, there is an increase in curiosity about the distinctive role of Fine Art as an asset class within diversified investment portfolios.

The global art market, lastly valued by Art Basel and UBS in 2023 at $67.8 billion, has seen an increase in sales of 3% over the last year, taking the market above pre-pandemic levels. This growth is attributed mainly to sales from the high-end of the market, that has caught the wonder and attention of a wider public in most recent years, and that works on a skewed supply and demand curve.

Going into better detail, considering the growth overview in the 21st century of the Contemporary and Modern Art[1] Market, which has been performing exceptionally, to say the least. Art Basel states that starting at $103 million in the early 2000s, just this past year it has generated $2.3 billion i.e. 22 times more. The 12-month period (1st of July 2022 – 30th of June 2023), was the 4th best-ever historical performance for auction turnover, and the highest transaction volume ever recorded with more than 123,000 Contemporary art lots sold at auctions around the world.

The interest in strengthening our knowledge of the art market comes from wanting to understand its unique characteristics and the potential art assets have as a strategic and unconventional diversifier for high-net-worth individuals (HNWI), who are seeking financial profit as well as the emotional dividends that owning artworks brings along.

This thesis' contribution comes from analyzing the Contemporary and Modern art market's performance expanding upon previous works to show how art investments are just as

[1] **Contemporary art** is the art produced in the second half of the 20th century or the 21st century, making it the art of today.
Modern art describes the period from the late 19th century to the 1960s. The "isms"—Impressionism, Post-Impressionism, Cubism, Dada, Surrealism, and so forth—are subsets of Modernism.

valid as an investment in traditional assets, and how the first have even outperformed some of the latter in different points in time.

Therefore, we conducted a comprehensive analysis of a dataset including the top 100 influential artists. We gathered data from public auction results, which ensured reliability while minimizing the selection bias. We then proceeded to implement repeat-sales data to develop an Art Index of our own.

What our results indicate is that art investments have had the potential to outperform traditional assets for the period between 2002 - 2023, and the findings highlight increased liquidity for artworks along with significant financial returns, focusing on the higher end of the art market.

This thesis is organized as follows, it first provides an overview of the global art market, its recent growth, and a comprehensive review of the notable literature in the field, having a focus on the works that were of interest to our research.

Second, specific details on the data were provided, from the collection process to the biases encountered, after which the methodology used is illustrated.

Moreover, when the main results are presented, there is the explanation of our art index's results, followed by their comparison with traditional assets' performances and Earlier Studies' results.

All is finally followed by the robustness check and the conclusions, summarizing our findings and their implications for investments in art.

Literature review

"A consensus marketing machine", is how Professor Olav Velthuis, an expert in the sociology of the global art market, described the art market's functioning and dynamics, in an interview for Vox. He emphasizes the presence of various quality signals driving the art market, from the fact that artists are exhibited in a prestigious museum, to collectors' demand, or even the opinion of curators. Collectively these elements describe the perceived value of an artist, amplifying her/his influence in the creation of a network of recognition that ultimately has relevant impacts on the market dynamics.
As we will further deepen in the *Data* section of this thesis, the ranking taken from Artfacts, which builds the fundaments of our dataset, keeps into consideration these important quality signals in order to implement a thorough view of what the elite investors in the contemporary art market look for.

From previous research, art valuation is shown to be fairly challenging, amongst many, the one reason that is an eye-catcher is its essential dichotomy, being both a financial asset and a consumption good at the same time (Mandel, 2009).
Acknowledging this, it follows that pricing for the artworks' asset class is different from the pricing practices used for equities and other financial instruments. Unlike the latter and as anticipated, artworks behave partly like a consumption good, this explains how the intrinsic aesthetic value they carry earns *emotional dividends*. Ultimately making artwork one of the most exclusive kinds of luxury goods, that is sought for its ability to signal wealth and is globally recognized as a statement of the status quo in modern society.
Therefore, this can be summarized by saying that the ownership of an artistic masterpiece brings both pecuniary and nonpecuniary payoffs, which make it a compelling candidate as an alternative investment for a diversified portfolio and auction sale after the auction sale, an agreement on a value range can be found.

We saw an opportunity to expand upon previous studies because HNWIs are not gatekeeping anymore their view of artistic assets as a profitable vehicle to implement a diversification strategy. The ability to predict trends and spot artists on the rise can yield interesting profits and that is exactly why the professional role of *art consultants* is in very high demand, and that is how the largest collector's families, like the Nahmad's for example, have been managing their art-wealth.

The specific artistic periods of Contemporary and Modern art, from which the pieces in our sample are selected, were put on the map with the exemplary case of the 1973 Scull sale. Where Robert C. Scull, a New York taxicab impresario and Abstract Expressionist collector, sold a 50-piece collection at Sotheby Parke Barnet putting Post-War and Contemporary Art under the spotlight. That auction reached a then-unprecedented total of $2.2 million, (equivalent to just under $12 million in today's dollars), and the acquisition costs were around $2,000 – 3,000 per piece or even less.

This sale truly made history, and from that moment onwards the market started to hustle and reached all-time highs, especially in the last couple of decades artworks were sold for astronomical prices, in the order of hundreds of millions.

Setting the scene by delivering a backstory on the most recent evolutions of the art investments scenario and having assessed that artistic works from popular artists are currently in extremely high demand.

Therefore, we will move on to address the previous research that inspired us and with which we aligned our work. We can find interesting efforts in estimating indexes and parallelisms with stocks in works from the 1960s when the very first indices for different artistic genres were computed (Rush, 1961). From then on, the interest in artworks' performances only grew in academia, where many started implementing studies based on auction sales data (Anderson, 1974; Baumol, 1986; Goetzmann, 1993).

Finally reaching more recent times, over the last two decades hedonic and repeat-sales regressions have been increasingly employed in expansive databases of art auction sales. These regressions are used to estimate price indexes for these special infrequently traded assets and are applied in different time frames as well as on different segments of the art market (Pesando, 1993; Mei & Moses, 2002; Renneboog & Van Houtte, 2002; Renneboog & Spaenjers, 2013; Coslor & Spaenjers, 2013), and our work builds upon their methodology and findings.

While results on the long-term returns of art investments vary across studies, generally outpacing inflation, they also tend to lag behind equities' performance (Mei & Moses, 2002).

It is worth recalling that computed returns have been more favorable in the upper end of the art market over the past 60 years (Renneboog & Spaenjers, 2013), however, recent research has highlighted methodological challenges in estimating the price indexes. For

instance, a significant concern derives from the *endogeneity* of trading, as items may only be (re)sold if they have been appreciated (Goetzmann, 1996). This 'survivorship bias', suggests that repeat-sales art price indexes might require a downward adjustment (Korteweg et al., 2013). It is nevertheless in most cases addressed and mitigated with the inclusion of works uniquely from established artists, which are easy to track and are recorded over longer periods of time, providing a result that unmistakably delivers a comprehensive view of the market performance, showing both appreciation and depreciation periods (Mei & Moses, 2002).
Lastly, art price indices, such as the ones from previous works and ours, might underestimate the volatility of the underlying asset portfolio, as they rely on price data typically aggregated annually (Campbell, 2008; Renneboog & Spaenjers, 2013).

Keeping these considerations into account, we can safely state that an artwork not only represents an investment diversification opportunity, but it also essentially represents a claim on an unending stream of non-financial consumption dividends, ergo the delight and pride felt by the respective owners (Goetzmann et al., 2014).

Finally, these are the foundations upon which our work has been constructed, demonstrating the opportunities brought by investing in Contemporary and Modern art, while diversifying itself from previous works both in terms of timing, and sample.

Data[2]

Financial sources are yet to offer any sort of publicly traded funds based on artworks; therefore, we created our dataset starting from the ranking of the 100 most influential and successful artists compiled by Artfacts (2024).

The ranking of the top 100 artists (see Appendix I for the ranking) is developed incorporating criteria such as the type of exhibition (solo, duo, or group), the kind of institution (museum, gallery, or temporary space), the 'quality' of the institution (exhibition history, location, foundation year), the global presence of the artist (how international they are) and the artist's network (the ranking of the other artists in the exhibition). This ranking was chosen especially because based on the same factors mentioned by Professor O. Velthuis in his description of the art market dynamics.

All the artists present in the ranking are considered Contemporary and Modern art masters. As mentioned in multiple previous works, prices estimated by galleries or direct-from-artists are not reliable (Mei & Moses, 2002), therefore we have created our sample with data coming from the catalogs of public auction results. This way, by selecting only established artists' works we ensured the mitigation of a selection bias because the works not only have a known market presence but, also reliable historical sales data, which overall lowers the risk of over-representation of pieces with abnormal sales patterns.

We implemented a selection of 3 masterpieces per artist, following the criteria used by Renneboog and Spaenjers (2013) and Moses and Mei (2002), therefore excluding the "attributed to" pieces, as well as 'bought-in' artworks.[3] The low availability and reliability of transaction records of sales, from dealers or artists directly, narrowed the sample even more, most likely excluding very low-priced first sales, therefore moderating the upward bias further explained below.
Consequently, we selected artworks sold at least two times, starting from the early 90s up until the spring of 2024.

[2] The data on the selected artworks per each artist is available upon request, as well as the Microsoft Excel worksheets and the R-Studio code written.

[3] **"Bought in**" pieces are the ones that were not sold due to bid lower than the reservation price.

Having gathered reliable data about masterpieces, we built the base for determining how their value changed over time, keeping into account their specific production or execution years. Sales data about the pieces was collected from auctions performed all over the world by notable auction houses (Sotheby's, Christie's, Phillips, and a few others). Previous sales were mostly scouted following the 'Provenance' listed in the piece's auction lot profile, which led to the respective lots in the catalogs of the prior auctions. This Auction House bias helped standardize data and reduced the variability brought on by lesser-known entities.

The amounts for which the artworks were sold were thoroughly converted to U.S. dollars, according to the average exchange rate during the year in which the sale was performed, provided by the Federal Reserve, (i.e. Joan Miró's (1893-1983) "*Femme et oiseaux dans la nuit*" was sold on February 2nd 2016 in London for GBP 5,794,500 – that year the average exchange rate was 1 GBP = 1.355 USD, therefore the amount was recorded in the data set as $7,850,947.50).

The repeat sales that made it to our data set amount to a total of 600 entries[4], for a total of 300 pairs, which allowed us to achieve statistically significant results, and develop an *art* index for our sample.

As suggested by Mei and Moses (2002) to simplify things, we are going to refer to the first sale of the piece as a '*purchase'* and to the second as a '*sale'*, assuming the point of view of the collector (see Appendix I for the summary statistics tables).
The quantitative prefiguration of the number of observations in our repeated-sale data by year of purchase and sale is depicted in Figure 1.

[4] We treated 18 unqualified data points by substituting them with the average of all the purchase and sale prices (these were simply caused by either inappropriate artworks forms as video installations, or by undisclosed sale prices).

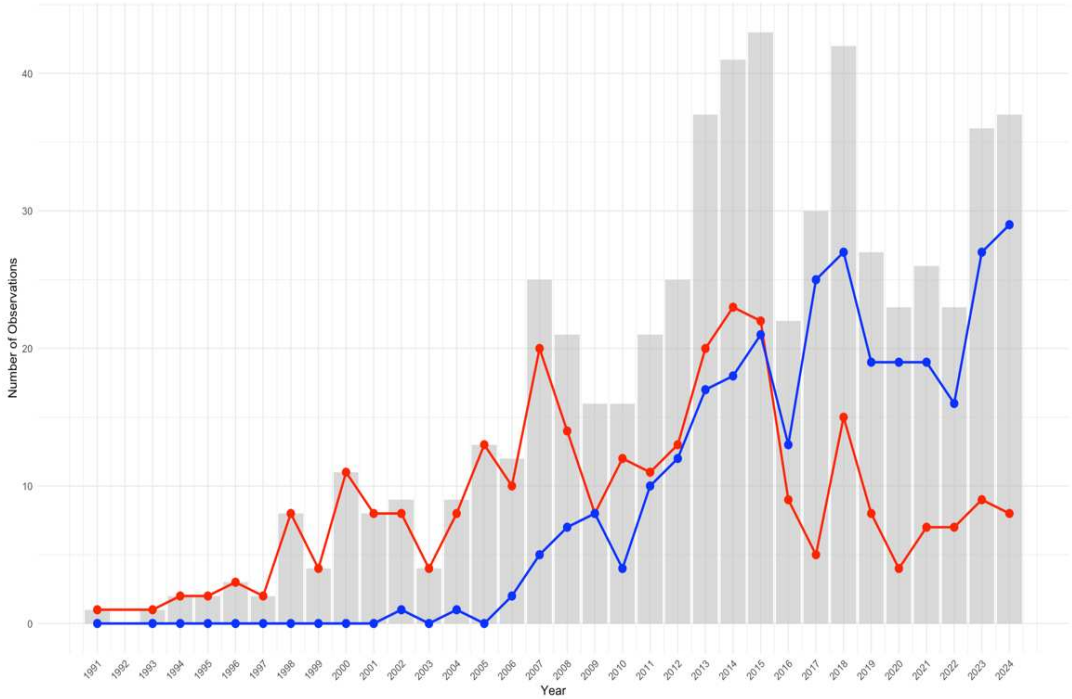

Figure 1 - *Number of Observations by Purchase and Sale Year.* The grey columns display the number of total transactions per year, while the red and blue plots describe the trends for Purchases and Sales respectively.

From such, we can observe how the volume of the transactions' data, experienced a quite rapid increase from the early 2000s.[5]

Compared to older samples which stop about where our sample starts (1875-2000), the 'hold time' for artworks was dramatically reduced from about 28 years (Mei & Moses, 2002), to a little under 7 years, showing how artworks became a more liquid asset class with time.

Our data set has, as aforementioned, an upward bias due to selection and survival, because the ranking of the 100 artists, per definition only includes the *very established* artists, which are more representative of the overall movements of the art market. These biases are nonetheless mitigated somehow, either from the exclusion of direct sales and donations or more simply, by the fact that 32.33% of our sample is composed of artworks with negative returns, which realistically represent the overall asset class performance.

[5] The size of the sample and the low volume of data gathered for 'sales' before the early 2000s, has an impact in terms of volatility.

We can sometimes witness how the price of pieces has fallen, this can be due to the fact that during auctions the houses are most times forced to sell, regardless of the piece's appreciation or depreciation.
This is done also to attract 'greenies', high net worth individuals new to the *collectors' world*, who would not step in spending an astronomical amount on their first purchase. Who, for the right deal, get attracted by the emotional dividends (Dimson, et al. 2014) of owning a piece from a notable artist. They then, in the most fortunate cases, get hooked to the non-financial returns the art piece provides, in terms of both aesthetic pleasure and personal enjoyment, but most of all they get the most satisfaction from the status that comes attached to the ownership of a unique masterpiece.

Overall, in this paper as in the ones preceding it, the biases lead to a slightly overstated approximation of the annual mean return for the artwork investments, in our time frame calculated from the repeated-sale data. This estimate could in fact be reduced by transaction costs, to the intermediaries.
Nevertheless, it is important to highlight as in previous works (Mei & Moses, 2002), that these biases, although with a lower magnitude affect other financial asset classes, such as market liquidity issues, survival, and transaction costs.

The data on traditional assets, as the S&P500, the 5-year US Treasury Bill, and US Corporate Bonds has been regularly extracted from the Center for Research in Security Prices (CRSP).

Methodology

Following the lines of Mei & Moses (2002) in their paper 'Art as an investment and the underperformance of masterpieces'. We implemented their three-stage generalized least-square RSR model, with the 'purchase' and 'sale' prices of our sample of artworks, thoroughly defined in the previous section.

We started our work from the calculation of the natural logarithm of the ratio of the sale prices at two different points in time for the same artwork, therefore calculating their price relatives[6].

$$r_{i,t} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$$

Where $r_{i,t}$ is the log price for artwork *i* sold at time *t*, $P_{i,t}$ is the sale price of the artwork *i* at time *t* (second sale), and $P_{i,t-1}$ is the sale price at time *t -1* (first sale).
Using the RSR method is advantageous because the resulting index is based on price changes of the same artwork, which in a way controls for the variations in the quality of the asset[7].

With those we proceed with the assumption that the continuously compounded returns for an artwork *i* in period *t*, $r_{i,t,}$ can be represented by μ_t, which is the continuously compounded return for an art price index, and an error term:

$$r_{i,t} = m_t + h_{i,t}$$

For which μ_t can be considered as the average return in period *t* for the artworks in the portfolio.

With the sales data from individual artwork, we estimated the μ index over the time interval *t=1, ..., T.* In this context, we then regard μ as a T-dimensional vector, whose elements are μ_t. The data we observe includes the purchase and sale price pairs, namely $P_{i,b}$ and $P_{i,s}$, for

[6] All the following computations were implemented using Microsoft Excel and R-Studio.

[7] Nevertheless, there are drawbacks due to the size of the sample, and its being a subset of all real transactions, these are discussed in depth by Olivier Chanel et al. (1996). It is important to mention another notable setback coming from the different endogenous events that affect every single purchase and sale at different times.

the individual pieces in the art index, with their respective purchase and sale dates, noted as b_i and s_i. Therefore, the logged price relative to the artwork asset i, held from its purchase date b_i to its sale date s_i, is expressed as:

$$r_i = \ln\left(\frac{P_{i,s}}{P_{i,b}}\right) = \sum_{t=b_i+1}^{s_i} r_{i,t} = \sum_{t=b_i+1}^{s_i} \mathrm{m}_t \quad + \quad \sum_{t=b_i+1}^{s_i} h_{i,t}.$$

We consequently let r represent the N-dimensional vector of logged price relatives for N repeated-sales observations.

The following generalized least-squares regression is demonstrated to provide the maximum likelihood estimate of m (Goetzmann, 1992), where X is an N-T matrix. This matrix has a row of dummy variables for each asset in the sample and columns for each holding interval. Ω is a weighting matrix, of which the weights could be determined with either the times between sales or could be based on error estimates from a three-stage estimation procedure (Case & Shiller, 1987). W is a weighting matrix, of which the weights could be determined with either the times between sales or could be based on error estimates from a three-stage estimation procedure (Case & Shiller, 1987). W is a weighting matrix, of which the weights could be determined with either the times between sales or could be based on error estimates from a three-stage estimation procedure (Case & Shiller, 1987). W is a weighting matrix, of which the weights could be determined with either the times between sales or could be based on error estimates from a three-stage estimation procedure (Case & Shiller, 1987).

$$\mu^* = (X'\mathrm{W}^{-1}X)^{-1}X'\mathrm{W}^{-1}r$$

This is followed by the calculation of annual returns, implemented as in Mei and Moses (2002) and also in Goetzmann (1992), we derive them from the exponential interpretation:

$$\text{Annual } Return = exp(\mu^*) - 1$$

Consequently, to ensure the realistic cumulative growth over time is represented by the index, we set the base value at 100 and we proceed to compute the cumulative returns using the annual returns calculated above:

$$Cumulative\ Returns\colon \prod_{i=1}^{t} (1 + Annual\ return_i)$$

Finally, the comparison with the the other traditional asset classes (stocks and bonds), as well as with the previous research papers on the topic, we used the same comparative approach as Mei and Moses (2002).

Main results

Figure 2 displays the plot of the art index over the 2002 - 2024 period with the base year index set to be 1.

This index is estimated as aforementioned with 300 pairs of repeated sale prices and is based on the procedure from Mei and Moses (2002).

The *R*-square resulting is 0.344, suggesting the index describes 34.4 percent of the variance of sample return variation. The *F*-statistic equals 9.437 with a p-value of 0.00657 indicating high statistical significance.

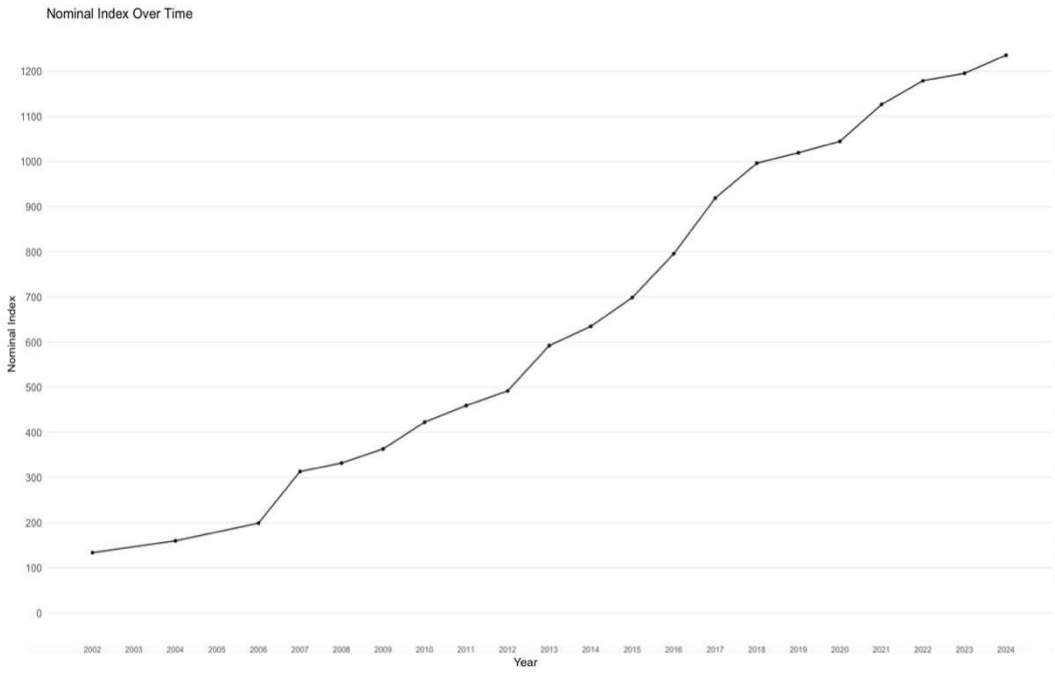

Figure 2 - *Art index over the period 2002-2023.*

Nominal index's base year 2002 = 100.

The plot shows a sharp rise in prices from 2006 to 2007, the steepest, representing a 57.49 percent which is then followed by a much slower upward trend, until 2013 when it rapidly accelerated again until 2019-2020, where it settled for increments between 1 and 7 percent.

Overall, we can see how the demand for contemporary and modern art in a 10-years interval grew exponentially, and how the index identified major price drops for example for the 2008 financial crisis and the more recent COVID-19 pandemic, by showing much lower growth rates.

Our findings are also consistent with the Art Basel and UBS growth estimates mentioned at the beginning of this paper, and although the major events mentioned have been very well documented in the art market, the price index allows for a more precise estimate in terms of precise time and magnitude of the price changes.

Table 1 exhibits the summary statistics on the behavior of the returns for our four asset classes: the Art Index, the S&P500, the 5-year US Treasury Bill, and US Corporate Bonds. For each variable we displayed the mean, the standard deviation, and its correlation with the other assets. We can also tell that our estimates are fairly accurate, the standard error for the mean return estimate is in fact only 0.2 percent for the 2002 - 2023 period.

Table 1 shows that for our period art had an annual compounded return of 11 percent, meaning it outperformed all the other assets, finding a close estimate in the US Corporate Bonds which yielded 10 percent, while the S&P500 and the 5-year US Treasury Bill yielded returns of 9 percent and 3 percent respectively.

We consequently compared our results with the results obtained in previous studies, which although analyze less recent time periods than ours, hint in the direction of how our study is a fair continuation. The results for can be found on the next page, with the results for the comparison at the bottom panel of Table 1.

Table 1 – *Summary statistics of returns*

2002 - 2023	Art Index	S&P 500	U.S. 5 Year Treasury Bill	U.S. Investment Grade Corporate Bonds
Mean	0.11	0.09	0.03	0.10
Standard Error	0.02	0.04	0.01	0.09
Standard deviation	0.07	0.17	0.05	0.38
	Correlation among returns (2002 - 2023)			
Art Index	1			
S&P 500	0.04	1		
U.S. 5 Year Treasury Bill	0.02	-0.21	1	
U.S. Investment Grade Corporate Bonds	-0.16	0.35	0.35	1
	Comparison with returns of earlier studies			
1950 - 1999	Mei & Moses	S&P 500	T-bill	Corporate Bonds
Mean	0.08	0.89	0.01	0.02
Standard deviation	0.21	0.16	0.02	0.09
1900 - 1986	Goetzmann	S&P 500	T-bill	Corporate Bonds
Mean	0.13	0.06	0.01	0.02
Standard deviation	0.02	0.21	0.05	0.08
1977 - 1992	Pesando	S&P 500	T-bill	Corporate Bonds
Mean	0.02	0.09	0.02	0.06
Standard deviation	–	0.12	0.03	0.13

Mei and Moses (2002) find with their art index a return with a mean of 8.2 percent between 1950 - 1999, which is slightly lower compared to ours, nonetheless, their index shows the same correlation with the S&P500 as our art index, at 0.04.
They also show a negative correlation with corporate bonds, -0.16 and -0.1 respectively ours and theirs. Mei and Moses' Index outperforms bonds as well as Goetzmann's, which also outperforms stocks. While our returns are revealed to be close to the ones calculated by Goetzmann (1993), 13.3 percent.[8]

In terms of the standard deviation of returns from Earlier Studies, we can notice how our Art Index has a lower estimate at 0.07, compared to Mei and Moses at 0.21, but comparably closer to Goetzmann's 0.02, which indicates lower volatility in recent years. This can be because earlier periods (1950 - 1999) include the post-World War II economic recovery, the Cold War tensions, and periods of high inflation in the 70s, all of which most likely contributed to higher volatility in the art markets. While the more recent period (2002 - 2023) showed improvements in market efficiency, and, as attested by the Art Basel evaluations mentioned at the beginning of this paper, the art market has been on track for a, to say the least, exceptional overall growth.

[8] It is important to acknowledge that while both Goetzmann (1993) and Mei and Moses (2002) include internationally sold pieces in their data, the first concentrates on the U.K. market before 1960, while the latter are skewed towards auction sales happening in the U.S.
The art returns characteristics of the two are not far off from each other but Goetzmann (1996) did not use the RSR approach for estimations in their paper, as us and Mei and Moses (2002) do.

Robustness check

To make sure our results were robust we implemented a hedonic regression model to effectively identify the key factors influencing the prices of the pieces in our sample (Renneboog and Spaenjers, 2013). We started with an Ordinary Least Square (OLS) regression with the log of sale prices, to normalize the price distribution, and we found that the *R*-squared and the adjusted *R*-squared are respectively 69.9 percent and 62.8 percent, which indicate a good fit, with a *F*-statistic of 9.78.

Independent variables such as the production year of the artworks, for our sample including only Contemporary and Modern artists were not statistically significant ($p = 0.286$)

It is interesting to see how on the other hand works by the most highly renowned artists for example Alberto Giacometti, have a significant positive influence in increasing the sale price (coefficient 4.8715, $p = <0.001$). The year of sale has a significant effect on the sale price as well, with a coefficient of 0.0547 meaning that with any additional year the log of the sale price increases by approximately 5.6 percent, its significance is confirmed by the p-value (<0.001) therefore indicating a trend of increasing prices over the time period observed.

To check for multicollinearity, we used the Variance Inflation Factor (VIF), and then removed the high estimated variables, as the Auction Houses, the model estimates showed an improved *R*-squared and adjusted.

Conclusions

From our findings, we can affirm, in line with previous research, that art investments – in our case specifically, investments in Contemporary and Modern art pieces, are a robust and profitable asset class.

The analysis illustrates how returns from such investments not only kept up with but also, in quite a few instances, outpaced traditional financial assets, such as equities, bonds, and treasury bills.

Our study, focusing on the period between 2002 to 2023, shows annual compounded returns for the index created to reach an impressive, though not surprising, return of 11 percent, outperforming all, the S&P500, US Corporate Bonds, and the 5-year US Treasury Bill, at respectively 9, 10 and 3 percent.

Another remarkable strength of the art asset class comes from its low correlation with traditional assets. At 0.04, our Art Index and the S&P500, indicate that the first moves quite independently from the stock market, and we can describe a quite similar behavior from the bond market as well.

It follows that the inclusion of artistic assets in a diversified portfolio, despite all the risks attached to them - from the long holding periods to the uncertainty upon the *popularity* of the artists, still can enhance returns, confirming in a way the ever-green value of art, now even as a strategic diversifier, and not only as a concrete representation of the human psyche.

Appendix

Table A1 - *Artfacts' Global Top 100 Artists.*

Rank	Artist	Born	Died	Country
1	Andy Warhol	1928	1987	United States
2	Pablo Picasso	1881	1973	Spain
4	Joseph Beuys	1921	1986	Germany
3	Gerhard Richter	1932		Germany
5	Cindy Sherman	1954		United States
6	Bruce Nauman	1941		United States
7	Louise Bourgeois	1911	2010	France
8	Georg Baselitz	1938		Germany
9	Wolfgang Tillmans	1968		Germany
10	Robert Rauschenberg	1925	2008	United States
11	Sol LeWitt	1928	2007	United States
12	Rosemarie Trockel	1952		Germany
13	Thomas Ruff	1958		Germany
14	Yayoi Kusama	1929		Japan
15	Erwin Wurm	1954		Austria
16	Sigmar Polke	1941	2010	Germany
17	Kiki Smith	1954		United States
18	Nam June Paik	1932	2006	United States, South Korea
19	Ed Ruscha	1937		United States
20	David Hockney	1937		United Kingdom
21	Henri Matisse	1869	1954	France
22	Nan Goldin	1953		United States
23	Olafur Eliasson	1967		Denmark
24	William Kentridge	1955		South Africa
25	Joan Miró	1893	1983	Spain
26	Felix Gonzalez-Torres	1957	1996	United States
27	John Baldessari	1931	2020	United States
28	Mona Hatoum	1952		Lebanon
29	Valie Export	1940		Austria
30	Roy Lichtenstein	1923	1997	United States
31	Imi Knoebel	1940		Germany
32	Alex Katz	1927		United States
33	Lawrence Weiner	1942	2021	United States
34	Man Ray	1890	1976	United States
35	Anselm Kiefer	1945		Germany
36	Max Ernst	1891	1976	Germany
37	Maria Lassnig	1919	2014	Austria
38	Ai Weiwei	1957		China
39	Ana Mendieta	1948	1985	Cuba
40	Marcel Duchamp	1887	1968	France

41	Francis Alys	1959		Belgium
42	Jenny Holzer	1950		United States
43	Marina Abramovic	1946		Serbia
44	Kader Attia	1970		France
45	Arnulf Rainer	1929		Austria
46	Marcel Broodthaers	1924	1976	Belgium
47	Paul Klee	1879	1940	Germany, Switzerland
48	Alexander Calder	1898	1976	United States
49	Isa Genzken	1948		Germany
50	Richard Serra	1938	2024	United States
51	Franz West	1947	2012	Austria
52	Alicja Kwade	1979		Germany, Poland
53	Laure Prouvost	1978		France
54	Yoko Ono	1933		Japan
55	Kara Walker	1969		United States
56	Zanele Muholi	1972		South Africa
57	Josef Albers	1888	1976	Germany
58	Heimo Zobernig	1958		Austria
59	Otobong Nkanga	1974		Belgium, Nigeria
60	Hito Steyerl	1966		Germany
61	Christian Boltanski	1944	2021	France
62	Tony Cragg	1949		United Kingdom
63	Ugo Rondinone	1964		Switzerland
64	Dieter Roth	1930	1998	Germany, Switzerland
65	François Morellet	1926	2016	France
66	Lucio Fontana	1899	1968	Italy, Argentina
67	Sean Scully	1945		Ireland (Republic)
68	Martin Kippenberger	1953	1997	Germany
69	Carrie Mae Weems	1953		United States
70	On Kawara	1933	2014	Japan
71	Tacita Dean	1965		United Kingdom
72	Daniel Buren	1938		France
73	Damien Hirst	1965		United Kingdom
74	Leiko Ikemura	1951		Switzerland, Japan
75	Thomas Struth	1954		Germany
76	Jasper Johns	1930		United States
77	Andreas Gursky	1955		Germany
78	Candida Höfer	1944		Germany
79	Richard Long	1945		United Kingdom
80	Alberto Giacometti	1901	1966	Switzerland
81	Günther Förg	1952	2013	Germany
82	Louise Lawler	1947		United States
83	Harun Farocki	1944	2014	Germany
84	Antoni Tàpies	1923	2012	Spain
85	Martha Rosler	1943		United States
86	Michelangelo Pistoletto	1933		Italy
87	Douglas Gordon	1966		United Kingdom
88	Albert Oehlen	1954		Germany

89	Rirkrit Tiravanija	1961		Argentina
90	Christian Marclay	1955		Switzerland, United States
91	Donald Judd	1928	1994	United States
92	Daniel Spoerri	1930		Switzerland
93	Monica Bonvicini	1965		Italy
94	Richard Prince	1949		United States, Canada
95	Ellsworth Kelly	1923	2015	United States
96	Etel Adnan	1925	2021	United States, Lebanon
97	Cy Twombly	1928	2011	United States
98	Christo & Jeanne-Claude			France, Bulgaria
99	Hiroshi Sugimoto	1948		Japan
100	Jean Dubuffet	1901	1985	France

Table A2 - *Descriptive statistics table - purchase prices (in USD$)*

Mean	1,296765.57
Median	59,375.00
Max	$44,618,350.00
0.25 percentile	18575
0.50 percentile	59375
0.75 percentile	209981.25
Min	$207
Standard Deviation	5383350.847

Table A3 - *Descriptive statistics table – sale prices (in USD$)*

Mean	$2,504,598.41
Median	$106,250
Max	$179,365,000.00
0.25 percentile	25023.75
0.50 percentile	106250
0.75 percentile	674250
Min	$325
Standard Deviation	13164254.54

Table A4 - *Numerical Values of all the art Index*

Year	Index	Year	Index
2002	133.643	2014	634.782
2004	159.748	2015	698.477
2006	198.889	2016	795.724
2007	313.250	2017	919.061
2008	332.033	2018	996.451
2009	363.227	2019	1019.307
2010	422.741	2020	1044.586
2011	459.264	2021	1126.261
2012	491.892	2022	1178.937
2013	592.176	2023	1195.435

Bibliography

Anderson, R. C. (1974). Paintings as an Investment. *Economic Inquiry*, *12*(1), 13–26. https://doi.org/10.1111/j.1465-7295.1974.tb00223.x

Artfacts. (2024, June). *Artist Ranking – The top artists on artfacts*. Artfacts.net. https://artfacts.net/lists/global_top_100_artists

Ashenfelter, O., & Graddy, K. (2003). Auctions and the Price of Art. *Journal of Economic Literature*, *41*(3), 763–787. https://doi.org/10.1257/002205103322436188

Ashenfelter, O., Graddy, K., & Stevens, M. (2000). A Study of Sale Rates and Prices in Impressionist and Contemporary Art Auctions. *Princeton University - Department of Economics*. https://economics.princeton.edu/working-papers/a-study-of-sale-rates-and-prices-in-impressionist-and-contemporary-art-auctions/

Baumol, W. J. (1986). Unnatural Value: Or Art Investment as Floating Crap Game. *The American Economic Review*, *76*(2,), 10–14.

Beggs, A., & Graddy, K. (2008). Failure to meet the reserve price: The impact on returns to art. *Journal of Cultural Economics*, *32*(4), 301–320.

Bryan, M. F. (1985). Beauty and the bulls: The investment characteristics of paintings. *Economic Review*, *Q I*, 2–10.

Buelens, N., & Ginsburgh, V. (1993). Revisiting Baumol's "art as floating crap game." *European Economic Review*, *37*(7), 1351–1371.

Campbell, J. Y. (1987). Stock Returns and the Term Structure. *Journal of Financial Economics,* 18(2), 373-399. https://doi.org/10.1016/0304-405X(87)90045-6

Carroll, J. (2021). *Omnia 101 Defining Modern Art | Omnia*. University of Pennsylvania - Penn Arts & Sciences. https://omnia.sas.upenn.edu/story/defining-modern-art

Case, K., & Shiller, R. (1987). Prices of single-family homes since 1970: New indexes for four cities. *New England Economic Review*, *Sep*, 45–56.

Chanel, O., Chanel, O., Gérard-Varet, L.-A., & Ginsburgh, V. (1996). The Relevance of Hedonic Price Indices: The Case of Paintings. *Journal of Cultural Economics*, *20*(1), 1–24.

De Bondt, W. F. M., & Thaler, R. (1985). Does the Stock Market Overreact? *Journal of Finance*, *40*(3), 793–805.

De Valle, G. (2019, May). *Why is art so expensive?*. Vox.com. https://www.vox.com/the-goods/2018/10/31/18048340/art-market-expensive-ai-painting

Dimson, E., & Spaenjers, C. (2014). Investing in Emotional Assets. *SSRN Scholarly Paper, 2387841*. https://papers.ssrn.com/abstract=2387841

European Central Bank. (2024, June 24). *Euro exchange rates charts*. Ecb.Europa.Eu. https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-usd.en.html

Fama, E., & French, K. R. (1995). Size and Book-to-Market Factors in Earnings and Returns. *Journal of Finance*, *50*(1), 131–155.

Frey, B. S., & Eichenberger, R. (1995). On the rate of return in the art market: Survey and evaluation. *European Economic Review*, *39*(3–4), 528–537. https://doi.org/10.1016/0014-2921(94)00059-9

Goetzmann, W., Mamonova, E., & Spaenjers, C. (2014). The Economics of Aesthetics and Three Centuries of Art Price Records. *NBER Working Papers*, Article 20440. https://ideas.repec.org//p/nbr/nberwo/20440.html

Goetzmann, W. N. (1993). Accounting for Taste: Art and the Financial Markets Over Three Centuries. *The American Economic Review*, *83*(5), 1370–1376.

Goetzmann, W. N., Renneboog, L., & Spaenjers, C. (2011). Art and Money. *American Economic Review*, *101*(3), 222–226. https://doi.org/10.1257/aer.101.3.222

Goetzmann, W. N., & Spiegel, M. (1995). Private value components, and the winner's curse in an art index. *European Economic Review*, *39*(3), 549–555. https://doi.org/10.1016/0014-2921(94)00061-4

Hook, P. (2009). *The Ultimate Trophy: How the Impressionist Painting Conquered the World*. Prestel.

Jouin, H. (1895). *Chefs-d'œuvre: Peinture, Sculpture Architecture*. Renourad.

Kakar, A. (2023, May 25). *10 New Artist Auction Records Set in May 2023*. Artsy. https://www.artsy.net/article/artsy-editorial-10-new-artist-auction-records-set-2023

Korteweg, A., Kräussl, R., & Verwijmeren, P. (2016). Does it Pay to Invest in Art? A Selection-Corrected Returns Perspective. *The Review of Financial Studies*, *29*(4), 1007–1038.

Lacey, R. (1998). *Sotheby's: Bidding for Class*. Little Brown & Co.

Lazzaro, E. (2006). Assessing Quality in Cultural Goods: The Hedonic Value of Originality in Rembrandt's Prints. *Journal of Cultural Economics*, *30*(1), 15–40. https://doi.org/10.1007/s10824-005-1918-0

Lovo, S., & Spaenjers, C. (2014). Unique Durable Assets. *HEC Research Papers Series*, Article 1037. https://ideas.repec.org//p/ebg/heccah/1037.html

Mandel, B. R. (2009). Art as an Investment and Conspicuous Consumption Good. *American Economic Review*, *99*(4), 1653–1663. https://doi.org/10.1257/aer.99.4.1653

McAndrew, C. (n.d.). *The Art Basel and UBS Global Art Market Report 2023: Global art market demonstrates resilience*. Ubs.Com. Retrieved June 24, 2024, from https://www.ubs.com/global/en/media/display-page-ndp/en-20230404-art-basel.html

Mei, J., & Moses, M. (2002). Art as an Investment and the Underperformance of Masterpieces. *American Economic Review*, *92*(5), 1656–1668. https://doi.org/10.1257/000282802762024719

Newman, G., & Bloom, P. (2011). Art and Authenticity: The Importance of Originals in Judgments of Value. *Journal of Experimental Psychology. General*, *141*, 558–569. https://doi.org/10.1037/a0026035

Pesando, J. (1993). Art as an Investment: The Market for Modern Prints. *American Economic Review*, *83*(5), 1075–1089.

Pownall, R. (2009). Art as a Financial Investment. *The Journal of Alternative Investments*, *10*. https://doi.org/10.3905/jai.2008.705533

Renneboog, L., & Spaenjers, C. (2012). Buying Beauty: On Prices and Returns in the Art Market, *SSRN Scholarly Paper 1352363*. https://doi.org/10.2139/ssrn.1352363

Renneboog, L., & Spaenjers, C. (2014). Investment Returns and Economic Fundamentals in International Art Markets. *CentER Discussion Paper*, *2014*(018). https://pure.uvt.nl/ws/files/1580051/2014-018.pdf

Renneboog, L., & Van Houtte, T. (2002). The monetary appreciation of paintings: From realism to Magritte. *Cambridge Journal of Economics*, *26*(3), 331–358. https://doi.org/10.1093/cje/26.3.331

Rush, R., H. (1961). *Art as an Investment*. Prentice-Hall.

Schwert, G. W. (1989). Indexes of United States Stock Prices From 1802 to 1987. *NBER Working Papers*, Article 2985. https://ideas.repec.org//p/nbr/nberwo/2985.html

Sussman, A. L. (2017, April 26). *Three Ways the 1973 Scull Sale Changed the Art Market*. Artsy. https://www.artsy.net/article/artsy-editorial-three-ways-single-auction-1973-changed-art-market

Triplett, J. (2004). *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to Information Technology Products*. *2004*(09). https://doi.org/10.1787/643587187107