Art as an Investment: the Top 500 Artists

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Abstract

This paper studies the historical prices and returns of the artworks of the top 500 artists in the world. We perform an advanced hedonic regression analysis, based on the two-step methodology developed by Kraeussl and van Elsland (2008). We investigate whether investing in art is an interesting alternative investment opportunity in times of economic turmoil. Furthermore, we examine whether art should be included in a well diversified portfolio. Based on our Top 500 Art Market index, we conclude that over a period of more than 24 years, art realizes a geometric return of 7.3% annually and that it has the highest standard deviation in our model. Our CAPM regression results show that art has a positive market beta of 0.70. Moreover, it positively correlates with the global equity index, having a correlation coefficient of 25.14%. From this, we conclude that the art market tends to move in the same directions as the global equity market. Therefore, art does not seem to be an interesting alternative asset to hedge returns of the global equity index. However, investing in art leads to diversification benefits and should be included in a well-diversified optimal portfolio.

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I. Introduction

During periods of economic crises, many investors hunt for alternative investment opportunities to protect themselves from declining stock markets. An interesting form of an alternative investment opportunity is art, because it is very different from stocks and bonds and therefore might show little correlation with the overall market movement. First, the time between a resale of an artwork may take a few years, while stocks and bonds are traded almost continuously. Second, artworks do not pay dividend or interest. However, artworks provide a high aesthetic return. Frey and Pommerehne (1989) conclude that the rate of return on investments in paintings is not as high as assumed by the public. However, this is compensated by the high aesthetic pleasure owners of artworks receive. Similarly, Goetzmann and Spiegel (1995) state that the average art investor is willing to give up some of the dollar returns, in exchange for aesthetic pleasure. Last, owning artworks brings forth additional risks compared to owning stocks and bonds, such as theft and possible damages.

According to the research done by Renneboog and Spaenjers (2009), the art market provides great investment opportunities. They have compared the total fine art turnover at public auctions of 2007 with that of 2006 and conclude that it has risen with more than 40 percent. Moreover, the World Wealth Report 2009 by Cap Gemini states that, over the last years, art continues to be one of the most popular investments of passion among high net worth individuals (HNWIs). Comparing the percentages invested in art in 2008 and 2009, we find that more and more is being invested in artworks by HNWIs. In 2007 European, Latin American, North American, Middle Eastern and Asian investors invested 22, 21, 11, 10 and 13 percent of their total investments in artworks, respectively (Cap Gemini, 2008). In 2009, however, the wealthy individuals from the mentioned parts of the world invested 30, 27, 21, 17 and 23 percent of their total investments in fine art, respectively (Cap Gemini, 2009). All in all, one can conclude that the attention to art as an investment has experienced an explosive growth.

Very little information, however, is available on private transactions. Thus, most studies on art market returns only regard public auction records. Since the total number of private transactions is low compared to that of public auction transactions, it seems safe to assume that the price trends observed in public auction sales are similar to those of the entire art market.

Furthermore, according to Ashenfelter and Graddy (2003), auction prices can at least serve as reference points for the art market in general.

Most researches on alternative asset classes study the returns of these investment opportunities and whether these assets provide an interesting alternative in a well-diversified portfolio of stocks and bonds. According to Kraeussl and Logher (2008), three different approaches exist to estimate the returns of art: the naïve art indices, the repeat sales regressions and the hedonic regressions.

The naïve art price indices are constructed using the averaged and median auction prices (Renneboog & van Houtte, 2002). The assumption made here is that the distribution of quality of the paintings is relatively constant over time. Renneboog and van Houtte (2002) come up with another naïve form of return calculation; one that is similar to a Consumer Price Index. With this method, a basket of representative paintings is created and the price of constituting paintings, which are not sold in the subsequent period, can be periodically re-evaluated by experts or they can be replaced with close substitutes. A preferred substitute is then a painting of the same artist and of the same quality and size. The commonly named disadvantage of this method is the subjectivity in determining substitutes.

The repeat sales regression approach estimates the average return on the set of assets in each period (Renneboog & Spaenjers, 2009). When applying this method to art, only those artworks that have been traded at least twice can be used. This is somewhat problematic, since the resale of a specific artwork may not even occur once in a century (Baumol, 1986). This will significantly reduce the total number of observations. Furthermore, the sample based on repeat sales only, may not represent the population correctly, causing a sample selection bias (Bourassa, Hoesli & Sun, 2006; Zanola, 2007).

Paintings are heterogeneous commodities of which the price, to some extent depends on its own characteristics (Chanel & Ginsburgh, 1996). In order to build a price index for such markets, it is of importance to control for permanent determinants of price variations. This motivated Court (1939) to first use hedonic price indices and Anderson (1974), the first author to apply a hedonic regression on art prices. Thus, with regard to paintings, hedonic regressions control for quality changes by attributing implicit prices to a set of value-adding characteristics. Then, to construct a hedonic price index, a time dummy can be used, which only captures the

pure time effect. According to Ginsburgh, Mei & Moses (2006), one of the difficulties of building a hedonic pricing model is the choice of characteristics. It is important to realize that a strong assumption behind the use of hedonic regressions exists, namely that the included characteristics capture nearly all of the uniqueness of the artwork. According to Renneboog and Spaenjers (2009), the most often used independent variables in hedonic regression models are those characteristics that are easily observable and quantifiable. One can think of the following characteristics: the artist, the auction house, the size, the used medium and material and the artist's living status.

Numerous authors have examined the risk and return characteristics of art investments. However, conflicting evidence can be found on the profitability of art investments. Moreover, contradicting evidence exists on the effectiveness of art investments for diversification purposes.

The results of the majority of the researches indicate low returns on artworks and limited diversification possibilities. Baumol (1986) concludes that the rates of return on paintings are significantly low compared to other financial assets. Similarly, Renneboog and Spaenjers (2009) claim that art investments underperform several financial assets and that art investments may not be as good as is often hoped for. Pesando (1993) states that the art market performs poorly relative to investments in more traditional assets and that art investments do not lead to diversification benefits. Goetzmann (1993) argues that the rates of return on artworks are not higher than what would be reasonable by a similar level of risk. Furthermore, he states that the art market highly correlates with traditional financial markets, which makes art investments not very useful for diversification purposes. These findings are in line with the results of the study done by Chanel (1995), which also indicates a high level of correlation between the art market and financial markets. Worthington and Higgs (2004) find that the risk and return characteristics of artworks are significantly inferior to those of financial assets and find no diversification benefits when including art in an optimized portfolio. Renneboog and van Houtte (2002) find limited diversification potential for Belgian art. Art is only included in an optimal portfolio within a certain range of standard deviation. Kraeussl and van Elsland (2008) conclude that it is only beneficial to include German art in an optimal portfolio, when maximum weights constraints are set for the examined asset classes. Finally, Kraeussl and Logher (2008) conclude

that Russian art should not be included, when constructing an optimal portfolio and that the inclusion of Chinese art is only beneficial, when a maximum weight constraint is set.

On the contrary, Buelens and Ginsburgh (1993) find large time intervals in which art investments perform better than other financial assets. Furthermore, Mei and Moses (2002) state that art is less volatile and that it shows a lower correlation with traditional financial assets than assumed. Therefore, they continue to conclude that art may be an attractive vehicle to invest in for diversification purposes. In addition, Campbell (2007) shows that the art market correlates negatively with traditional financial markets, making art a beneficial investment for portfolio diversification.

The study done by Renneboog and Spaenjers (2009) shows that a positive masterpiece effect exists; high quality art makes a better investment. Therefore, it is interesting to study the artworks of the world's top artists, in order to investigate whether investing in art yields a competitive risk-adjusted return in comparison with other, more traditional asset classes. To perform this research, we have used a comprehensive list of the top 500 artists of 2007 in the world, ranked by Artprice.com (2008). All the sales data have been extracted from Artnet.com, a large online auction sales database. Our final dataset includes sales records of nearly 100,000 transactions. This enables us to apply an extensive and advanced hedonic regression analysis, based on the two-step methodology developed by Kraeussl and van Elsland (2008). We will examine the risk and return characteristics of the collected data, as well as their potential diversification benefits in an optimal portfolio. For the optimal portfolio, we consider the following markets: art market, commodities, corporate bonds, government bonds, hedge funds, private equity, real estate, global stocks and Treasury bills.

Our results show that art realizes a geometric return of 7.3% annually. It is, however, the most volatile asset in our model. Our CAPM regression results indicate that art has a high and positive market beta of 0.70. The pairwise correlation matrix shows that art positively correlates with the global equity index. A correlation coefficient of 25.14% is found. From this, we conclude that Top 500 Art Market index tends to move in the same directions as the MSCI World Equity index. Therefore, art does not seem to be an interesting alternative asset to hedge returns of the global equity index.

However, art should be included in a well-diversified optimal portfolio. This holds for all scenarios appeared in this research. Nonetheless, the amount that should be invested in art should diminishes as the level of risk aversion rises. On the basis of these results, we conclude that investing in the artworks of the top 500 artists in the world leads to diversification benefits in a well-diversified portfolio.

The remainder of this paper is structured as follows. Section II extensively describes our dataset, the hedonic variables used in our analysis and the methodology used to estimate the hedonic regressions. Section III outlines our hedonic regression results and the resulting art price index. Furthermore, it contains a performance analysis and an optimal asset allocation analysis. In Section IV we draw our conclusions.

II. Data & Methodology

A. The Art Market & Financial Markets

We have downloaded all the painting data from www.artnet.com, a large online auction sales database. The Artnet price database includes auction results from over 500 international auction houses since 1985 and it includes over 3.5 million artworks made by more than 180,000 artists. For each auction record, the following characteristics may be available: artist name, artist nationality, artist year of birth, artist year of death (if applicable), title of work, year of creation of the work, medium, size (in inches and centimeters), miscellaneous (containing info on whether the work is signed, stamped, etc.), auction house, date of auction, lot number, estimate (currency of estimate and estimate converted to dollars), sale price (currency of sale price and sale price converted to dollars) and a note on the sale, indicating whether it was bought in, withdrawn, sold at hammer price or at a premium.

Baumol (1986) believes that investing in art is similar to a floating crap game. He states that, all things being equal, all artists have a comparable chance at becoming famous. However, once famous, these artists seem to sell their artworks at a premium. Therefore, it is interesting to examine whether buying the artworks of the world's top artists is a good investment or not. We

have downloaded all the auction records of the paintings made by the top 500 artists of 2007 in the world, available on Artnet.com. Out of the 500 artists, 28 artists were either not available on Artnet.com or had no artworks available. The initial number of downloaded auction records of the remaining artists over the years 1985 to 2009 (first four months) was 144,586. Of these records, 29.89% were either paintings that have been bought in, withdrawn, removed or that were not available. This reduces the total number of useable auction records to 101,369. Furthermore, auction records that miss crucial information, such as the used medium and material or the size of the painting, were removed from the dataset as well. This reduced the total number of useable auction records to 98,548, created by 467 artists. This represents 68.16% of the total auction records of the top 500 artists on the Artnet database. The obtained prices paid for the paintings over the 24 years and four months time span sum up to a total of USD 36 billion. The average number of trades is 4,050 per year and the average price paid for a painting is USD 365,639. The minimum price paid for a painting is only USD 2.00, while on the other hand the maximum price paid for a painting is USD 104 million.

We have retrieved data for all other assets from the Thomson Financial DataStream, except for the data of the ten-year Treasure bonds, which we retrieved from the St. Louis Fed. We make use of the following asset classes for our empirical research: the MSCI World Equity index represents the world's stock market; the World-DataStream REITS represents the real estate market; the GSCI Commodity index represents the commodity market; the LPX 50 represents the private equity market; the ten-year Treasury bonds represent the government bond market; the Merrill Lynch Corporate Bonds Master index represents the corporate bond market; the CS/Tremont Hedge Fund index represents the hedge fund market; and the three-month Treasury bill rate is the government short-term bond market (the risk-free rate).

B. Methodology & Hedonic Variables

Previous studies have shown that artwork characteristics have an explicit impact on market valuation. To build price indices that properly account for these characteristics of the regarding item, a hedonic regression model may be used. The first author who has used a hedonic regression analysis is Court (1939). He studied the changes in automobile prices over time in

relation to performance characteristics. Chow (1967) used a similar method to examine the impact of technological changes on computer prices. Furthermore, hedonic models are widely used to construct art price indices. Examples include studies by: Chanel, Gerard-Varet and Ginsburgh (1994), Chanel (1995), Gerard-Varet (1995), Kraeussl and van Elsland (2008) and Renneboog and Spaenjers (2009).

Paintings are heterogeneous assets and a variety of physical and non-physical characteristics cause a painting to be unique. To construct a good predictive model, we will use hedonic modeling to separate these characteristics that determine the price of a painting. The dependent variable in our hedonic model is the natural logarithm of the sales price in USD. The independent variables used in our model describe the following characteristics: medium, auction house, surface, signature, estimate price, living status, artist reputation and sale date. A hedonic regression can be represented as follows:

$$\ln P_{kt} = \alpha_0 + \sum_{j=1}^{x} \beta_j X_{nkt} + \sum_{t=1}^{t} \lambda_t C_t + \varepsilon_{kt} \qquad (1),$$

where P_{kt} represents the price of painting k at time t, α_0 indicates the regression intercept, β_j reflects the coefficient values of the quality characteristic x, X_{nkt} is the value of quality characteristic n of painting k at time t, the anitlogs of the coefficients λ_t are used to build a hedonic price index, C_t reflects the time dummy variable, which takes the value 1 if painting k is sold in period t and takes the value 0 otherwise and ε_{kt} represents the disturbance term.

Sale date. Based on the sale dates of the paintings, the time dummy variables have been created. Each time dummy variable covers a period of three months, of which the first period is that of 1985, January – March. The last period in the dataset is that of 2009, January – March. These time dummy variables are specified, such that a value of 1 indicates that a specific painting k is sold in period t.

Medium. Previous studies have shown that oil paintings on canvas command the highest average prices (Valsan, 2002; Reddy & Dass, 2006; Agnello, 2002). It is the most appreciated and commonly used combination of medium and material. Hence, this will be used as the reference variable. Numerous other combinations of medium and material were used. The most commonly used combinations within our dataset have been used as separate dummy variables. The remaining combinations have been joined together under the dummy variable 'other media'.

The expectation is that all the combinations of medium and material, other than oil on canvas, will have a negative coefficient sign, since it is expected that these combinations are valued relatively lower than the reference variable. The dummy variables are specified in such manner that a value of 1 indicates that a painting has a certain combination of medium and material. The used dummy variables are: oil on canvas, oil on board, oil on paper, oil on panel, acrylic on canvas, acrylic on paper, mixed media and other media.

Auction house. The most expensive artworks are associated with the names Christie's and Sotheby's (De la Barre, Doccio & Ginsburgh, 1994; Valsan, 2002; Agnello; 2002; Renneboog & Spaenjers, 2009). Moreover, De la Barre et al. (1994) state that the quality of an artwork is partly explained by the auction house coefficient. Good paintings are auctioned at Christie's and Sotheby's, while less good artworks are auctioned at smaller auction houses. The most commonly appeared auction houses in the dataset have been used as separate dummy variables, for which a value of 1 indicates that a painting has been auctioned at a specific auction house. The remaining auction houses have been joined together under the dummy variable 'other auction houses' and this dummy variable serves as the reference variable. Thus, the expectation is that the other dummy variables (the large auction houses) should all have positive coefficients signs, since it is believed that these auction houses auction more prestigious artworks. The used dummy variables are: Christie's Amsterdam, Christie's Milan, Christie's London, Christie's New York, Sotheby's London, Sotheby's New York, Briest Scp., Loudmer Scp., Tajan and other auction houses.

Surface. According to Kraeussl and van Elsland (2008), the most commonly used variable that describes the physical characteristics of a painting is its surface. The variable is specified with the width multiplied by the height of the painting. In accordance with previous studies (e.g., Valsan, 2002; Agnello, 2002; Renneboog & Spaenjers, 2009), the expectation is that the surface of the painting should have a positive effect on its sale price. Thus, a relatively larger painting should have a higher sale price. However, the sale price increases with a diminishing effect, due to the fact that exceptionally large paintings are more difficult to display. In the dataset, the surface values have been logged.

Signature. Previous studies have shown that investors are willing to pay a relatively higher price for a painting, if they are certain that the painting is authentic. Examples include

studies by: Agnello (2002) and Renneboog and Spaenjers (2009). Therefore, the expectation is that signed paintings or paintings that have any other marks of authenticity will most likely earn higher sale prices than unsigned paintings. This variable is specified as a dummy as well, such that a value of 1 indicates that the painting does not have a mark of authenticity.

Estimate. The estimate variable states whether an estimate price for a certain painting is available. According to Ashenfelter and Graddy (2003), the availability of an estimate price for an artwork has a positive effect on its sale price. Thus, it is expected that if this information is available, this should lead to a higher sale price. However, it may function as an equilibrium as well. In other words, potential buyers are unwilling to bid prices that deviate considerably from the estimate price. This may limit buyers to overpay for a piece of art. This variable has been specified as a dummy variable as well, such that a value of 1 indicates that a painting does not have an estimate price.

Living status. This dummy variable indicates whether an artist is dead or alive and is specified in such manner that a value of 1 indicates that the artist is alive. It is expected that the artworks of artists who are no longer alive generally lead to higher sale prices, because the production of these artists halts. However, artists who are no longer alive are not able to build on their artistic reputation. Therefore, their work might become forgotten, which will result in lower sale prices in the long run.

Reputation. This final variable is used to make a distinction between highly rated artists and lower rated artists. To be able to make this distinction, the two-step hedonic approach by Kraeussl and van Elsland (2008), will be used to construct an artist index. The first step is to estimate the standard hedonic regression from equation (1). The second step is to manually compute the artist index, using the equation below:

$$Index_y = \frac{\prod_{i=1}^{n}\left(P_{i,y}\right)^{1/n} \;/\; \prod_{i=1}^{m}\left(P_{i,y-1}\right)^{1/m}}{exp\left[\sum_{j=1}^{z}\beta_j\left(\sum_{i=1}^{n}\frac{X_{ij,y}}{n} - \sum_{i=1}^{m}\frac{X_{ij,y-1}}{m}\right)\right]} \quad (2),$$

where $P_{i,y}$ is the sales price of painting i, created by artist y, $P_{i,y-1}$ is the sales price of painting i, created by the reference artist $y-1$, n is the number of paintings created by artist y, m is the number of paintings created by the reference artists $y-1$, β_j represents the regression coefficient of a particular quality characteristic j, $X_{ij,y}$ refers to the particular painting's quality characteristic

value for artist y and $X_{ij,y-1}$ represents the particular painting's quality characteristic value for the reference artist $y-1$.

The resulting two-step hedonic artist index is multiplied by 100. Thus, the index value of the reference artist will equal 100. Index values lower than 100 indicate relatively lower valued artists compared to the reference artist and index values higher than 100 indicate relatively higher valued artists compared to the reference artist. Since the top 500 artists are used in this research, all artists have received a rank by forehand. The number one ranked artist, Andy Warhol, serves as the reference artist. Thus, it is expected that the other artists index values will have values lower than 100. The lower an artist is ranked, the further its index value is apart from 100.

III. Discussion of Results

A. The Top 500 Art Market Index

In this section, we discuss the findings for the hedonic values for various characteristics. Furthermore, we focus on the Top 500 Art Market index. Table I presents the results of the hedonic regression model for the top 500 artists. This model includes 98,526 paintings created by these artists from January, 1985 until March, 2009. Approximately 63% of the price variability in the artworks of the top 500 artists is explained by this model.

The combinations of medium and material variables are all highly significant at a 1% level. In accordance with previous research, oil on canvas fetches one of the highest prices. Only oil on panel seems to command higher prices than oil on canvas. The remaining combinations of medium and material variables all have coefficient signs as one would expect.

Previous studies have shown that more famous auction houses earn higher prices on average. Our empirical results support these findings. The most commonly appeared auction houses within our dataset all fetch higher prices than the reference variable, which includes all other auction houses. As expected, Christie's London, Christie's New York, Sotheby's London and Sotheby's New York command the highest prices. These auction houses are significant at a 1% level.

Table I

Hedonic Regression Results

This table presents the hedonic results for the Top 500 Art Market index on a quarterly basis. The dependent variable is the natural logarithm of the USD denominated auction price. For the combination of medium and material, oil on canvas serves as the reference variable. For auction houses, the category 'other auction houses' serves as the reference variable. The reference artist is Andy Warhol; the number one ranked artist of the top 500 artists. The asterisks *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

Top 500 (1985:Q1 – 2009:Q1)				
	Coefficient	S.E.	Prob.	Sig.
Acrylic on Canvas	-0.4259	0.0169	0.0000	***
Acrylic on Paper	-0.9136	0.0188	0.0000	***
Mixed Media	-0.3819	0.0288	0.0000	***
Oil on Board	-0.0680	0.0153	0.0000	***
Oil on Panel	0.0795	0.0145	0.0000	***
Oil on Paper	-0.4165	0.0212	0.0000	***
Other Media	-0.4047	0.0090	0.0000	***
Christie's Amsterdam	0.1235	0.0309	0.0001	***
Christie's London	0.7765	0.0120	0.0000	***
Christie's Milan	0.0761	0.0405	0.0607	*
Christie's New York	0.7460	0.0115	0.0000	***
Sotheby's London	0.7544	0.0116	0.0000	***
Sotheby's New York	0.7419	0.0109	0.0000	***
Briest Scp.	0.1282	0.0331	0.0001	***
Loudmer Scp.	0.2621	0.0293	0.0000	***
Tajan	0.0333	0.0260	0.2014	
Ln(Surface)	0.4625	0.0033	0.0000	***
Unsigned	-0.1922	0.0128	0.0000	***
No Estimate	0.3674	0.0358	0.0000	***
Alive	-0.5360	0.0103	0.0000	***
Ln(Reputation)	0.0996	0.0004	0.0000	***
C	-1.8896	0.1246	0.0000	***
Adjusted R-squared	0.6251			
S.E. of regression	1.0611			
F-statistic	1405.2410			
Included Observations	98,526			

In line with previous studies, our empirical results show a positive coefficient for the surface variable. Thus, larger paintings command higher prices on average. It has a reasonable factor loading of 0.46 and it is highly significant on a 1% level.

As reported in previous studies, unmarked paintings command lower prices than marked paintings. Our empirical results support these findings; the estimated coefficient of the unsigned dummy variable presents a negative sign. It is significant at a 1% level.

The no estimate dummy variable carries a positive coefficient and is significant at a 1% level. Thus, higher prices are paid for paintings that have not received an estimate price. The theory that estimate prices function as an equilibrium and therefore limit buyers from overpaying for a piece of art holds in this case.

The alive dummy variable indicates a negative coefficient and is highly significant at a 1% level. Thus, the expectation that the artworks of artists who are no longer alive generally lead to higher sale prices, because the production of these artists halts, is supported by our empirical results.

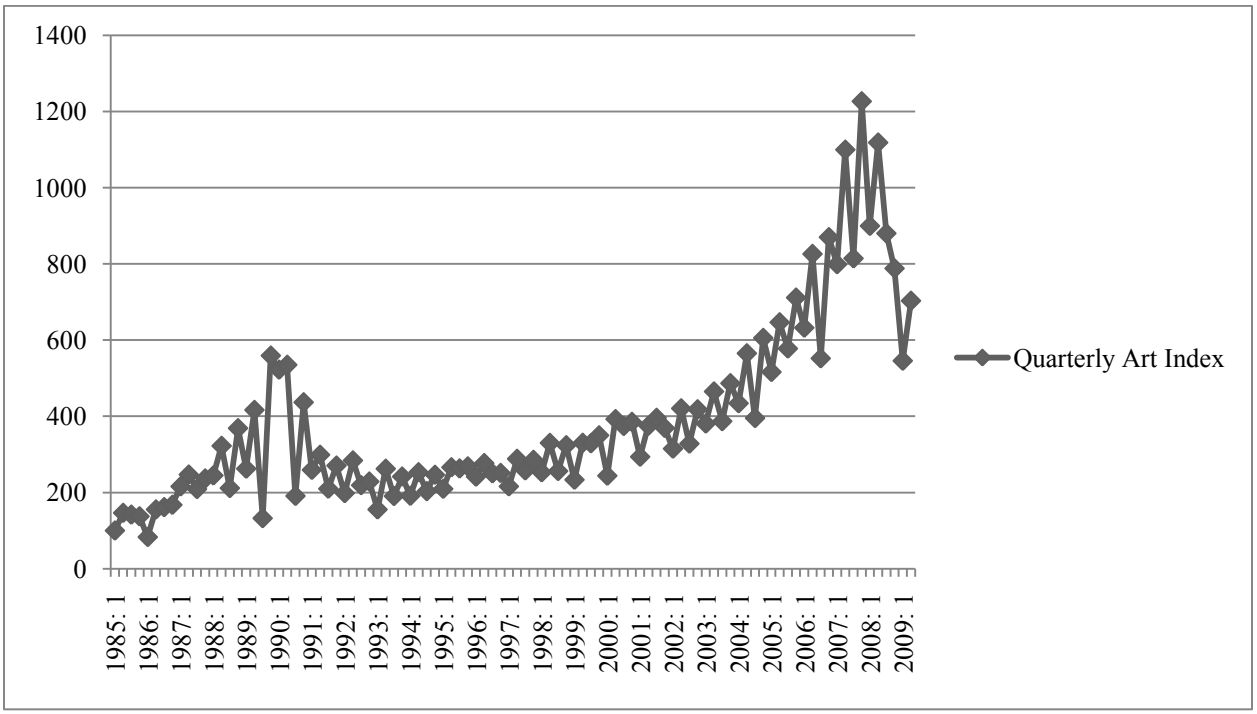
At last, in line with our expectations, the artist's reputation variable shows a positive coefficient. It is significant at a 1% level. Thus, the artworks of high ranked artists generally command higher prices than the artworks of lower ranked artists.

Figure I presents the Top 500 Art Market index[1]. We have used end-of-quarter index values, quarter 1 (Q1) covering the months January until March. The index reveals a significant growth over the years. 1985:Q1 is the base quarter and has an index value of 100. The lowest index value can be observed in 1986:Q1, which had a value of 83.07. The fourth quarter of 2007 exhibits the highest index value, reaching a value of 1226.32.

Earlier studies have shown that a significant rise in the prices of the art market is observable in the late 1980s and that the art market went into a tailspin in the early 1990s. According to Gerard-Varet (1995), the sharp rise in the prices of the art market in the late 1980s can be explained by a 'rational bubble'. Rational bubble models state that agents are fully aware of the fundamental price of an asset. However, they may be willing to pay more than this amount. This may occur if agents expect that the future price appreciation is large enough to satisfy their required rate of return. The Top 500 Art Market index reflects these trends as well.

[1] Within this index, two quarters have been interpolated: 1985:Q3 and 1986:Q3. The first has been interpolated, because this quarter contained zero observations. The latter has been interpolated, because this quarter only contained two observations, which led to an unrealistic peak in the index. The index values of these quarters are the average of the index values of 1985:Q2 & 1985:Q4 and 1986:Q2 & 1986:Q4, respectively.

Figure I: Top 500 Art Market Index on a quarterly basis (1985:Q1 – 2009:Q1)



Furthermore, a sharp decline is observable in the first quarter of 2008, continuing until the first quarter of 2009. This may be the consequence of the economic crisis we are currently in.

All other estimations, calculations and conclusions are based on the above described hedonic regressions. Therefore, it is of importance to examine the firmness of the index results. To check for robustness, we will apply the advanced hedonic regression analysis, based on the two-step methodology developed by Kraeussl and van Elsland (2008), again, however, this time on a semi-annual basis. The results for this hedonic regression model on a semi-annual basis can be found in Table II. All variables show the same coefficient sign and the factor loadings remain fairly similar. The significance of the findings have not changed, except for auction house Christie's Milan (now significant at a 1% level). The resulting Top 500 Art Market index on a semi-annual basis (see Figure II) displays the same trends as the index based on quarterly data.

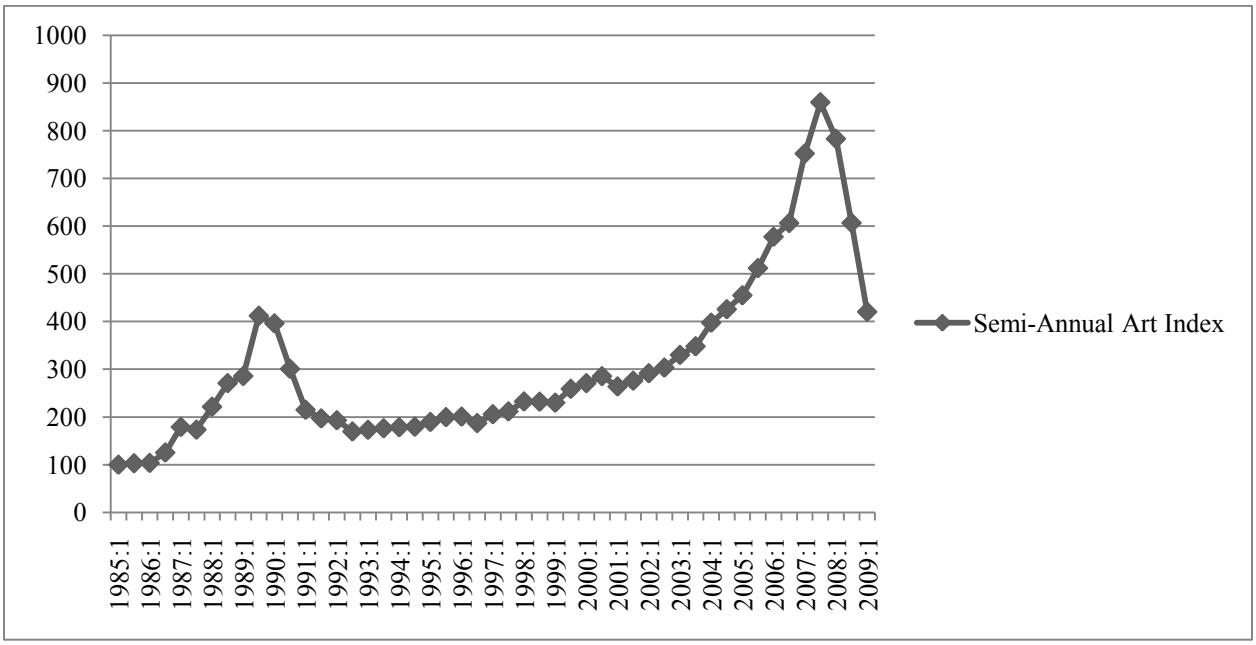
Table II

Hedonic Regression Results

This table presents the hedonic results for the Top 500 Art Market index on a semi-annual basis. The dependent variable is the natural logarithm of the USD denominated auction price. For the combination of medium and material, oil on canvas serves as the reference variable. For auction houses, the category 'other auction houses' serves as the reference variable. The reference artist is Andy Warhol; the number one ranked artist of the top 500 artists. The asterisks *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

Top 500 (1985:S1 - 2009:S1)				
	Coefficient	S.E.	Prob.	Sig.
Acrylic on Canvas	-0.4360	0.0170	0.0000	***
Acrylic on Paper	-0.9293	0.0190	0.0000	***
Mixed Media	-0.3837	0.0289	0.0000	***
Oil on Board	-0.0728	0.0155	0.0000	***
Oil On Panel	0.0805	0.0145	0.0000	***
Oil on Paper	-0.4143	0.0214	0.0000	***
Other Media	-0.4040	0.0091	0.0000	***
Christie's Amsterdam	0.1487	0.0312	0.0000	***
Christie's London	0.7510	0.0118	0.0000	***
Christie's Milan	0.1174	0.0406	0.0038	***
Christie's New York	0.7395	0.0116	0.0000	***
Sotheby's London	0.7231	0.0114	0.0000	***
Sotheby's New York	0.7321	0.0109	0.0000	***
Briest Scp	0.1237	0.0336	0.0002	***
Loudmer Scp	0.2583	0.0294	0.0000	***
Tajan	0.0170	0.0259	0.5127	
Ln(Surface)	0.4668	0.0033	0.0000	***
Unsigned	-0.2029	0.0128	0.0000	***
No Estimate	0.3390	0.0360	0.0000	***
Alive	-0.5374	0.0103	0.0000	***
Ln(Reputation)	0.1007	0.0004	0.0000	***
C	-2.2371	0.0650	0.0000	***
Adjusted R-squared	0.6212			
S.E. of regression	1.0666			
F-statistic	2342.6070			
Included Observations	98.526			

Figure II: Top 500 Art Market Index on a semi-annual basis (1985:S1 – 2009:S1)



B. Performance Analysis & Optimal Asset Allocation

In this section, we examine the general descriptive statistics for the Top 500 Art Market index and all other financial asset classes used in our research, over the period 1985:Q1 to 2009:Q1. Furthermore, we investigate whether art is an interesting alternative investment opportunity in times of economic turmoil and whether it should be included in a well diversified portfolio. In order to find out, we will pay attention to the CAPM analysis, a pairwise correlation matrix, including all assets used in our research and we will perform an optimal asset allocation based on the power utility optimization.

When considering geometric returns, Table III shows that hedge funds outperform all other asset classes. It realizes a return of 8.7% on an annual basis. Corporate bonds are the second best performing financial assets, since it realizes an annual return of 8%. Art as an alternative investment asset seizes a respectable third place, with an annual geometric return of 7.3%.

Table III

Return Statistics

This table presents the quarterly descriptive statistics and the risk and return characteristics of nine different asset classes over the period 1985:Q1 to 2009:Q1. All retrieved indices are transformed into continuously compounded returns and all data are in quarterly terms. The Sharpe ratio is the quarterly arithmetic rate of return minus the risk-free rate, divided by the standard deviation. Less observations are included for Hedge Funds and Private Equity, since these indices start in 1994:Q1.

Descriptive Statistics									
	Art	Com-modities	Corp. Bonds	Govt. Bonds	Hedge Funds	Private Equity	Real Estate	Global Stocks	T-Bill
Obs.	96	96	96	96	61	61	96	96	96
Arithm. Ret.	0.1411	0.0339	0.0198	0.0619	0.0222	0.0120	0.0235	0.0150	0.0121
Geom. Ret.	0.0178	0.0173	0.0194	-0.0424	0.0210	0.0009	0.0157	0.0112	0.0121
Median	-0.0002	0.0062	0.0179	0.0601	0.0245	0.0214	0.0200	0.0297	0.0128
Maximum	6.2291	0.5956	0.0980	0.1031	0.1380	0.5338	0.3244	0.2277	0.0238
Minimum	-0.8509	-0.3388	-0.0716	0.0252	-0.1381	-0.4397	-0.3500	-0.2439	0.0004
Std. Dev.	0.7796	0.1913	0.0281	0.0177	0.0478	0.1436	0.1237	0.0859	0.0054
Sharpe ratio	0.1655	0.1139	0.2744	2.8138	0.2593	-0.0007	0.0926	0.0340	0.0000
Skewness	5.6635	0.8948	0.1270	0.3046	-0.7644	-0.1565	-0.2358	-0.7379	-0.1350
Kurtosis	41.4237	3.7421	3.7919	2.2013	6.3086	6.4948	4.2258	4.0960	2.4131
Jarque-Bera	6402.75	14.6144	2.7584	3.9901	33.4733	31.2793	6.8716	13.2448	1.6604
Probability	0.0000	0.0008	0.2518	0.1360	0.0000	0.0000	0.0322	0.0013	0.4360

However, art is by far the most volatile asset, while only Treasury bills and government bonds are less volatile than hedge funds and corporate bonds. The Sharpe ratio reflects the trade-off between risk and return. Government bonds possess a Sharpe ratio of 2.8138, which is the highest ratio in this study. This makes this financial asset the most attractive one for a mean variance efficient investor. The least attractive asset for such investor would be private equity, since it has a negative, but very low ratio of -0.0007. Art has a Sharpe ratio of 0.1655, the fourth high ratio in our model. Corporate bonds and hedge funds, once again, prove to be well performing assets, achieving the second and third highest Sharpe ratio, respectively.

The Jarque-Bera test indicates that the returns of art are not normally distributed. Moreover, it has by far the most positively skewed distribution. Since the distribution of the returns on art is right-skewed, extreme high returns on art are more probable than extreme low returns on art. This strongly skewed distribution of the returns on art may seem interesting to investors. However, in addition, the returns on art possess the highest level of kurtosis, which

measures the relative concentration of values in the center of the distribution as compared with the tails. In other words, extreme returns are more likely to occur, when one invests in art, compared to when one invests in any other asset used in this research.

In Table IV, the CAPM regression results indicate that art has a high and positive market beta of 0.70. Furthermore, this value is significant at a 10% level. This empirical finding suggests that the Top 500 Art Market index tends to move in the same directions as the MSCI World Equity index. Moreover, this finding is supported by the pairwise correlation matrix in Table V, which indicates that it positively correlates with the global equity index (25.14%) as well. Previous studies have found similar results. In Agnello (2002), the returns on art have a correlation coefficient of 23% with the S&P 500 index. Renneboog and van Houtte (2002) report a correlation coefficient of 24.9% with the MSCI World Equity index. In Kraeussl and van Elsland (2008), a correlation is reported of 18.91% with the MSCI World Equity index. Contrarily, Mei and Moses (2002) report a very low, though positive correlation coefficient of 4% with the S&P 500 index.

When one wants to hedge returns of the global equity index, commodities (e.g., crude oil, salt, sugar, coffee beans, gold, silver, etc.) are the most attractive and effective asset. Table IV indicates that it has a market beta of -0.1429. Moreover, it negatively correlates with the MSCI World Equity index as well, having a correlation coefficient of -7.49% (see Table V).

Thus, investing in art does not seem be an interesting alternative asset to hedge returns of the global equity index. However, will art lead to diversification benefits in a well-diversified portfolio? To analyze this, we will perform an optimal asset allocation, based on the power utility optimization. This method is represented by the following:

$$max\ U_{avg} = (\sum E_t [R^{1-\gamma} / 1-\gamma]) / n \qquad (3),$$

where U_{avg} reflects the average utility over all periods, R indicates the gross return on the portfolio, γ is the risk aversion parameter and n specifies the number of periods.

To calculate the maximum average utility, we have interpreted each period as a scenario for returns on each of the used assets. Per scenario, a utility is then calculated. All utilities have been summed up and divided by the total number of periods to find the average utility. Finally, the weights for each of the assets are adjusted to obtain the maximum average utility. Regarding

Table IV

Return Statistics

Table IV displays the results of the CAPM analysis. The CAPM estimations are based on excess returns: $R_i = r_f + \beta_i(R_m - r_f)$, where the MSCI World Equity index reflects the market return and the three-months Treasury bills represents the risk-free rate. The MSCI World Equity index proxies for the systematic market factor. The probabilities appear in parentheses.

CAPM							
	Art	Com-modities	Corporate Bonds	Government Bonds	Hedge Funds	Private Equity	Real Estate
Intercept	0.1269	0.0222	0.0077	0.0498	0.0130	0.0039	0.0088
	(0.1154)	(0.2604)	(0.0063)	(0.0000)	(0.0081)	(0.7880)	(0.3747)
Beta	0.7001	-0.1429	0.0167	0.0243	0.3480	1.0615	0.8956
	(0.0659)	(0.5286)	(0.6278)	(0.2211)	(0.0000)	(0.0000)	(0.0000)
R-squared	0.0059	0.0041	0.0029	0.0227	0.3925	0.3918	0.3865
F-statistic	0.5584	0.3849	0.2719	2.1834	38.1229	38.0096	59.2148
S.E. of regression	0.7846	0.1929	0.0269	0.0138	0.0372	0.1138	0.0975

Table V

Pairwise correlation coefficients of alternative asset classes

Table V lists the pairwise correlation coefficients for all the assets used in our research. The most interesting alternative investment opportunities are those assets that negatively correlate with the global stocks.

	Art	Global Stocks	Real Estate	Com-modities	Private Equity	Govt. Bonds	Corp. Bonds	Hedge Funds	T-Bill
Art	1								
Global Stocks	0.2514	1							
Real Estate	0.1908	0.5942	1						
Commodities	0.3781	-0.0749	-0.0399	1					
Private Equity	-0.0152	0.6265	0.3371	-0.1514	1				
Govt. Bonds	0.0418	0.3071	0.3758	-0.0053	0.2199	1			
Corp. Bonds	0.0247	-0.0182	0.1929	-0.0376	0.0553	0.0285	1		
Hedge Funds	0.1924	0.6334	0.4598	-0.0292	0.5958	0.2292	0.3621	1	
T-Bill	0.0438	0.1590	0.2626	-0.1405	0.0400	0.6504	0.2727	0.2193	1

the weights, two constraints are made. First, short selling is not allowed. Second, all weights must add up to one. Thus, the values of the weights must lie between zero and one.

Since one investor may be more risk averse than other investors, we apply three risk aversion parameters: $\gamma = 2$ indicates a low level of risk aversion, $\gamma = 5$ indicates an average level of risk aversion and $\gamma = 10$ indicates a high level of risk aversion. Furthermore, two scenarios have been set up. The first scenario has no weight constraints. The second scenario does have a weight constraint, namely that the weight per asset class may not be larger than 15%.

Table VI displays the results of the performed optimal asset allocation. Panel A represents the results of the first scenario with no weight constraints. When the level of risk aversion is low, art is well present in the optimal portfolio. Our results suggest that 23.14% should be invested in art, 76.65% in hedge funds and 0.22% in government bonds. At the average level of risk aversion, our findings still suggest to invest in art, hedge funds and government bonds only. However, considerably less should be invested in art and hedge funds than in the previous case. 8.83%, 62.99% and 28.18% should be invested in art, hedge funds and government bonds, respectively. Our results show that art should still be invested in, even when the level of risk aversion is high. In this case, 4.41% should be invested in art. Moreover, our findings suggest that investors should invest in six out of the nine asset classes to obtain a well-diversified optimal portfolio. The three asset classes investors should not invest, when trying to maximize utility, are global stocks, real estate and private equity. This is, however, not surprising, considering the worldwide stock market crash we have recently experienced. This causes global stocks to be an unattractive asset to invest in. In addition, our empirical results show that real estate and private equity possess the highest market beta in our sample, 0.90 and 1.06, respectively. Furthermore, real estate and private equity correlate strongly with global stocks, 59.42% and 62.65%, respectively. Finally, these three assets have the lowest Sharpe ratios of all the assets used in our research.

Panel B of Table VI shows the results of the second scenario with weight constraints of 15%. At $\gamma = 2$, all assets are included in the optimal portfolio, except for global stocks and private equity. Art is included with a weight of 15%. At the average level of risk aversion, art is still present in the portfolio with 13.41%. Global stocks are included as well with a weight of 4.14%. The only absent asset is private equity. When the level of risk aversion is high, art is included for 5.55% in the well-diversified portfolio. Once again, only private equity is excluded.

We conclude that, as the level of risk aversion rises, the amount that should be invested in art diminishes. However, in all cases art should be included in the optimal portfolio. Our empirical findings indicate that the artworks of the top 500 artists in the world play a significant role in a well-diversified portfolio.

Table VI

Optimal Asset Allocation

This table presents the results of the optimal asset allocation study based on the power utility optimization: $maxU_{avg} = (\sum E_t[R^{1-\gamma} / 1-\gamma]) / n$. This analysis covers a period of 1994:Q1 until 2008:Q4. Two constraints are made: *short sales are not allowed* and *all weights must add up to 1*.

A. Weights Unconstrained

	Art Excluded			*Art Included*		
	$\gamma = 2$	$\gamma = 5$	$\gamma = 10$	$\gamma = 2$	$\gamma = 5$	$\gamma = 10$
Art	0.0000	0.0000	0.0000	0.2314	0.0883	0.0441
Global Stocks	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Real Estate	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Commodities	0.0000	0.0384	0.0302	0.0000	0.0000	0.0036
Private Equity	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Government Bonds	0.0000	0.2687	0.2017	0.0022	0.2818	0.1879
Corporate Bonds	0.0000	0.0000	0.2192	0.0000	0.0000	0.2546
Hedge Funds	1.0000	0.6929	0.3805	0.7665	0.6299	0.3262
T-Bill	0.0000	0.0000	0.1684	0.0000	0.0000	0.1836
Average Return	0.0223	0.0210	0.0174	0.0284	0.0235	0.0183
Std. Deviation	0.0482	0.0385	0.0256	0.0741	0.0452	0.0272
Reward to Variability	0.4633	0.5464	0.6802	0.3829	0.5198	0.6733
Utility	-0.9805	-0.2337	-0.0982	-0.9776	-0.2328	-0.0978

B. Weights 15%

	Art Excluded			*Art Included*		
	$\gamma = 2$	$\gamma = 5$	$\gamma = 10$	$\gamma = 2$	$\gamma = 5$	$\gamma = 10$
Art	0.0000	0.0000	0.0000	0.1500	0.1341	0.0555
Global Stocks	0.1000	0.1000	0.1338	0.0000	0.0414	0.1067
Real Estate	0.1500	0.1500	0.1342	0.1500	0.1500	0.1357
Commodities	0.1500	0.1500	0.1320	0.1000	0.0745	0.1021
Private Equity	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Government Bonds	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
Corporate Bonds	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
Hedge Funds	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
T-Bill	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
Average Return	0.0153	0.0153	0.0151	0.0207	0.0199	0.0170
Std. Deviation	0.0372	0.0372	0.0361	0.0541	0.0499	0.0395
Reward to Variability	0.4119	0.4119	0.4182	0.3833	0.3990	0.4309
Utility	-0.9863	-0.2386	-0.1036	-0.9824	-0.2368	-0.1030

IV. Conclusion

During periods of economic turmoil, numerous investors prefer to invest their money in alternative assets in order to protect themselves from crashing markets. Investing in art is considered to be an interesting alternative, since it notably differs from common assets. Therefore, one may expect that investing in art is an effective way of hedging against the returns of common assets. In addition, Artprice reported that investors are more and more interested in art. The total art turnover at public auctions in 2007 rose considerably, namely with 43.8% compared to the turnover in 2006.

In the present paper, we studied the historical prices and returns in the art market and discussed the determinants of art prices. We applied the advanced hedonic regression analysis, based on the two-step methodology developed by Kraeussl and van Elsland (2008). We downloaded all the auction records of the paintings made by the top 500 artists of 2007 in the world, available on Artnet.com. The data covers a period of more than 24 years, running from January, 1985 to April, 2009. In total, it includes 98.548 auction records. Furthermore, we performed a performance analysis to investigate whether investing in art is an interesting alternative investment opportunity in times of economic turmoil. Consequently, we studied whether art should be included in a well diversified portfolio, using the power utility optimization method.

Our hedonic regression results support the findings of previous studies. Medium, auction house, surface, signature (or other marks of authenticity) and the availability of an estimate price influence sale prices. In addition, our empirical results suggest that the living status and the reputation of an artist play a significant role as well in determining sale prices.

The coefficients of the time dummy variables in our hedonic regression model are used to build an art price index. Based on this index, we conclude that over a period of more than 24 years, art realizes a geometric return of 7.3% annually. However, we also found that art is by far the most volatile asset. To look into the trade-off between risk and return, we calculated the Sharpe ratio for each asset. Our findings show that art has a Sharpe ratio of 0.1655, which is the fourth high ratio found in our results.

The CAPM regression results show that Top 500 Art Market index tends to move in the same directions as the MSCI World Equity index. The pairwise correlation matrix supports this finding, indicating a positive correlation with the global equity index of 25.14%. From this, we conclude that investing in art does not seem be an interesting alternative asset to hedge returns of the global equity index.

Our optimal asset allocation results show that art should be included in the optimal portfolio, in all scenarios appeared in this research. However, as the level of risk aversion rises, the amount that should be invested in art should be reduced. All in all, our empirical findings indicate that the artworks of the top 500 artists in the world do play a significant role in creating well-diversified portfolios.

Further research should explore the effects of taxation on the returns of art. This is, however, rather difficult, since it is generally not known in which country the auctioned paintings will end up. Moreover, transaction costs associated with buying artworks should be examined as well. In addition, it may be interesting to study whether behavioral anomalies exist in art markets. In financial markets, behavioral anomalies have already proved to be of significance, such as the January effect, the Holiday effect and the Christmas effect. This present paper might have shed light on investing in art as an alternative investment opportunity, however, it remains necessary to better understand other factors that may affect the real price outcome of artworks.

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