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Sleeping Beauty

ABSTRACT

In times of economic uncertainty and a need for alternative investment possibilities, art as an asset class is garnering more attention. This thesis evaluates whether art is a yielding investment, and in what way art functions as a hedge or safe haven. The Dutch auction market is assessed by a unique dataset of over 7300 auction transactions from the Venduehuis in The Hague from 2018 to 2024. Through a hedonic pricing model price determinants are identified, and an art price index is constructed. This index is compared with the AEX index to evaluate the performance of art as a financial asset.

The results show that certain characteristics, such as a signature, a mention in literature, the artist's reputation and certain materials, significantly increase the hammer prices at auction. The comparison with the AEX shows that art does not produce a significantly higher or lower yield, nor does it have anti cyclical or protective capabilities. Subgroup analyses confirm this for separate genres, materials and reputation categories.

These findings suggest that though art can have objectively valuable characteristics for investors, as an asset class it has limited predictability and risk control. This thesis contributes to the academic debate by empirically analyzing the structural dynamics of price formation in the Dutch art market and offers valuable insights to both art investors and auction houses.

KEYWORDS: *Art, Investment analysis, Hedonic pricing model, Auction data*

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1. Introduction

The question as to whether art can function as a financial asset, has gained public and academic attention in the last decades. In a time where investors increasingly search for alternative investment opportunities besides traditional assets, such as stocks and bonds, art is an intriguing and yet complex alternative. The global art market had a total value of over 57 billion dollars in 2024 (McAndrew, 2025), and the number of investors of greater wealth that buys art as part of a more diversified portfolio is steadily rising. This is in line with a broader trend of financial diversification, in which certain 'real' assets, such as real estate, precious metals and art, play a role in covering inflation- or market risks.

Against this background the question arises whether within a specific national context, with a rich cultural tradition and an active auction market, art can truly be a trustworthy investment option. The Netherlands has a special role in this context. The Dutch art market combines a centuries old artistic tradition with a relatively open and transparent auction infrastructure, making it an interesting case for empirical research. Moreover, the cultural value of art in the Netherlands is bound to the collective consciousness, this is not only shown in public debate about museum purchases, but also in private investment behavior. An introductory, speculative example is given on the iconic work by Rembrandt van Rijn: the Nachtwacht.

In the golden age of the Dutch republic, art was a status symbol. It was common for wealthy merchant families, or companies to commission a painting of themselves. Having art in your house was a sign of a developed wealthy household (Ganbold, 2025). This is how the Nachtwacht was commissioned. The Nachtwacht could be considered the epicenter of Dutch cultural heritage. Painted by the grand master of the Dutch Republic, Rembrandt van Rijn. He was commissioned by the company of captain Frans Banning Cocq, in 1642 the company paid 1600 guilder, quite the sum for that time (Geschiedenislokaal Amsterdam, n.d.). The amount would be 201 thousand euros today, corrected for inflation (*Graaien in De 17e Eeuw: Een Historische "Quote 500,"* 2018, Centraal Bureau voor de Statistiek, 2025). In 2011 the Dutch tv show 'de Rekenkamer' estimated the current value of the painting to be around 500 million euros, that would be around 689 million euros today, corrected for inflation (Stasse, 2011; Centraal Bureau voor de Statistiek, 2025). This accumulates to an increase of over 342000% in 383 years. Following the formula for compound interest, the Nachtwacht has had an average yield of 6.63% since its creation, which is better than all current European bonds (European Central Bank, 2024). This raises the question whether all artworks can be employed as private reserves.

During the COVID-19 crisis, the top segment of art remained noticeably stable. The work Triptych Inspired by the Oresteia of Aeschylus by Francis Bacon was sold for 84.6 million dollars and the art market proved to be resilient and stable during the disruption caused by the pandemic (Georgy et al., 2020).

The recent auction of Piet Mondrian's "Composition with Large Red Plane, Bluish Gray, Yellow, Black and Blue" (1922) at Christie's New York for $47.56 million on May 12, 2025, reaffirms the exceptional market position of masterpieces within the international art trade (Crow, 2025). While the sustained or appreciating value of works by iconic artists like Mondrian and Rembrandt is to be expected, this case prompts a broader, economically relevant inquiry: Does this value stability extend to art in a wider sense? To what extent can artworks outside the absolute top segment be considered profitable investments, and do they possess the capacity to shield an investment portfolio against economic volatility?

The conceptualization of art as an alternative investment vehicle has garnered increasing attention in recent years, both among private investors and in wealth management. According to the Art & Finance Report (Deloitte, 2022), 89% of wealth managers believe that art should constitute an integral component of modern investment strategies. Concurrently, the academic discourse regarding the actual financial value and stability of art as an asset class remains persistently complex. While art is lauded for its potential for value appreciation, critics point to low liquidity, high transaction costs, and limited predictability of returns.

The academic discussion around art as an investment is thus aimed at two fundamental questions: can art produce an attractive yield, and does it function as a protection against economic volatility? Several studies apply empiric models, such as repeat sales analyses and hedonic pricing models, to assess whether art possesses hedging- or safe haven capabilities. Though some results point towards value preservation and even contracyclical movement with respect to financial markets, others affirm the high volatility, limited liquidity and structural inefficiencies of the art market.

In academic literature, a division exists about the role of art as a financial asset. On the one hand art is prized for its potential as an alternative asset class with attractive yields. Pioneers like Anderson (1974) and Stein (1977) showed that artworks had higher yields than stock in specific periods. Mei and Moses (2002) introduced a repeat sales index to measure this systematically and concluded that art, though on average it underperformed stock, it could still be considered a valuable asset, especially artworks of renowned artists.

Concurringly, Baumol (1986) warned that price developments in the art market are mostly random and that art as an investment is a “floating crap game.” Pesando (1993) critiques the inefficiencies, low liquidity and high transaction costs, that separate art from traditional financial markets. Moreover, the yields are strongly dependent on subjective valuation, reputation effects and timing.

More recent studies nuance these contradictions. Renneboog and Spaenjers (2012) find that art, on average, has a yield comparable to bonds, but with a higher risk profile and without clear hedging capabilities. Öztürkkal & Togan-Eğrican (2019) conclude that art has little or negative correlation with stock markets, which could make it an interesting component in a diversified portfolio. Still, the question whether art can be a hedge or safe haven, is up for debate (Zhukova et al., 2020; Wang, 2024).

Against this background the question arises whether within a specific national context, with a rich cultural tradition and an active auction market, art can truly be a trustworthy investment option. The Netherlands has a special role in this context. The Dutch art market combines a centuries old artistic tradition with a relatively open and transparent auction infrastructure, making it an interesting case for empirical research. Moreover, the cultural value of art in the Netherlands is bound to the collective consciousness, this is not only shown in public debate about museum purchases, but also in private investment behavior. An introductory, speculative example is given on the iconic work by Rembrandt van Rijn: the Nachtwacht.

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This thesis contributes to this debate by offering an empirically based analysis of art as an investment. Aiming to investigate the financial accomplishments, volatility and possible safe haven- or hedging capabilities that art might have as an alternative asset class. A unique dataset is assessed; The Venduehuis in The Hague has offered me all their auction data from 2018 to 2024. The dataset contains information on over 7300 artworks that went to auction, with their characteristics, such as information on signatures on the pieces, materials used, genre, size and provenance. The period assessed contains both strong price surges, during the COVID-19 pandemic, as well as the period afterwards that saw a sharp decline.

To analyze this data a hedonic pricing model is applied. Although the hedonic pricing model is meant to explain variation in individual auction prices based on object characteristics, this approach contributes equally when assessing art as an asset class. By identifying which characteristics systematically contribute to higher prices, the model reveals pricing mechanisms in the Dutch art market. Information that is essential to investors that need predictable yields. Moreover, the inclusion of year dummy variables makes it possible to construct an art price index, with which price developments can be analyzed over time. The model offers an indirect but responsible way to map yield potential and volatility. Thus, not just explaining price differences, but also structural value development of artworks, an important matter in the review of art as an alternative investment category. This empirical

approach offers new insights in the performance of art outside of the absolute top segment and contributes to the broader discussion on the possible role of art as an alternative asset class.

This thesis is structured as follows. In the next chapter the theoretical framework will be laid out. The economic functions of art as an investment, hedge and safe haven are discussed through existing theoretical and empirical literature. Chapter 3 presents the used dataset and methodological choices, with special attention for the hedonic pricing model and the construction of an art price index. Chapter 4 contains the empirical results, amongst them the determinants of art prices and the comparison of yields from different aspects of the art market to stock yields. In chapter 5 the findings are evaluated in relation to theoretical expectations. Moreover, this chapter contains the conclusions including reflections on the research and its limitations and suggestions for future research.

2. Theoretical Framework

This chapter discusses the theoretical and empirical literature that is inherent to analyzing art as a financial asset. Two functions of art within an investment portfolio are analyzed: art as a hedge against market volatility and as a safe haven during times of economic distress. Moreover, this research evaluates what specific factors of art determine value, as value is typically driven by unique characteristics of an artwork, rather than by market wide trends. By evaluating existing literature, it is laid out why art could theoretically have these capabilities, what empirical evidence is found on the subjects, and how these findings are relevant for the interpretation of this research.

Aside from the hedging and safe haven potentials of art, it is increasingly so seen as a complete alternative investment (McAndrew, 2025). In contrast to traditional financial assets, art does not generate cash flows but offers other forms of revenue that are recognized in economic and sociologic literature. Aesthetic pleasure, symbolic capital and status levitation (Anderson, 1974; Campbell, 2008; Renneboog & Spaenjers, 2012). This component makes art unique within the spectrum of asset classes. In contrast to prior research that applies repeat sales data to determine yields over time, this research evaluates price determinants at auction.

Even though some studies suggest that art offers competitive yields with respect to traditional financial assets, other research finds the low predictability and volatility of art as an asset class outweigh the upsides of the asset. This paragraph covers some influential papers that highlights both sides of what drives art prices and whether art as an asset class is a worthwhile investment or not.

Within economic and cultural literature, the attention for the determinants of which characteristics of artworks systematically contribute to high auction prices increases. Instead of focusing on realized yields over time, which is mostly done in studies with repeat sales data, this research focusses on the characteristics that determine why one artwork is sold for a substantially higher price than another, under the hammer. These price determinants can be indicative for whether art is an interesting investment.

One of the most robustly researched determinants is the reputation of the artist. Multiple studies show that work by internationally acclaimed or frequently traded artists, systematically reach higher prices (Renneboog & Spaenjers, 2012; Mei & Moses, 2002). The presence of an artist in museum collections, academic literature of important exhibitions similarly increases

expected market value (Chanel et al., 1996). In this framework Chambers et al. (2020) affirms that the successful performance of the collection of John Maynard Keynes is partially explained by the reputation of the artists in his collection, indicating that reputation is not just a reflection of prices, but also an autonomous value factor.

Object bound characteristics also play a role in price formation. Anderson (1974) states that the size of the painting is positively correlated to the price, though this effect is not linear. Furthermore, other research states that the used material is indicative of prices. Works that were painted with oil paint, are on canvas or on metals such as coppers or bronze are appreciated higher than works on paper or less sustainable media (Zhukova et al., 2020; Ashenfelter & Graddy, 2003). If a work is signed, the trust in the authenticity of the work, as well as collector's value, increases. This results in an increase in prices. In the same research Renneboog & Spaenjers (2012) find that the dating of the work, whether it is mentioned in literature or if the work has clear provenance is contributory to higher auction yields.

Though it is harder to quantify, subject and genre also prove influential. Portraits and landscapes appear to perform structurally better in certain markets that abstract or less recognizable themes (Chanel et al., 1996). This is partially explained by the preferences of collectors and the narrative of personal character of these works.

Besides intrinsic characteristics of the artwork and the artist, external market factors also influence prices. The auction location, the auction house and the season in which the work is put to auction can influence the price (Goetzmann et al., 2011). During economic fortune art prices rise more often and artworks in the top segment are seen to appreciate, whilst lesser-known artworks are more stable. Mei and Moses (2002) show that artworks in top segments can be underappreciated.

Even though these determinants are common in studies, the conclusions of the strength and relevance of these effects are different. The differences can mostly be led back to variations in datasets and methodological choices. Mei and Moses (2002) use a repeat-sales dataset with over 4800 transactions, which allows them to calculate yields over time. However, this method is susceptible to selection bias, only repeat sales are incorporated, which overrepresents the top segment and can skew results. Anderson (1974) on the other hand uses a hedonic pricing model per year, without the repeat sales component. His approach is better suited to identifying price determinants with auction sales. The market levels researched influence results as well. Renneboog and Spaenjers (2012) use a million observations stretching multiple decades and countries, where other studies use smaller scales in terms of countries and segments. The

narrower research can explain the variations in price less accurately, since the variation within a segment is slim.

The attraction of art as an investment lies in the selection. According to Mei and Moses (2002) and Renneboog and Spaenjers (2012) carefully selected artworks, especially in the top segment, can yield significant profits. Comparable, or even higher than yields on the bond- or stock market. Moreover, Anderson (1974) and Campbell (2008) argue that the aesthetic value, status alleviation and symbolic capital from additional immaterial revenues that traditional capital can never offer.

Nevertheless, there are numerous limitations to art as an investment category. The art market is illiquid, with high transaction costs and long holding periods before resale is possible. Furthermore, the value determination is, as reviewed, dependent on subjective drivers such as reputation or trend. These factors make the market vulnerable to speculation (Baumol, 1986). Additionally, there is no central price information and due to the heterogeneity of the products it is hard for investors to map an investment strategy.

The literature shows that the price of art on the secondary market is not a predominantly random outcome, but a complex mix of characteristics. Reputation, materials, signature, size and origin are all empirically supported factors that contribute to value determination. Simultaneously, differences in data, segment choice and methodology show that the validity of these determinants are influenced by said context. The determinants are versatile within the empirical literature; a clear pattern arises. Artworks with so-called “top-tier attributes” are structurally valued higher in auctions.

In the study by Mei and Moses (2002) it is shown that the yield on art is strongly dependent on careful selection, and that mostly the top works generate profit. Renneboog and Spaenjers (2012) affirm this by showing that object characteristics that coincide with high reputation such as quality or the fame of the artist, measured by presence in museum collection or sale frequencies, are positively correlated with the hammer price of an artwork. Nevertheless, they acknowledge, along with Baumol (1986) and Pesando (1993), that these yields are paired with significant risk due to volatility and heterogeneity, which makes the value of art as an investment dependent on the presence of price increasing characteristics.

Given the difficulties in measuring yields over time, in the absence of repeat sales, it is useful to assess the price of an artwork in an auction as a proxy for potential investment quality. This is in line with the methodology of Anderson (1974) and others. He assessed a hedonic pricing model to find the impact of characteristics on the pricing level.

Thus, the first hypothesis will assess whether artworks that have top tier attributes, on average have higher yields. These characteristics are considered indicative for market perception in this research, and they are operationalized as independent variables in the hedonic model. The following hypothesis if formed, assuming no effect for the null hypothesis.

H1: Within the Venduehuis dataset (2018–present), artworks associated with top-tier attributes (e.g., signed, oil on canvas, exhibited) does not yield significantly higher average annual returns than lower-tier artworks, suggesting that financial performance depends on compositional quality.

Besides the composition bound value of individual artworks, it is also relevant to assess art as a broad asset class as opposed to traditional markets such as the AEX. Whilst some studies indicate substantial yields for carefully selected artworks, a sizable number finds art to underperform stock in general. Baumol (1986) states that art prices are mostly random and that real surplus is limited in the long term. Pesando (1993) and Renneboog and Spaenjers (2012) find average artworks to deliver lower and volatile yields in comparison to conventional financial markets. Based on these finding this research assesses a second hypothesis.

H2: The average real return on art sold at Venduehuis between 2018 and 2024 is significantly lower than traditional financial markets (e.g., the AEX), supporting previous findings that art underperforms financial assets over time.

Similarly to the investment debate, the debates on whether art can be a good hedge or a safe haven have been amply researched. We firstly need to outline the concepts investigated in this research. In financial literature there is distinction between hedges and safe havens as strategies to control for risk in investments. According to Baur and Lucey (2010) a hedge is defined as an equity that on average has no or negative correlation with another asset class. This does not necessarily protect a portfolio against market shocks, considering that the correlation in periods of economic crises can be positive, as long as it is negative over longer periods. The goal of a hedge is covering risks under normal market circumstances, for instance to hold value when stock courses drop or inflation increases. A safe haven on the other hand is an asset class that shows no or negative correlation with another asset class specifically during market turbulence such as financial crises, geopolitical shocks or sudden liquidity shortages (Baur & Lucey, 2010). This means these asset classes have a specific role in periods of negative market shocks,

where the equity maintains its value or even appreciates in value. Art can theoretically be seen as a hedge if it structurally has low correlation with traditional financial markets. This would mean art prices are less susceptible to macro-economic cycles and therefore contribute to the diversification of an investment portfolio. Several authors, amongst them Renneboog and Spaenjers (2012) have shown that art yields have limited correlation with stock yields. The concept of art as a safe haven requires additional conditions. In this case art should not just be unaffected by market shocks but offer active protection during periods of crises. This means price stability or value appreciation during periods of economic turmoil. This study will assess the hedging- and safe haven capabilities of art.

Why do we hypothesize that art might have these capabilities? This expectation is derived from some unique fundamental characteristics of art as an asset class. Even though the empirical accomplishments of art can be volatile, as will be put forth. From a theoretical perspective there can be parallels between art and more established alternative asset classes, like gold, real estate and collectors' objects that are traditionally seen as anti-cyclical or unaffected by crises.

Firstly, art, as gold, likewise, is often seen as a real asset with intrinsic value that has the up- and downward trends of the economy have little effect on. As opposed to financial assets like stocks or bonds, that draw their value from future cashflows or interest, the value of art is amongst other factors influenced by scarcity, aesthetics and cultural significance. These attributes give art a distance to the market, making it less susceptible to economic shocks or inflation (Binh, 2024). These characteristics are typically related to materials used, signatures or whether the artist is renowned (Anderson, 1974).

Moreover, art has parallels with real estate in terms of physical essence, long tendence capabilities and relatively low liquidity. Similar to real estate, art exhibits low correlation with financial markets, because the price setting happens in a separated market with that has its own dynamic (Pownall, 2007). The limited correlation with traditional markets implies that art can offer a diversification advantage, essential for good hedges. Furthermore, art shares characteristics with luxury products and collectors' objects, like rare wines and cars, in which consumption- and investment value collide. These assets are subject to taste and trend but maintain their value relatively well within prosperous collector networks. The presence of a devoted niche market with high doorsteps in the entrance can offer price support in times of economic turmoil, comparable to the collectors' market for rare watches or vintage cars (Velthuis & Coslor, 2012).

Subsequently, art is scarce and irreproducible. Unlike stocks that can be split, or bonds that can theoretically always be given out. The scarcity is strengthened by the artist's reputation, the authenticity of the artwork and the historical context, which results in a value that is less dependent on conjunctural factors (Anderson, 1974). Lastly, the investment behavior of high-net-worth individuals (HNWIs) that are less dependent on direct liquidity can dampen the price shocks. These theoretical parallels suggest that art could behave as a hedge or a safe haven, forming a plausible alternative within a diversified investment strategy aimed at risk reduction and value increase.

Empirical research has been done to assess whether art in different regions of circumstances possesses these capabilities. Öztürkkal and Togan- Eğrican (2019) collaborated with Turkish auction houses to investigate art's performance during financial crises and conclude that art has low, to negative correlation with stock markets, indicating hedging possibilities. Their analysis, based on a hedonic pricing model, shows the continued attractiveness of art as an asset class during economic distress. Especially in emerging markets which are characterized by liquidity needs of sellers and strategic purchase by investors.

Zhukova, Lakishna and Lenova (2020) offer robust arguments for the effectiveness of art as a hedge, likewise analyzing a hedonic pricing model to compare art prices to the S&P 500. They find that art is negatively correlated with the commonly used index, concluding that art can be an effective hedge against volatility in traditional financial markets. The increased robustness of their conclusions is found in their systemic segmentation of the art market and the application of the Heckman correction to reduce the influence of unobserved transactions.

Yet other studies indicate significant limitations with respect to the role of art as a hedge. Binh (2024) finds that art has low mean reverting capabilities compared to gold and wheat, implying that price fluctuations do not return to a stable mean, but are subject to periods of depreciation or stagnation. This suggests art to be an incapable hedge, influenced by the uprising and deterioration of the economy.

Moreover, Wang (2024) indicates that the structural short comings of the art market that limit the effectiveness of art as a hedge. Specifically, the low liquidity, subjectivity and inconsistent valuation of art works along with limited acceptance by traditional institutional investors are put forth as key factors undermining the effectiveness of art, deployed as a hedge. Furthermore, Hafner (2020) states that even though art shows negative correlation with traditional investment markets, it is not automatically a trustworthy hedge, as value development is strongly dependent on speculative dynamics and market sentiment.

Though there are theoretical parallels between art and assets that are traditionally seen as hedges and safe havens, such as gold, real estate or luxury goods, the question remains whether these attributes can be empirically affirmed.

Based on the discussed literature art theoretically has characteristics that allow for these capabilities. Art is palpable, scarce and partially disconnected from financial market dynamics. Several authors have proven the limited correlation between art and traditional financial markets (Öztürkkal & Togan-Eğrican, 2019; Zhukova et al., 2020), which is how art could offer a diversification advantage within a portfolio.

Simultaneously, the empirical evidence for this role of art as a safe haven or hedge is not commonly accepted. Various research shows that art prices are not perfectly correlated to traditional financial markets, but that this lack of correlation is paired with high levels of volatility, limited liquidity and subjective value determination. Binh (2024) states that art has limited mean reverting characteristics, meaning it does not structurally recover after a depreciation. This is problematic for assets that are meant to shield an investment portfolio from market risks. Wang (2024) and Hafner (2020) stress that the structural characteristics of the art market, low transparency, low tradability and the lack of institutional interest limit the hedging capabilities. Even if a negative correlation is observed, it is often not robust enough to serve as a strategic risk controlling asset. Based on the literature and the context the following hypothesis is formulated.

H3: The returns on artworks sold at Venduehuis exhibit no significant correlation or significant negative correlation with equity market returns over the same period, indicating that art does not function as an effective hedge. Nor does it prove anticyclical during economic shocks, indicating it is not a safe haven asset in this market.

3. Data & Methodology

For this study a unique dataset was put together, based on all auctions of Venduehuis The Hague held between 2018 and 2024. The data contains information on the specifications of individual artworks as well as the circumstances under which they were sold. In this chapter the dataset is explained, cleaning steps are elucidated, and the relevant variables and descriptive statistics are discussed.

Data

The original dataset contained 7335 observations. For this analysis unsold works are kept in the dataset. Objects without hammer price, or those that were registered as 'withdrawn' or 'no lot', were made to have a hammer price of zero. If these observations were deleted, the dataset would be affected by success bias. The dataset contains a wide variety of variables, all relevant for the analysis of art price development. For each artwork the title, artist, hammer price, measures, date of sale are incorporated. Furthermore, the genre of the artwork, the materials used, think about canvas, oil paint, watercolor, copper and others were all captured in dummies to help construct a robust hedonic pricing model. Moreover, additional variables were constructed, such as Dutch artist, a dummy that captures whether the artwork was made by a Dutch artist. The variable real price was made, correcting the nominal hammer price for inflation based on the monthly customer price index (CPI) (2015=100), sourced from the CBS (Centraal Bureau voor de Statistiek, 2025). Consequently, for each observation the real price was calculated dividing the nominal price by the CPI-deflator.

Furthermore, the AEX index was added. To assess the performance of art as a financial asset, it is essential to compare it with a financial benchmark. In this research the AEX index (Amsterdam Exchange Index) is chosen, the leading stock index in the Netherlands. The AEX index represents the 25 biggest listed companies on Euronext Amsterdam and is therefore a representative indicator of the Dutch stock market. Since the dataset is exclusively comprised of auctions at the Venduehuis, an auction house operative within the Dutch art market, the choice for a national benchmark is fitting.

Moreover, the AEX allows for the possibility to position art as an investment option within the Dutch economic context, which is relevant for both individual- as institutional investors that operate on the national market. By comparing art prices with AEX yields in the

same period (2018-2024), it can be evaluated whether art can be an alternative to traditional investment in the national stock market.

The yields were calculated, based on the data of ABN-AMRO, by dividing the difference between two years on the year prior. The yields are as follows:

Table 1: AEX Yields

Year	AEX Yield (%)
2018	-10.41
2019	+23.92
2020	+3.31
2021	+27.75
2022	-13.65
2023	+14.20
2024	+11.67

This table gives the AEX yields per year of the analyzed period.

For the regressions that uses surface area as an independent variable, the observations without values are automatically excluded. This way the dataset remains intact, whilst filtering the right data per analysis. Although the surface area and hammer price variables are log-transformed in the regression analysis, the summary statistics presented in this chapter are based on the original, untransformed values to enhance interpretability.

Table 2 represents the descriptive statistics of all artworks that were put to auction at the Venduehuis from 2018 to 2024. The displayed values are the auction prices corrected for inflation, in euros. The column mean displays average sales price per year, 'SD' shows the standard deviation or spread of prices within that year. The reported minimum and maximum reflect the lowest and highest sales prices every year, respectively. The minimum having a standard value of zero, since every year there have been artworks that were not sold.

Table 2: Yearly Sales Summary

Year	N	Mean	SD	Minimum	Maximum
2018	626	1790.14	3632.94	0	48337.20
2019	1452	2079.28	5788.97	0	117746.80

2020	1187	2915.19	6805.30	0	120919.00
2021	892	3276.75	8548.27	0	158528.90
2022	1241	3207.78	8542.66	0	139998.40
2023	654	3448.40	7053.92	0	88825.45
2024	1283	3240.66	7859.76	0	141969.20

This table provides summary statistics for the sales made in each year of the dataset.

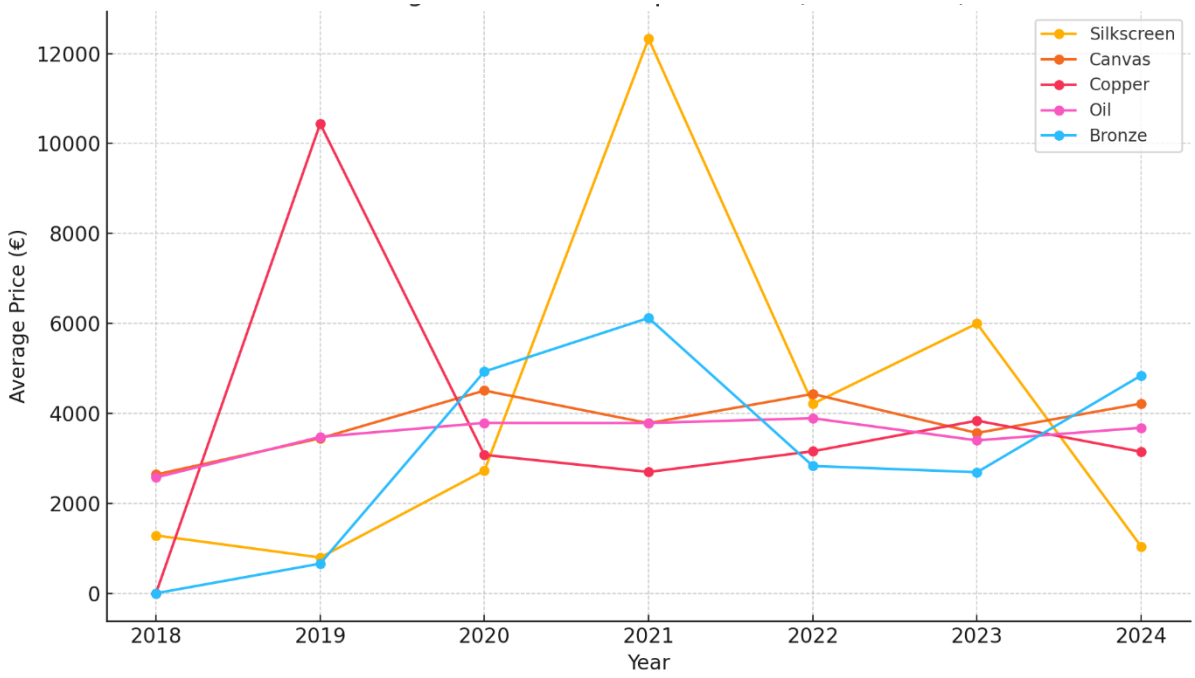
The artwork with the highest hammer price in the assessed period is the artwork “Still life with pears and lemons” by Pyke Koch. It was sold for 185 thousand euros in 2024 and 141 thousand corrected for inflation. The highest sold artwork with all artworks corrected for inflation is Queen Beatrix of the Netherlands from the series 'Reigning Queens' (Royal Edition) (1985) (4) by Andy Warhol, sold in 2021 for a price of 175 thousand at the time and corrected for inflation that was 158 thousand.

Table 2 presents the descriptive statistics of the sold artworks in the analyzed period, 2018 to 2024. The average real hammer price has risen in the assessed period, from around 2079 euros in 2018 to over 3200 euros in 2024. This rising trend clearly indicates possible value creation in the auctioned artworks or a rise in the quality of the artworks. Noteworthy is the high standard deviation, every year it is above the mean, indicating strong variation between price classes of the sold artworks.

Table 3 holds the statistics per material used and genre and can be found in the appendix. The medium canvas is the most frequently present in the dataset, followed by oil. These two also yield higher hammer prices, suggesting a preference amongst the Venduehuis client. Furthermore, silk screen and bronze stand out with high average prices, respectively 4374 euros and 4006 euros. Within genres, landscapes are on average valued higher and come up more often than portraits in the dataset. The analyses suggest that both the medium and the genre are influential to the price of the artwork.

Additionally, it is informative to assess what the average auction prices were for different materials, genres and artists in the assessed period. This offers supplementary insight in the structural price determinants in the Dutch art market. By analyzing the average auction prices of the most valuable materials and genres over time, it becomes clear which characteristics are paired with high appreciations.

Graph 1: High value materials average auction prices over time

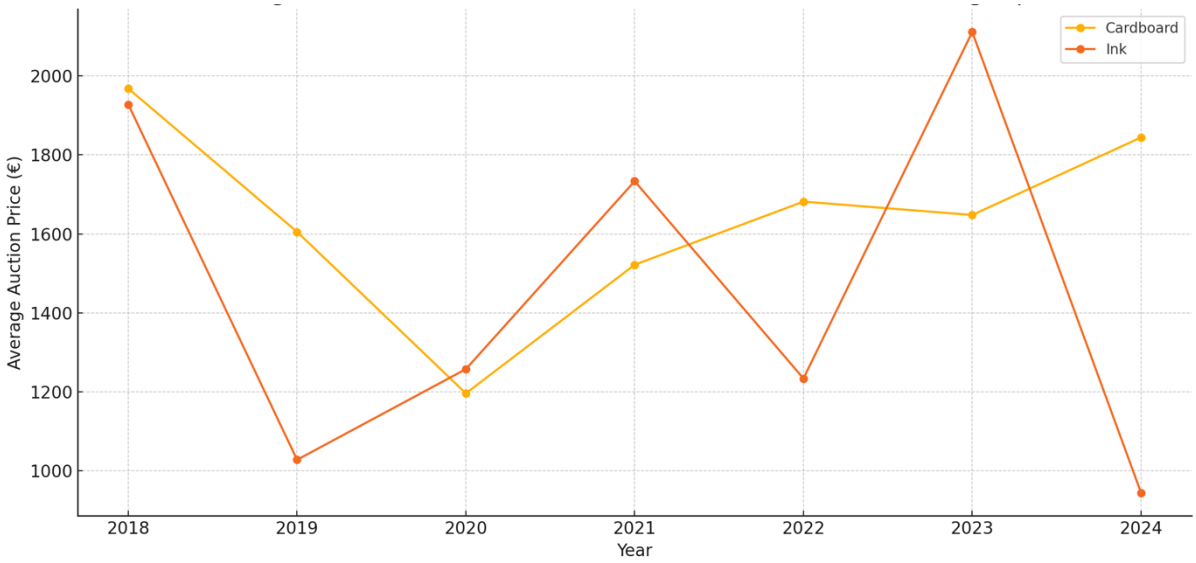


This graph plots the top materials average auction prices in the assessed period (2018-2024).

For the top materials, artworks with oil and canvas are the most consistent value creators. Bronze and copper thereafter, and silkscreen is a medium with higher variation. This can be attributed both to the intrinsic value of the materials and to the artistic traditions in which these media are often employed. Copper for instance is known to conserve colors in paint very well for long periods of time, if used as a surface for a painting (Stoner & Hermens, 1999).

For a complete analysis, the bottom materials, cardboard and ink, are analyzed as well. To create a full image of the art market in the Netherlands. Low valued materials would appear as unwise investment decisions, however they could possess anti cyclical characteristics.

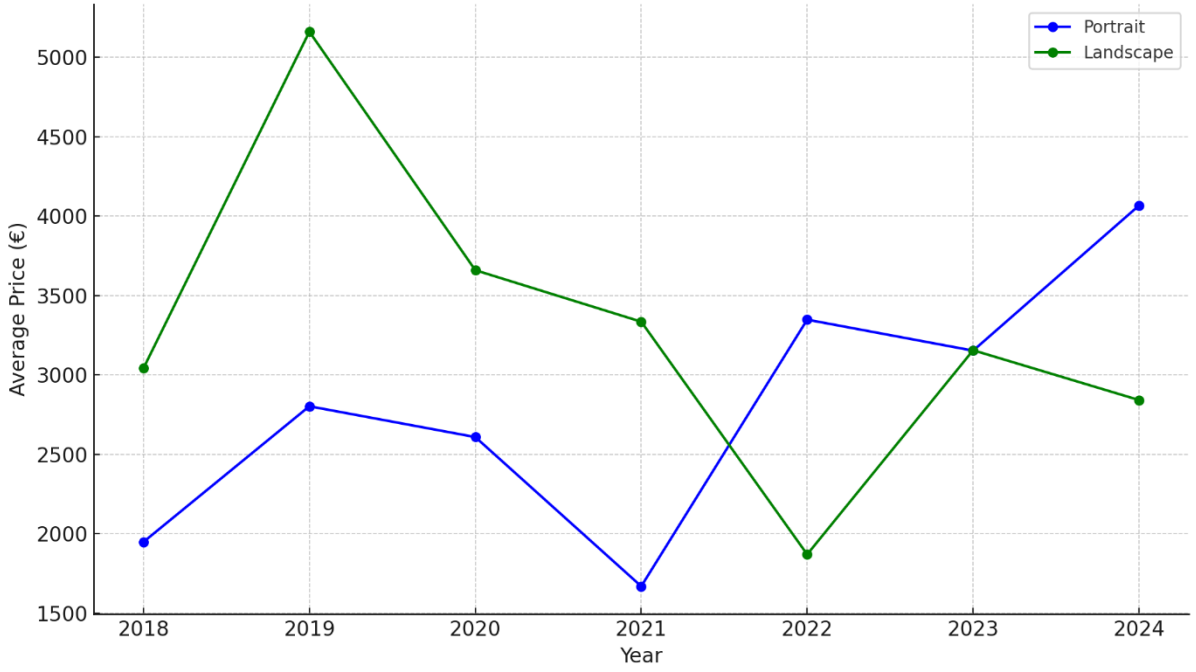
Graph 2: Low value materials average auction prices over time



This graph plots the bottom materials average auction prices in the assessed period (2018-2024).

The graph shows cardboard to have a relatively stable pricing pattern, with light fluctuations between 1200 and 1900 euros. Ink has a relatively more volatile trajectory; this could be due to fluctuating quality of auctioned artworks in the respective years.

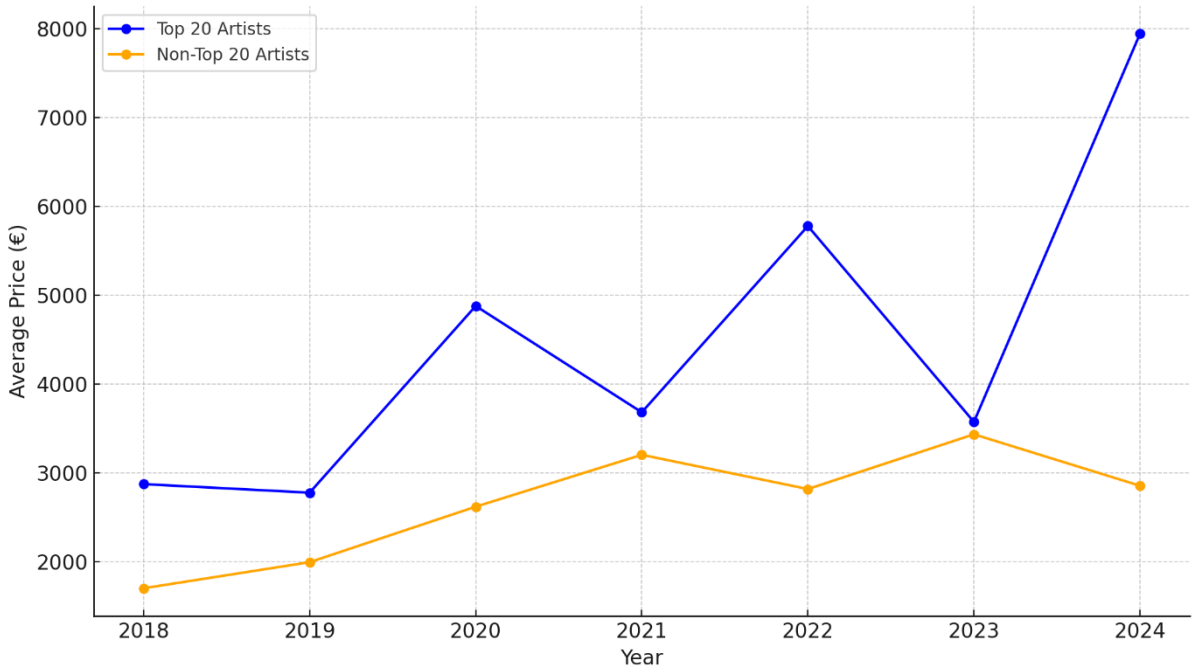
Graph 3: Average auction prices genres over time



This graph plots the two identified genres average auction prices in the assessed period (2018-2024).

Graph 3 shows the average auction prices of artworks that fall within the identified categories portrait and landscape in the period of 2018 to 2024. It stands out that landscapes have higher averages than portraits. However, this division is not constant, as 2022 and 2024 see higher prices for portraits. These fluctuations can point to changing preferences of stakeholders in the art market, or to outliers in the dataset. The graph offers valuable insight in the relative market appreciation of these two classic genres over time.

Graph 4: Average auction prices top 20 artist and non-top 20 artists over time



This graph plots the top 20 and non-top 20 average auction prices in the assessed period (2018-2024).

Graph 4 shows the average auction prices of artworks that fall within the identified reputation categories, the most frequently sold artists and the others, in the period of 2018 to 2024. As expected, over the course of the analyzed period the top 20 most sold artists have consistently higher auction prices. Thus, the conclusions that Mei and Moses (2002) draw from their dataset seem to coincide with this dataset upon visual inspection.

To gain a first insight into possible relations between variables, a correlation matrix was put together. This offers valuable input for the specification of the hedonic pricing model. In the table the correlations between, amongst others, surface area, hammer price and year of sale is shown. For instance, surface area and hammer price are expected to have high correlations as size is often an indicator for the value of an artwork. Table 4 is included in the Appendix, it is the correlation table, which does not show any problematic values, correlation values outside

the range of -0.8 to +0.8 should be taken seriously, as they could indicate multicollinearity issues (Shrestha, 2020).

Methodology

Analyzing art as a financial instrument demands specific methodological choices to overcome the heterogeneity of art. This study applies two econometric techniques to on the one hand measure the yield of art as an investment and on the other hand analyze the movements of art prices compared to other equities to identify possible hedging or safe haven capabilities.

Given the absence of repeat sales in the available dataset, it is not possible to conduct a traditional repeat sales analysis on yields over time. Instead, the observed auction price per artwork is taken as a proxy for value creation. This methodology coincides with earlier work by Anderson (1974) amongst others. He used a hedonic pricing model to assess the impact of object characteristics on yearly art prices. In this study a similar methodology is followed, by means of a regression analysis, it is researched whether specific characteristics of an artwork, such as material, size or signature, are indicative of the realized auction price.

A central goal of this analysis is the identification of the determinants of auction prices. By incorporating a broad scale of object characteristics, such as surface area, used materials, signatures, top artists and literature mentions, the model aims to assess which characteristics systematically contribute to higher or lower market valuations. Deducing these characteristics offers valuable insight into how prices are formed in the art market and can inform both collectors and investors in their purchasing strategies. Unlike repeat sales models, that estimate the average yields over time based on repeat sales, the hedonic pricing model allows for an assessment of price differences within a collection of unique transactions. This is specifically relevant for the data from the Venduehuis, where all artworks in the analyzed periods are only sold once. By assessing the auction price as a dependent variable explained by all characteristics of the artwork, this model offers insight into the structure of value assignment in the Dutch auction practice.

The selected period is methodologically relevant, it holds multiple macro-economic shocks, including the COVID-19 pandemic and a period of heightened inflation in 2022-2023. This context offers a suitable framework to assess whether art prices correlate with- or deviate from financial markets, which is essential in evaluating diversification- and risk reductive characteristics of art within investment portfolios.

This model uses all observed sells and non-sells and explains price as a function of object specifications, modelling the year of sale as a time component.

$$ln(P_{kt}) = \sum_{m=1}^{M} \alpha_m X_{mkt} + \sum_{t=1}^{T} \beta_t Z_t + \epsilon_t$$

P_{kt} is the real hammer price of artwork k in year t, corrected for inflation through the monthly consumer price index. X_{mkt} is a vector of all the specifications of the artwork, including continuous and dummy variables. Z_t is a vector of the year dummy variables, α_m and β_t are the coefficient to be estimated and ϵ_i represents the error term. To prevent selection bias, non-sold works, observations without a hammer price, are also included in the model. When these observations would be excluded, the analysis would be skewed. Artworks with a 'winning' profile of characteristics that were not sold, would be ignored. This would lead to an overestimation of the effects of certain characteristics on the eventual hammer price, and an artificially high R-squared value. This is why the Heckman selection procedure is unnecessary. As opposed to many other studies, the complete supply of auctioned artworks is taken into the model and there is no truncation or sample selection bias. Since the auction result, sold or not sold, is accounted for in the dependent variable, application of the Heckman correction would be redundant. For timebound analysis, year- and month dummies were added to the data.

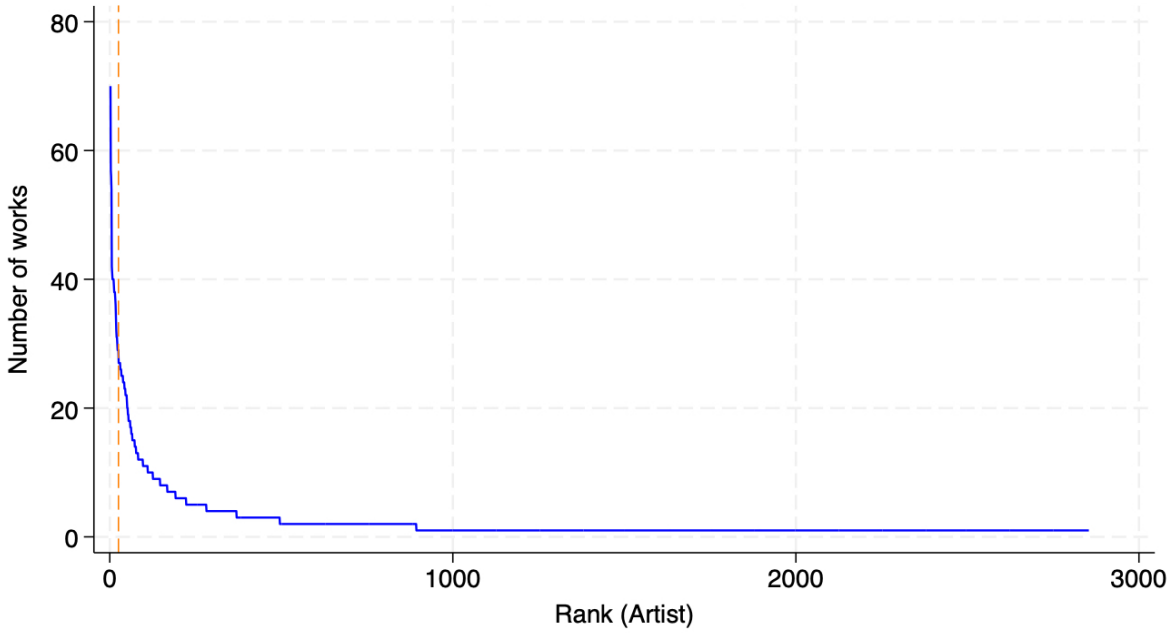
To research whether artworks by popular artists are systematically priced different, this research uses a binary variable for "top artists". This variable is based on the frequency with which an artists is present in the dataset. For all works sold between 2018 and 2024 through the Venduehuis, the frequencies for each artist were counted.

The frequency spread shows a top-heavy pattern, where a small number of artists is responsible for a signific part of the auctions. To determine the cut off for the variable, a scree plot was graphed, as seen in graph 1. The graph shows the number of auctions (y-axis) ranked at frequency (x-axis) and shows a diminishing trend with a clear slope off point. To determine this point systemically, the elbow method is used (Tibshirani et al., 2001). This method identifies the point where adding another artist adds marginal explanatory power to the model. At first the explanatory power increases drastically for each added rank. However, the additional explanatory power decreases and turns to a near flat line after 50 ranks. Visual inspection of the scree plot, as the elbow method show a bending point around the 20 most frequent artists. Based on this, the variable top 20 artist is constructed, which takes the value 1

for artworks by these artists, and 0 in other cases. This variable was added to the hedonic pricing model as an indicator for top artists.

By using a logarithmic transformation in the form of ln $(price + 1)$ the null values can be included in the model in a technically consistent manner $(1 = e^0)$. Since, the artworks are generally sold for an average of around 3000 euros, the deviation will not be sincere, for clarity it is good to mention, however. The specifications included are the surface area of the artwork, whether the artwork has a signature, whether there is research available on the 'lifetime of the artwork' whether the artwork was dated, if it was mentioned in papers, magazines or books. Furthermore, the dummy variables for materials used, dummy variables for genre.

Graph 5: Scree Plot: Painter Frequencies



The graph represents the scree plot where the frequencies per rank of artist is plotted with frequencies on the y-axis and ranks on the x-axis. The blue line is the plot; the orange dotted line is rank 20 illustrating the elbow point.

The 20 most frequently appearing artists are given in table 5 along with their respective summary statistics.

Table 5: Top 20 most frequently auctioned artists

Artist	N	Mean	SD	Min	Max
Lucebert	70	2849.451	7028.327	0	54352.750
Eugene Brands	57	1463.369	1313.703	0	5764.640
Jan Schoonhoven	56	1405.144	1367.514	0	6588.160

Harm Kamerlingh Onnes	54	796.534	1070.578	0	5888.210
Louis Apol	42	6232.950	8726.674	0	46044.051
Marius Bauer	41	2567.219	4608.082	0	26044.090
Isaac Israels	40	19570.244	24421.305	0	1.15e+05
Jan Hendrik Weissenbruch	40	4584.852	5550.454	0	32027.131
Jan Toorop	40	5453.875	11144.764	0	55999.340
Floris Arntzenius	39	6249.214	8333.681	0	33485.262
Cornelis Vreedenburgh	38	3235.417	3281.070	0	13952.190
Jan Sluijters	38	10709.190	18574.834	0	90587.172
Jan Saudek	37	739.398	509.654	0	2141.150
Charles Leickert	36	3611.117	4800.384	0	24491.330
Leo Gestel	34	1933.030	3393.196	0	16882.820
Willem Hussem	32	5459.327	5542.749	0	19929.340
M.C. Escher	31	8847.067	13349.494	0	57646.379
Willem Roelofs	31	4101.112	4540.424	0	20463.211
Anton Mauve	30	3735.422	3407.542	0	13022.040
Kees van Bohemen	29	4002.793	4379.438	0	17447.859

This table provides summary statistics of the top 20 most frequently auctioned artists.

From the top 20 artists, the highest auction price is from a work by Isaac Israels.

The logarithmic transformation of the dependent variable reduces skewness and price distribution and makes the interpretation of coefficients as percentual changes possible. The model is estimated with robust standard errors to eradicate heteroskedasticity. This approach is in line with literature (Renneboog & Spaenjers, 2012; Öztürkkal and Togan-Eğrican, 2019) and allows for a separation of the influence of the market from the influence the specifications of the artwork have. In the model year dummy variables are used to correct for the influences that systematically affect all observations within a year. These dummies allow for, after controlling for object characteristics, assess the average price level and thus form a valid source for the formation of yearly yields and their indexes. The exponential differences between the estimated year dummy coefficients represent the corrected price change between consecutive years, where effects of size, technique, artist and other control variables are held constant. The year-on-year price change is calculated with the following formula:

$$Index_{t+1,t} = \exp(\beta_{t+1} - \beta_t)$$

Here, β_t is the estimated coefficient for a year within the regression. By calculating these yearly changes cumulatively from a chosen base year, a complete art price index can be built. This index is the basis for the comparison of the yearly return of art to those of traditional equities, such as the return of the AEX.

To test the second hypothesis, stating that on average art produces a lower yield than stock, next to visual inspection, a statistical test is executed. A Wilcoxon signed-rank test is employed, which is suitable for small sample sizes and is not dependent on the assumption of normality. This test compares the difference in year-on-year yield between the art- and AEX-index over the analyzed period, to assess whether it is statistically significant. Given the limited number of observations (n = 6), the exact variant of the test, that compares the rank sum with all possible permutations under the null hypothesis, is assessed. This prevents distortion through assumptions of a normal distribution.

$$W = \min\left(\sum_{i=1}^{n} R_i^+, \sum_{i=1}^{n} R_i^-\right)$$

Where R_i^+ is the rank of the *i* difference with a positive sign and R_i^- for the rank of the *I* difference with a negative sign. The test statistics is the smallest sum of ranks, either the positive or the negative ranks. In other words, the Wilcoxon signed rank test compares the sum of the positive and negative ranks of the differences between paired, by year, observations and takes the smallest of the two sums as a test value. This value is then used to assess whether the difference between the pairs is significant.

The third hypothesis, which researches whether art prices can be a hedge or safe haven in the context of the stock market, a Pearson correlation analysis is executed. The year-by-year price development of the art market is compared to the yields of the AEX index in the same period. This correlation offers a first indication into the way art prices structurally move with or diverge from stock yields.

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 * \sqrt{(y_i - \overline{\bar{y}})^2}}}$$

Here, x_i and y_i represent individual observations of variables *X* and *Y*, while $\bar{x}$ and $\bar{y}$ are their respective means. The coefficient *r* ranges from –1 to +1, where values close to –1 or +1 indicate a strong negative or positive linear relationship, respectively, and values near 0 indicate no linear correlation.

Based on the model it is not possible to calculate a yearly correlation coefficient, since each year has one index. For that reason, a combined correlation analysis over the entire period of six years is calculated.

To research whether certain categories of artworks react systemically different to macro-economic circumstances, additional subgroups analyses are carried out. The regression specifications as described before are individually applied to three subgroups. Artworks from the top 20 most auctioned artists, artworks made with the top 5 most valuable material categories and artworks that fall within the two identified genres, portrait and landscape.

For each subgroup, a separate hedonic pricing model is estimated, where the year dummy variables are incorporated again. Thus, for every group, an art price index can be constructed, based on the corrections for composition within the model. This approach allows for the possibility to assess more homogeneous segments within the market. Subsequently, every subgroup art price index is compared to the AEX index, and a Pearson correlation coefficient is calculated.

This addition allows the evaluation of certain types of artworks, that might behave different from the general market and could be better equipped to be hedges or safe havens.

4. Results

In this chapter the empirical results based on the hedonic pricing model are presented. The analyses identify price determinants of artworks that are auctioned at the Venduehuis between 2018 and 2024 and evaluate whether art can be used as a financial asset in investment portfolios.

The results are structured as follows. Section 4.1 discusses the core model based on the full dataset, including an interpretation of coefficients. In section 4.2 the art price index of the entire model is constructed, it is evaluated alongside the AEX index, and a Pearson correlation analysis is put forth. Section 4.3 explore pricing dynamics within subgroups based on individual models for introduced materials, genres and artists, the results are visualized in year-on-year yield graphs, for each subgroup, the Pearson correlation values are given similar to section 4.2. Full regression tables and cumulative index values for each subgroup can be found in Appendix B.

4.1. The Hedonic Pricing Model

In the hedonic pricing model assessed in this model, the natural logarithm of the real hammer price is the dependent variable. The variable was log transformed to normalize the spread of the prices and to make the results interpretable as percentual effects. This means that an estimated coefficient of 0.48 for a binary variable signifies an average price increase of 48% with regard to artworks that the specific characteristic does not apply to, all other variables held constant.

The independent variables are categorical, surface area, used materials, presence of a signature, dating, provenance and mentions in literature. Furthermore, a dummy for the top 20 most auctioned artists in the dataset is employed as a proxy for reputation and a dummy for Dutch artists is assessed. Year dummy variables model the time component and give the estimated price effects per auction year with respect to a base year. In this model the year 2018 is the reference category. For the material variables, the reference category is the non-categorizable observations. Artworks where the material used is not explicitly mentioned, artworks with mixed methods, or unknown or rare materials for example. Coefficients of the material variables should be interpreted as the difference in price with regards to this rest category. For the genre dummies the rest category is similar. Many observations are not classified in a genre. The dummies are based on these observations.

The model is estimated with robust standard errors to correct for heteroskedasticity. The R-squared is 0.115 which, given the high variance and heterogeneity within art auctions, is acceptable. The total number of observations with values for all variables is 6628.

Table 6: Hedonic Pricing Model

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	2.21	.027	0	0	**
Top 20 Artist	.512	.12	4.27	0	.277	.747	***
Signed	1.361	.117	11.62	0	1.131	1.59	***
Dated	.224	.085	2.62	.009	.057	.391	***
Provenance	.575	.172	3.33	.001	.237	.913	***
Literature	.878	.25	3.51	0	.388	1.369	***
2019	-.075	.164	-0.46	.647	-.398	.247	
2020	.395	.166	2.37	.018	.069	.721	**
2021	.68	.174	3.90	0	.338	1.021	***
2022	.275	.168	1.64	.102	-.055	.605	
2023	-.553	.222	-2.49	.013	-.988	-.117	**
2024	-.667	.203	-3.28	.001	-1.065	-.269	***
Oil	.202	.114	1.78	.075	-.02	.425	*
Canvas	-.268	.107	-2.51	.012	-.478	-.059	**
Lithography	.432	.202	2.14	.032	.037	.828	**
Silkscreen	.766	.21	3.65	0	.355	1.176	***
Collage	-.511	.234	-2.19	.029	-.969	-.053	**
Watercolor	-1.099	.307	-3.57	0	-1.702	-.496	***
Ink	-.264	.164	-1.61	.107	-.585	.057	
Pencil	-.133	.199	-0.67	.505	-.523	.257	
Charcoal	-.582	.294	-1.98	.048	-1.159	-.005	**
Gouache	.397	.161	2.46	.014	.08	.713	**
Bronze	1.882	.437	4.30	0	1.025	2.739	***
Acrylic	.468	.215	2.18	.029	.047	.889	**
Silver	-.586	.305	-1.92	.054	-1.183	.011	*
Print	-.298	.214	-1.40	.163	-.717	.121	
Cardboard	.105	.335	0.31	.753	-.552	.763	

Paper	-4.052	.213	-19.03	0	-4.469	-3.634	***
Chalk	.091	.293	0.31	.756	-.484	.667	
Copper	1.764	.481	3.66	0	.82	2.708	***
Landscape	-.098	.195	-0.50	.617	-.48	.285	
Portrait	.61	.21	2.91	.004	.198	1.021	***
Dutch Artist	.83	.172	4.82	0	.492	1.167	***
Constant	4.366	.184	23.78	0	4.006	4.726	***

Mean dependent var	5.759	SD dependent var	3.330
R-squared	0.115	Number of obs	6628
F-test	81.061	Prob > F	0.000
Akaike crit. (AIC)	34013.129	Bayesian crit. (BIC)	34244.297

*** $p<.01$, ** $p<.05$, * $p<.1$

The regression results show that several characteristics are statistically significant and contribute to the auction price of artworks. Artworks by the top 20 most traded names are on average 48% more expensive at auction than artworks by other artists. Signed works bring in 135% more than unsigned works, pointing towards buyers' strong preference for confirmed authenticity. Works with a mention in literature are hammered at a 141% over those who are not mentioned in literature, dating and provenance lead to price increases of respectively 25% and 78%.

Regarding materials used the results show a clear distinction. Artworks on paper are on average priced 98% percent lower than the reference category, whilst bronze artworks bring in 553% more. Similarly, copper makes prices ascend 476%, silkscreen increases price by 115%. Concurringly, canvas has a significant negative effect on the price (-23%), this could be explained by the standardization of this medium in all price categories. Furthermore, gouache (+48%), acrylic (+60%) and lithography (+54%) are all positively correlated with hammer prices.

Within genres, portraits are sold for 84% more than the reference category, whilst the genre landscape shows no significant effect. Artworks by Dutch artist are sold for 129% more than artworks not made by these artists. Moreover, time dummies show that prices rise after 2018, with significant increases in 2020 (+48%) and 2021 (+97%). From 2023 on prices

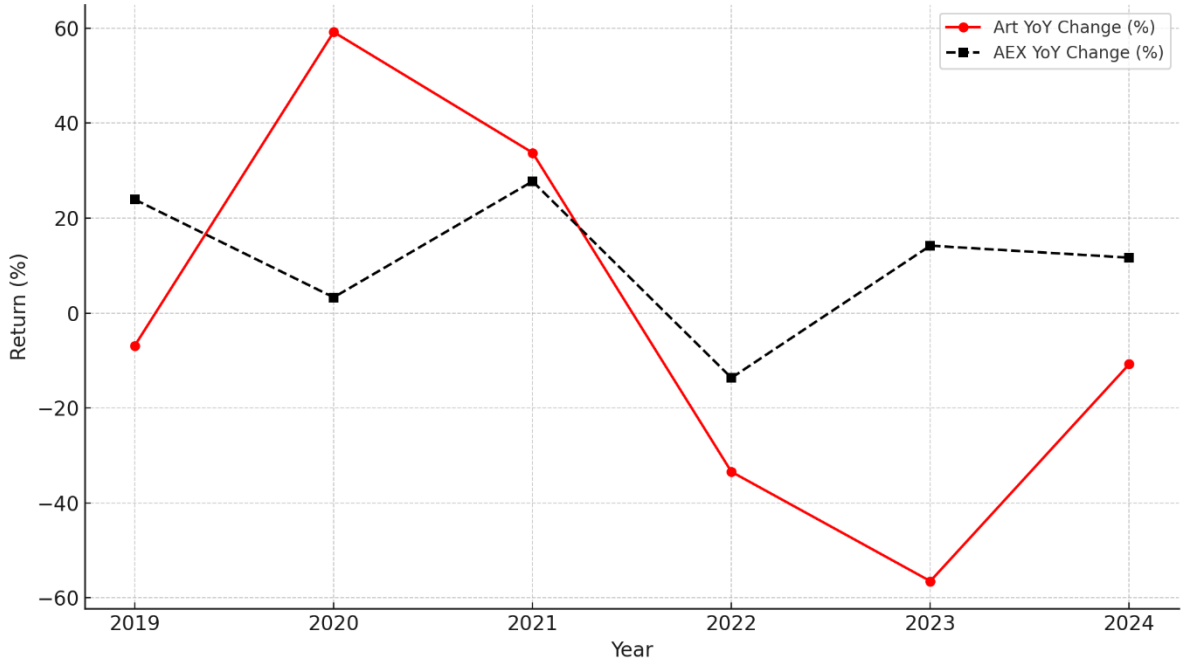
significantly decline with regards to 2018, -42% in 2023 and -49% in 2024, this could be a correction after the peak in corona years.

These results show that reputation, authenticity, materials used, and nationality of the artist structurally affect the auction price of art. These results affirm earlier research and offer new insight in price setting within the Dutch auction context.

4.2. Year to year price development and the Art Price Index

The values in graph 6 and table 6 are based on the coefficients of the year dummies from the hedonic pricing model. Because the year 2018 is a reference category, all subsequent years are interpreted with regards to 2018.

Graph 6: Art Price Index vs AEX Index (2018-2024)



The graph plots the art price index along the AEX index, for evaluation. The red line represents the art price index; the black dotted line represents the AEX index.

The volatility of the art market stands out. In 2019 the art price index descended (-6.85%), whilst the AEX ascended (23.92%). Consequently, art performs extraordinarily well during the COVID-19 years of 2020 (59.2%) and 2021 (33.78) but strongly declines in the years after. In 2024 (-10.77) the yield seems to stabilize.

Table 7: The Art Price Index in comparison with the AEX Index

Year	Art Price Index	AEX Index
2019	-6.85%	+23.92
2020	+59.2%	+3.31
2021	+33.78%	+27.75%
2022	-33.44%	-13.65%
2023	-56.48%	+14.20%
2024	-10.77%	+11.67%

This table compares the Art price index to the AEX index, for each year of the analyzed period.

The right column serves to compare the art index to the AEX index, a representation of the Dutch stock market. By lining the indexes up, it can be evaluated in what way the art prices move with or diverge from the stock market.

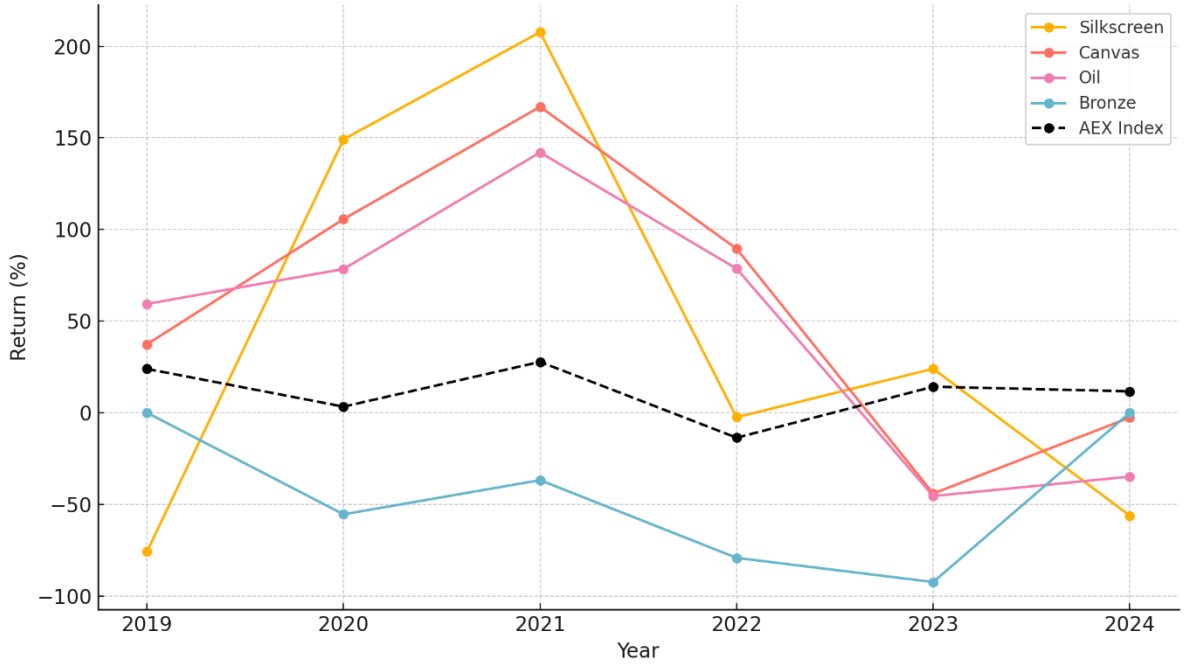
The second hypothesis is assessed through the Wilcoxon signed rank test, it yields $W = 6$ and a p-value of 0.219. There is no conclusive evidence in this dataset that art significantly underperformed the stock market.

To test the third hypothesis, the Pearson correlation coefficient is calculated for the period of 2019 to 2024. The outcome of the calculation yields and r of 0.21 and a p-value of 0.694, this points to a weak positive, but insignificant, linear correlation between the year-on-year differences of art and stocks in this period. This correlation value offers a first indication of the relation between both markets, which will be interpreted with respect to the hypotheses in the next chapter.

4.3. The Subgroup Analyses

In this section the price evolution of artworks within different subgroups is evaluated. Based on regression results the year-on-year yields per subgroup were calculated. In the following graphs these yields are compared to the AEX index. The first graph compares the high value materials to the AEX index, then the low value materials, the genres and the top 20 and non-top 20 artists indexes. In the interpretation of these graphs caution is advised. Not all subgroup regression models yield significant coefficients, the detailed models with significance indicators can be found in Appendix B.

Graph 7: Art Price Index (High Value Materials) vs AEX Index (2018-2024)

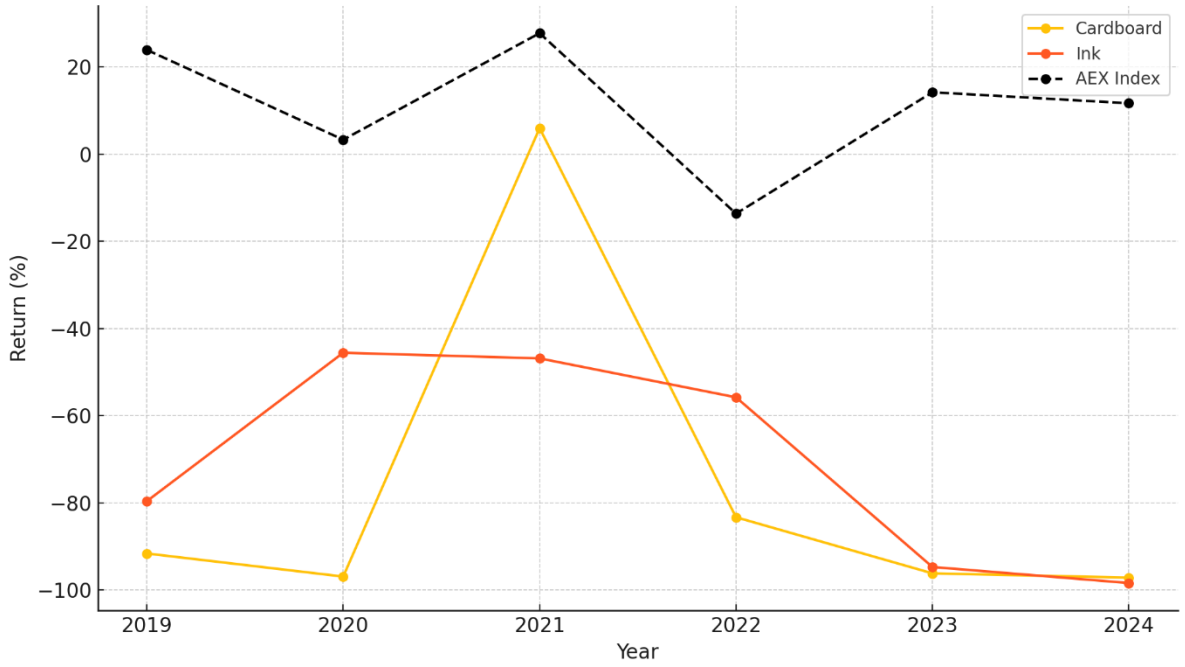


This graph plots the art price indexes of the top materials along the AEX index, for evaluation. Each line represents a different material; the black dotted line represents the AEX index.

In this graph copper was consciously excluded. Copper was included in top materials; however, the regression results were extreme (Table 18, Appendix B). Consequently, the calculated yields were off the charts (2019: 348,000%) and the visual interpretation of the other materials became impossible. These results are due to outliers in a limited sample of around 40 observations for the specific material.

The remaining materials show more interpretable results. Silkscreen has noticeably high yields in 2020 (149%) and 2021 (208%), whilst canvas and oil are relatively stable and similar, which yields little surprise as the combination of the two is common, until 2022, when the yields decline. Bronze lacks data in 2019 and 2024, but for other years yields consistently low.

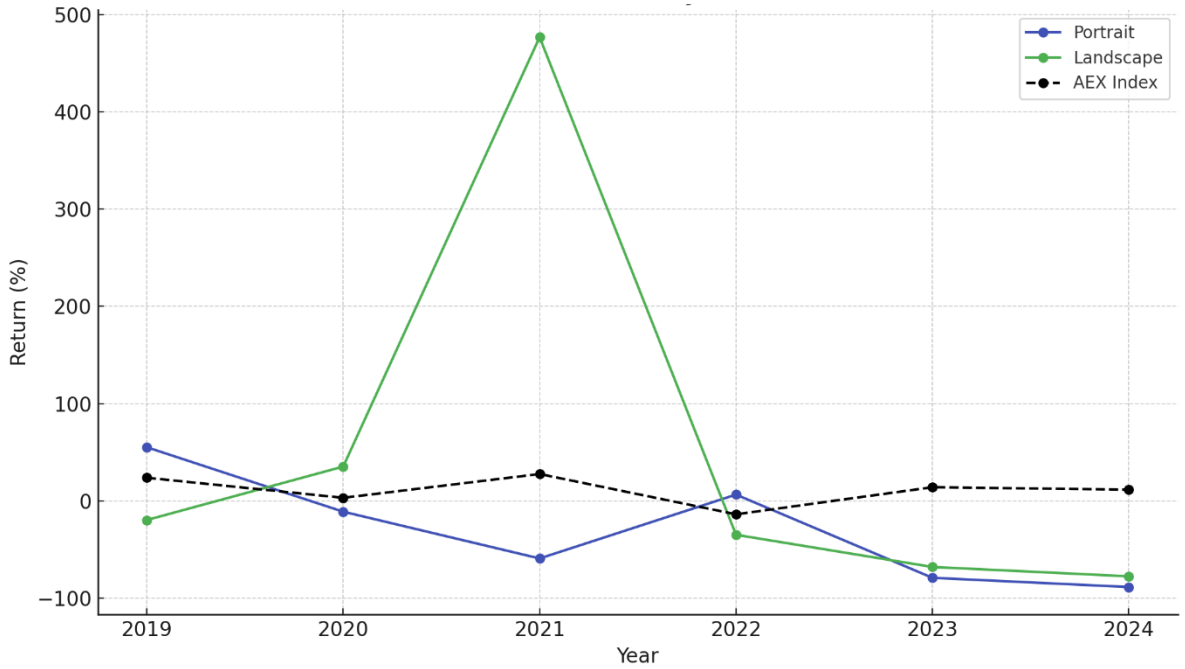
Graph 8: Art Price Index (Low Value Materials) vs AEX Index (2018-2024)



This graph plots the art price indexes of the bottom materials along the AEX index, for evaluation. Each line represents a different material; the black dotted line represents the AEX index.

Both materials show explicit negative trends. Cardboard starts extremely negative compared to 2018 (2019: -91.60%), the positive year of 2021 (5.97%) returns to declining numbers in the years that follow. The medium seems continuously depreciative. Ink follows a similar pattern with continuously negative yields. Where the AEX index recovers, these media show no such signs.

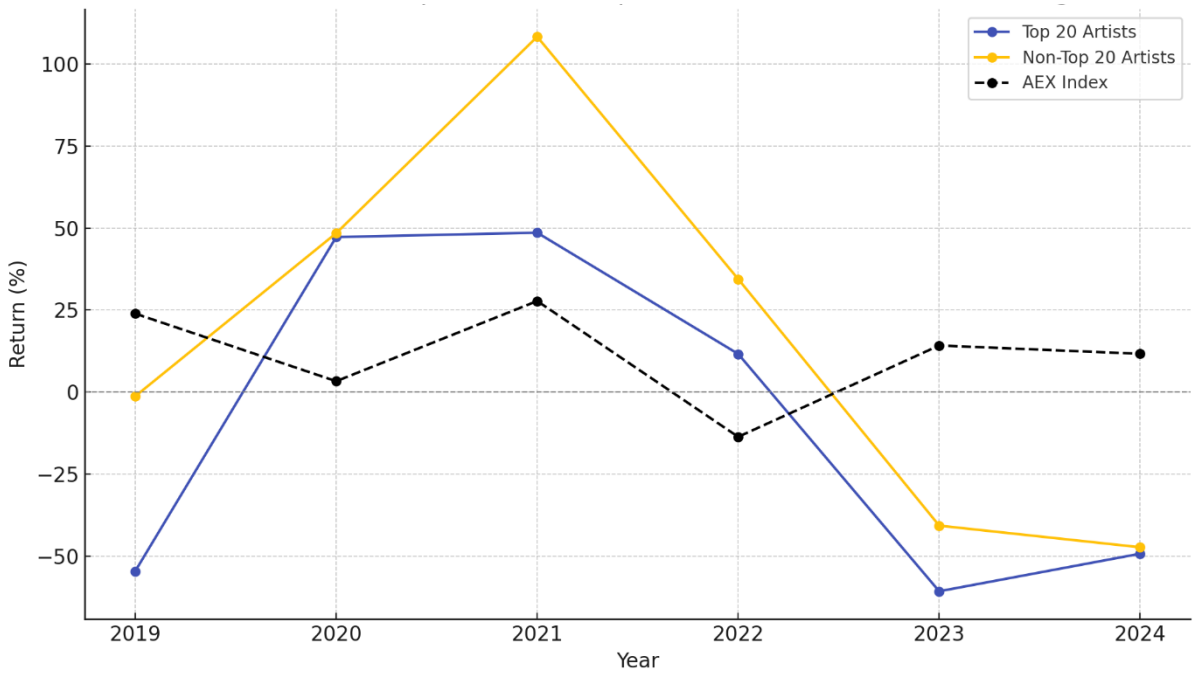
Graph 9: Art Price Index (Genres) vs AEX Index (2018-2024)



This graph plots the art price indexes of the genres along the AEX index, for evaluation. Each line represents a different genre; the black dotted line represents the AEX index.

The genre portraits show a fairly anti cyclical trend, with respect to the AEX index, an important notion is the positive yield in 2022 (6.61%). The landscapes genre has a more volatile course, possibly by a few extremely successful artworks in 2021.

Graph 10: Art Price Index (Top 20- & Non-Top 20 Artists) vs AEX Index (2018-2024)



This graph plots the art price indexes of the top 20- and non-top 20 artists along the AEX index, for evaluation. Each line represents a different cluster of artists; the black dotted line represents the AEX index.

The last graph is aimed at reputation. By separating the top 20 most auctioned artists from the others, it is evaluated whether artworks of 'top artists' generate structurally different yields from the rest. Both categories follow similar trajectories they start weakly in 2019 (Top 20: -54.8; non-top 20: -4.92) and recover in 2020 and 2021. 2023 and 2024 both return negative yields. The top 20 most frequently auctioned artists return lower yields over the entirety of the analyzed period; however, the difference is limited.

Table 8: Wilcoxon signed rank test for the subgroups

Subgroup	N (years)	Wilcoxon Z	p-value
Canvas	6	2.0	0.093
Oil	6	2.0	0.093
Bronze	4	3.0	0.625
Silkscreen	6	10.0	1.000
Ink	6	0.0	**0.031**
Cardboard	6	1.0	0.062
Landscape	6	8.0	0.687
Portrait	6	5.0	0.312
Top20	6	5.0	0.312
NonTop20	6	6.0	0.437

For all subgroups, the Wilcoxon Zs are given, along with their respective p-values.

Only for the subgroup ‘Ink’ the conclusion is that it is significantly different from the AEX. It strictly underperforms the AEX in the analyzed period.

Table 9: Pearson’s r for the subgroups

Subgroup	Pearson's r	p-value
Silkscreen	-0.208	0.692
Canvas	0.276	0.597
Copper	0.416	0.411
Oil	0.491	0.322
Bronze	0.083	0.876
Cardboard	0.541	0.268
Ink	-0.313	0.545
Portrait	-0.597	0.211
Landscape	0.583	0.225
Top 20	-0.251	0.631
Non-top 20	0.309	0.552

For all subgroups, the Pearson’s r’s are given, along with their respective p-values.

Since none of the subgroups exhibit statistically significant correlations with the AEX, not confirming that art has no correlation with the AEX. For then the Pearson’s r should be significantly 0.

5. Discussion and Conclusion

To explain the results of this research comprehensively, the theoretical framework and the hypotheses that are to be answered are shortly put forth once more. In academic literature art is progressively considered as an alternative investment category, in addition to offering aesthetic value, potential yield and protection against market volatility are in question. Within this discussion three functions are analyzed: art as an investment, art as a hedge and art as a safe haven during times of economic turmoil.

As for the first function, several studies point towards different characteristics of artworks as price determinants. Artworks that are signed, dated, have known provenance or are mentioned in art historic literature are structurally appreciated at a higher price level at auctions (Anderson, 1974; Renneboog & Spaenjers, 2012). Reputation is similarly of significant influence, artworks by renowned artists or artists with high auction frequency are valued higher (Mei & Moses, 2002).

Moreover, within the financial-cultural literature, ample research on the role of art within an investment portfolio as risk deflationary instrument is available. A hedge is defined as an asset that on average has low or negative correlation with the traditional financial markets and maintains value in economic fluctuations (Baur & Lucey, 2010). A safe haven maintains or appreciates in value during times of extreme market stress, such as financial crises or geopolitical turmoil.

The expectations of art as a hedge are based on intrinsic values of art as palpable, scarce and culture bound, making it semidetached from financial market dynamics. Yet empirical research indicates that these theoretical assumptions cannot just be confirmed. The illiquidity, heterogeneity and speculative price formation of art obstruct a robust protective deployment of the asset (Binh, 2024; Wang, 2024).

Based on this theoretical framework and empirical findings, the following hypotheses were formulated.

H1: Within the Venduehuis dataset (2018–present), artworks associated with top-tier attributes (e.g., signed, oil on canvas, exhibited) does not yield significantly higher average annual returns than lower-tier artworks, suggesting that financial performance depends on compositional quality.

H2: The average real return on art sold at Venduehuis between 2018 and 2024 is significantly lower than traditional financial markets (e.g., the AEX), supporting previous findings that art underperforms financial assets over time.

H3: The returns on artworks sold at Venduehuis exhibit no significant correlation or significant negative correlation with equity market returns over the same period, indicating that art does not function as an effective hedge. Nor does it prove anticyclical during economic shocks, indicating it is not a safe haven asset in this market.

These three hypotheses will be answered with the empirical results. First the entire dataset will be discussed, then all the different subgroups will be evaluated.

Hypothesis 1 states that top tier attributes, as mentioned, deliver on average higher auction prices. The results of the hedonic pricing model significantly support this hypothesis. The regression analysis shows that a signed artwork yields on average 135% more that unsigned works for the dataset in the analyzed period. A literature mention increases prices with 141% percent, and a clear provenance increases the auction price by 78%, ceteris paribus. Reputation is similarly attractive, the top 20 most auctioned artists in the dataset increase the hammer price of the auctioned artworks by 48%. Lastly, the effect of the artist being Dutch is remarkably high, it increases the artwork's price by 83%.

These findings confirm empirically, what the theory suggests: it is not random, there are systematically present quality characteristics that contribute to prices in the art market. In absence of central price setting and homogeneity these characteristics function as trustworthy indicators of value. Investors can run a 'checklist' when investing in art. Hypothesis 1 is rejected. Artworks with top tier attributes are systematically valued higher at auctions, coinciding with theoretical expectations.

Hypothesis 2 states that art underperforms the traditional financial markets. Since the Wilcoxon signed rank test yielded insignificant results, the hypothesis cannot be rejected. There is no statistical evidence for or against the hypothesis. For the subgroup 'Ink', the second hypothesis is not rejected. The material significantly underperforms the AEX for the analyzed period.

Lastly, the third hypothesis, which assesses whether art fails to function as a safe haven or hedge, is grounded in research suggesting that art is inherently illiquid and prone to speculative pricing (Wang, 2024; Hafner, 2020). Pearson's r correlations were calculated to

map the relation between art prices and the AEX index. None of the analyses, on the total dataset or the subgroups, yielded significant results. No statistical evidence was found for a consistent positive of negative correlation between art and the stock market. Consequently, the third hypothesis, stating that art cannot function as a hedge nor a safe haven, cannot be rejected. The absence of significant values coincides with earlier research that points to the complexity of art as a financial instrument, where illiquidity, heterogeneity and market speculation blur the correlation with traditional markets (Wang, 2024; Hafner, 2020). That is why other 'real' assets, such as gold or real estate, would be more proper hedged. The value is not subjective, for gold there is no real heterogeneity and for real estate, every stakeholder in the market agrees on the added value of characteristics such as location, square meters or sun hours. For art there is no such consensus, this thesis aids in revealing the importance of these characteristics, but does not claim to provide a generalizable catalogue of price determinants. Additional coinciding results need to be found to reach such conclusions.

In summary, the first hypothesis, stating that artworks with top-tier attributes yield systematically higher hammer prices. The significant coefficients in the hedonic pricing model offer convincing evidence. The second and third hypothesis, that state respectively that art structurally underperforms the AEX and that art cannot function as a hedge or safe haven, do not find statistical evidence. These hypotheses cannot be rejected. Only artworks made with ink significantly and consistently underperform the AEX in the analyzed period, for this subgroup hypothesis two is not rejected. These findings affirm that art prices are set by intrinsic and reputation bound characteristics, but that art as an asset class has limited predictability or protective capabilities for investment portfolios. The strong rise in art prices in 2020 and 2021, followed by sharp downturn in the two years prior, coincide with macro-economic developments. The years of the pandemic were characterized by stimulation measures and a shift of consumption towards alternative investments, whilst later years saw high inflation and economic insecurity. These contextual factors partly explain why art prices are volatile in the analyzed period, despite no significant correlation with stock markets.

The results offer clear implications for auction houses and investors. For auction houses, research is a valuable investment. Provenance and documented literature increase prices significantly. Additionally, the observed price premiums for frequently auctioned artists suggest that, when applicable, auctioning a series of lower value works prior to selling a more valuable piece by the same artist could be a worthwhile strategy. This approach may enhance visibility and reputation within the auction context, potentially increasing the final hammer price of high value works. For investors, there are certain characteristics that improve an

artwork's value, there is no investing in the asset class art, each investment should be meticulously analyzed per artwork. This research offers a solid basis for the quantification of value indicators in the Dutch art market and contributes to a more transparent understanding of art as an investment category.

Though this research offers valuable insights into the price setting and investment value of art, there are methodological limitations that limit the interpretability of the results. Firstly, the dataset spans a relatively short period of seven years, making it hard put forth robust conclusions about long term development. Moreover, the split of the dataset, to materials and genres, lead to smaller samples, deteriorating statistical power. This led to an inability to significantly recognize any effects. Furthermore, there is no control for other macro-economic effects besides inflation, such as interest developments or geopolitical tensions, that could directly affect the art market, that offer more detail and nuance then the year dummies. Additionally, the dataset contains no repeat sales of artworks, disallowing the use of repeat sales models. Such models are praised for their ability to measure price evolutions, with which reliable yields can be calculated. As it is a valid approach to compare an artwork's current value to its value from 'i' years ago, since all other characteristics equal over time. Lastly, considering the heterogeneity of artworks, precaution is advised when interpreting the results. Whilst there is control for a number of characteristics, overall quality of the artwork, presentation or timing of sale are variables that are not in this model. However, they do affect hammer prices. These limitations affirm the need for precaution in interpreting the findings and are opportunities to future research.

Based on this research multiple directions for future research can be proposed. Firstly, it would be valuable to assess auction house effects by comparing the national and Belgian auction houses. This analysis could provide insight into institutional differences in price setting within the national and Belgian markets. Furthermore, an expansion of the dataset could improve the statistical power of the subgroup analyses. Through this expansion, price determinants of specific materials, genres or artists can be identified. Moreover, the importance of cultural and symbolic value could be interesting to analyze. Elements such as national identity, public visibility, presentation and marketing are hard to quantify but can significantly impact value perception. Additionally, the relation between sale frequency and price development of individual artists would be an interesting research proposition. Earlier research by Mei and

Moses (2002) concludes that frequent auction participation can build reputation and increase pricing levels. It could be interesting to assess that with respect to the current national market.

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Appendix A

Table 3: Media and Genres Summary

Category	N	Mean	SD	Min	Max
Oil	3827	3608.10	8307.76	0	141969.16
Canvas	2552	3952.90	9179.55	0	141969.16
Lithograph	169	2765.49	7723.23	0	78234.38
Silk screen	126	4171.16	14827.84	0	158528.86
Collage	128	1157.75	1743.76	0	9058.79
Watercolor	29	12.78	68.81	0	370.58
Ink	363	1339.37	2293.59	0	25378.70
Pencil	230	1472.68	3057.63	0	33765.64
Charcoal	118	1694.83	2504.39	0	16,470.39
Gouache	277	2351.68	7622.01	0	117764.29
Bronze	77	3628.44	4094.70	0	18117.58
Acrylic	208	3092.30	6455.24	0	65938.20
Silver	158	1007.45	2732.36	0	28551.04
Print	384	1355.69	2622.02	0	23,201.86
Cardboard	86	1650.17	2187.56	0	10743.61
Paper	114	118.49	770.04	0	7137.76
Chalk	107	2520.03	5596.91	0	52088.18

Copper	54	3996.50	5879.10	0	28551.04
Landscape	341	3324.56	9902.85	0	120918.98
Portrait	254	2885.28	5106.62	0	42207.05
Dutch Artist	410	6758.45	13559.82	0	120918.98
Signed	5212	3196.45	7640.06	0	158528.86
Dated	2713	3133.47	7556.31	0	141969.16
Provenance	1082	4078.87	9129.94	0	141969.16
Literature Reference	291	7019.41	13043.06	0	141969.16

This table provides summary statistics for all media used in the artworks and the genres identified in the dataset, the statistics are the prices the respective medium has sold for.

Table 4: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Hammer Price	1.000													
(2) Surface Area	0.061	1.000												
(3) Top 20 Artist	0.081	0.109	1.000											
(4) Dutch Artist	0.144	0.062	0.129	1.000										
(5) 2018	0.035	0.010	0.005	0.010	1.000									
(6) 2019	0.056	0.028	0.024	0.028	0.133	1.000								
(7) 2020	0.006	0.006	0.029	0.006	0.126	0.225	1.000							

(8) 2021	0.006	0.040	0.035	0.017	0.106	0.190	0.180	1.000						
(9) 2022	0.014	0.026	0.029	0.021	0.127	0.227	0.215	0.181	1.000					
(10) 2023	0.031	0.013	0.016	0.029	0.084	0.150	0.142	0.120	0.143	1.000				
(11) 2024	0.046	0.009	0.049	0.045	0.122	0.218	0.207	0.174	0.208	0.138	1.000			
(12) Oil	0.126	0.032	0.099	0.050	0.001	0.086	0.006	0.063	0.035	0.005	0.109	1.000		
(13) Canvas	0.133	0.267	0.070	0.028	0.012	0.053	0.001	0.027	0.017	0.025	0.072	0.553	1.000	
(14) Lithography	0.017	0.017	0.003	0.060	0.002	0.089	0.044	0.025	0.029	0.029	0.019	0.195	0.134	1.000

Table 4 continued

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(15) Silkscreen	0.010	0.059	0.023	0.034	0.016	0.042	0.023	0.010	0.001	0.023	0.037	0.164	0.115	0.011
(16) Collage	0.040	0.005	0.031	0.036	0.021	0.060	0.015	0.022	0.023	0.012	0.020	0.136	0.068	0.069
(17) Watercolor	0.006	0.008	0.037	0.004	0.004	0.007	0.006	0.005	0.030	0.004	0.006	0.016	0.011	0.002
(18) Ink	0.058	0.093	0.047	0.014	0.000	0.053	0.039	0.013	0.056	0.004	0.048	0.257	0.172	0.035
(19) Pencil	0.055	0.065	0.024	0.027	0.024	0.025	0.031	0.014	0.011	0.011	0.051	0.205	0.145	0.022
(20) Charcoal	0.029	0.031	0.092	0.051	0.010	0.009	0.047	0.009	0.008	0.021	0.013	0.142	0.094	0.024
(21) Gouache	0.031	0.067	0.083	0.007	0.012	0.031	0.025	0.011	0.015	0.008	0.018	0.238	0.167	0.033
(22) Bronze	0.001	0.036	0.033	0.004	0.024	0.043	0.023	0.032	0.006	0.077	0.009	0.098	0.063	0.015
(23) Acrylic	0.008	0.196	0.063	0.019	0.010	0.050	0.024	0.014	0.002	0.002	0.005	0.183	0.086	0.027
(24) Silver	0.053	0.072	0.061	0.040	0.043	0.066	0.043	0.100	0.036	0.044	0.039	0.167	0.120	0.027
(25) Print	0.061	0.017	0.037	0.002	0.014	0.042	0.037	0.073	0.013	0.012	0.054	0.260	0.179	0.071
(26) Cardboard	0.028	0.019	0.002	0.005	0.015	0.026	0.027	0.025	0.018	0.001	0.006	0.027	0.054	0.020
(27) Paper	0.005	0.004	0.012	0.008	0.009	0.015	0.018	0.012	0.002	0.035	0.014	0.035	0.024	0.005
(28) Chalk	0.013	0.048	0.075	0.067	0.049	0.017	0.008	0.010	0.004	0.009	0.009	0.136	0.094	0.005

Table 4 continued

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(29) Copper	0.021	0.037	0.031	0.021	0.022	0.002	0.005	0.005	0.018	0.027	0.016	0.053	0.062	0.000
(30) Landscape	0.020	0.035	0.009	0.053	0.005	0.019	0.019	0.015	0.014	0.014	0.015	0.123	0.018	0.039

(31) Portrait	0.006	0.008	0.009	0.023	0.025	0.024	0.008	0.010	0.010	0.031	0.025	0.060	0.028	0.035

Table 4 continued

Variables	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
(15) Silkscreen	1.000											
(16) Collage	0.017	1.000										
(17) Watercolor	0.002	0.002	1.000									
(18) Ink	0.035	0.006	0.003	1.000								
(19) Pencil	0.002	0.019	0.072	0.060	1.000							
(20) Charcoal	0.021	0.019	0.002	0.023	0.021	1.000						
(21) Gouache	0.015	0.079	0.003	0.111	0.027	0.069	1.000					
(22) Bronze	0.013	0.012	0.001	0.010	0.017	0.012	0.019	1.000				
(23) Acrylic	0.015	0.011	0.003	0.030	0.003	0.018	0.037	0.017	1.000			
(24) Silver	0.015	0.012	0.002	0.036	0.030	0.021	0.034	0.014	0.023	1.000		
(25) Print	0.044	0.027	0.003	0.040	0.009	0.032	0.049	0.011	0.027	0.611	1.000	
(26) Cardboard	0.028	0.059	0.002	0.019	0.023	0.023	0.007	0.010	0.015	0.004	0.017	1.000

Table 4 continued

Variables	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
(27) Paper	0.005	0.041	0.000	0.007	0.006	0.004	0.007	0.003	0.028	0.005	0.008	0.106	1.000	
(28) Chalk	0.020	0.004	0.002	0.033	0.073	0.075	0.044	0.011	0.025	0.020	0.031	0.002	0.004	1.000

(29) Copper	0.012	0.011	0.001	0.019	0.016	0.011	0.018	0.007	0.015	0.013	0.019	0.009	0.003	0.011
(30) Landscape	0.034	0.024	0.003	0.018	0.014	0.016	0.005	0.020	0.037	0.035	0.053	0.002	0.007	0.000
(31) Portrait	0.024	0.013	0.003	0.024	0.012	0.004	0.044	0.006	0.028	0.022	0.010	0.015	0.006	0.013

Table 4 continued

Variables	(29)	(30)	(31)
(29) Copper	1.000		
(30) Landscape	0.040	1.000	
(31) Portrait	0.034	-0.035	1.000

The correlation matrix does not yield any alarming results, correlation values outside the range of -0.8 to +0.8 should be taken seriously, as they could indicate multicollinearity issues (Shrestha, 2020).

Appendix B

Table 10: Hedonic Pricing model Top 20 = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	0.99	.323	0	0	
Top 20 Artist	0	.	.	.	.	.	
Signed	.623	.477	1.31	.192	-.313	1.559	
Dated	-.036	.26	-0.14	.89	-.545	.474	
Provenance	.488	.623	0.78	.433	-.734	1.711	
Literature	-.607	.793	-0.77	.444	-2.164	.949	
2019	-.79	.466	-1.70	.09	-1.704	.124	*
2020	.387	.443	0.87	.383	-.483	1.257	
2021	.396	.435	0.91	.363	-.458	1.249	
2022	.11	.455	0.24	.809	-.783	1.003	
2023	-.935	.669	-1.40	.162	-2.248	.377	
2024	-.679	.689	-0.99	.325	-2.032	.674	
Oil	.876	.341	2.57	.01	.207	1.545	**
Canvas	-.425	.37	-1.15	.251	-1.151	.301	
Lithography	1.106	.818	1.35	.177	-.5	2.711	
Silkscreen	.317	.387	0.82	.412	-.442	1.077	
Collage	-.166	1.109	-0.15	.881	-2.343	2.011	
Watercolor	-.07	.192	-0.37	.715	-.447	.307	
Ink	-.245	.373	-0.66	.511	-.978	.487	
Pencil	-.747	.481	-1.55	.121	-1.692	.197	
Charcoal	-.429	.46	-0.93	.351	-1.332	.474	
Gouache	.451	.306	1.47	.142	-.151	1.052	
Bronze	0	.	.	.	.	.	
Acrylic	-.602	1.203	-0.50	.617	-2.963	1.759	
Silver	-1.686	.773	-2.18	.029	-3.203	-.169	**
Print	.683	.633	1.08	.281	-.56	1.926	
Cardboard	1.101	.5	2.20	.028	.12	2.082	**
Paper	-6.054	.513	-11.81	0	-7.06	-5.048	***
Chalk	-.11	.557	-0.20	.843	-1.203	.983	

Copper	0	.	.	.	.	.	
Landscape	-.936	.596	-1.57	.117	-2.105	.234	
Portrait	-.286	.74	-0.39	.699	-1.739	1.167	
Dutch Artist	.821	.369	2.22	.026	.096	1.545	**
Constant	5.772	.604	9.56	0	4.587	6.957	***

Mean dependent var	6.464	SD dependent var	3.167
R-squared	0.146	Number of obs	780
F-test	106.829	Prob > F	0.000
Akaike crit. (AIC)	3950.332	Bayesian crit. (BIC)	4094.770

*** p<.01, ** p<.05, * p<.1

Table 11: Hedonic Pricing Model Top 20 = 0

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	1.90	.057	0	0	*
Top 20 Artist	0	.	.	.	.	.	
Signed	1.401	.123	11.43	0	1.161	1.641	***
Dated	.239	.092	2.59	.01	.058	.42	***
Provenance	.577	.18	3.20	.001	.224	.931	***
Literature	1.107	.261	4.24	0	.595	1.619	***
2019	-.013	.176	-0.08	.94	-.358	.331	
2020	.395	.178	2.21	.027	.045	.745	**
2021	.734	.189	3.88	0	.363	1.104	***
2022	.296	.181	1.64	.102	-.058	.65	
2023	-.523	.236	-2.22	.027	-.985	-.061	**
2024	-.641	.214	-3.00	.003	-1.06	-.222	***
Oil	.126	.121	1.04	.3	-.112	.363	
Canvas	-.278	.112	-2.48	.013	-.497	-.058	**
Lithography	.294	.212	1.39	.166	-.122	.709	
Silkscreen	.799	.226	3.53	0	.355	1.242	***
Collage	-.559	.24	-2.33	.02	-1.03	-.089	**
Watercolor	-1.255	.343	-3.66	0	-1.927	-.582	***
Ink	-.252	.185	-1.36	.172	-.614	.11	

Pencil	.002	.217	0.01	.993	-.424	.428	
Charcoal	-.731	.375	-1.95	.051	-1.466	.003	*
Gouache	.412	.192	2.15	.032	.036	.788	**
Bronze	1.818	.443	4.11	0	.95	2.686	***
Acrylic	.495	.218	2.27	.023	.067	.922	**
Silver	-.497	.34	-1.46	.144	-1.164	.17	
Print	-.409	.228	-1.80	.073	-.857	.038	*
Cardboard	.003	.374	0.01	.993	-.73	.736	
Paper	-3.869	.235	-16.45	0	-4.33	-3.408	***
Chalk	.25	.352	0.71	.478	-.441	.941	
Copper	1.779	.48	3.71	0	.839	2.72	***
Landscape	-.006	.206	-0.03	.976	-.41	.398	
Portrait	.734	.217	3.38	.001	.308	1.16	***
Dutch Artist	.821	.204	4.03	0	.421	1.221	***
Constant	4.341	.194	22.36	0	3.96	4.722	***

Mean dependent var	5.665	SD dependent var	3.340
R-squared	0.111	Number of obs	5848
F-test	67.783	Prob > F	0.000
Akaike crit. (AIC)	30076.358	Bayesian crit. (BIC)	30296.595

**** p<.01, ** p<.05, * p<.1*

Table 12: Hedonic Pricing Model Oil = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	0.33	.742	0	0	
Top 20 Artist	.761	.197	3.87	0	.375	1.147	***
Signed	1.783	.162	11.02	0	1.466	2.101	***
Dated	.331	.121	2.72	.006	.093	.568	***
Provenance	.553	.231	2.39	.017	.1	1.007	**
Literature	1.219	.354	3.45	.001	.525	1.912	***
2019	.466	.24	1.94	.052	-.004	.936	*
2020	.579	.233	2.48	.013	.121	1.036	**
2021	.884	.252	3.51	0	.39	1.378	***

2022	.58	.233	2.49	.013	.124	1.037	**
2023	-.607	.308	-1.97	.049	-1.21	-.004	**
2024	-.429	.276	-1.55	.121	-.971	.113	
Oil	0	.	.	.	.	.	
Canvas	-.274	.118	-2.33	.02	-.505	-.044	**
Lithography	0	.	.	.	.	.	
Silkscreen	2.095	1.053	1.99	.047	.03	4.161	**
Collage	.813	.47	1.73	.084	-.109	1.735	*
Watercolor	0	.	.	.	.	.	
Ink	-2.124	3.161	-0.67	.502	-8.321	4.074	
Pencil	-2.614	.94	-2.78	.005	-4.457	-.771	***
Charcoal	-.991	1.29	-0.77	.443	-3.52	1.539	
Gouache	.77	.574	1.34	.18	-.356	1.896	
Bronze	0	.	.	.	.	.	
Acrylic	.64	.608	1.05	.293	-.552	1.832	
Silver	-1.685	1.616	-1.04	.297	-4.854	1.483	
Print	.652	.681	0.96	.338	-.683	1.988	
Cardboard	-.464	.483	-0.96	.336	-1.41	.482	
Paper	-4.677	.227	-20.60	0	-5.123	-4.232	***
Chalk	1.297	2.01	0.65	.519	-2.645	5.238	
Copper	1.815	.516	3.51	0	.802	2.827	***
Landscape	-.004	.217	-0.02	.984	-.43	.422	
Portrait	.66	.269	2.45	.014	.131	1.188	**
Dutch Artist	.852	.275	3.10	.002	.313	1.391	***
Constant	3.986	.245	16.27	0	3.506	4.467	***

Mean dependent var	5.829	SD dependent var	3.523
R-squared	0.092	Number of obs	3785
F-test	62.445	Prob > F	0.000
Akaike crit. (AIC)	19965.972	Bayesian crit. (BIC)	20153.136

**** p<.01, ** p<.05, * p<.1*

Table 13: Hedonic Pricing Model Canvas = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	0.20	.839	0	0	
Top 20 Artist	.753	.259	2.90	.004	.245	1.262	***
Signed	1.987	.21	9.46	0	1.575	2.399	***
Dated	.32	.152	2.11	.035	.023	.617	**
Provenance	.548	.293	1.87	.062	-.027	1.123	*
Literature	.938	.435	2.16	.031	.085	1.791	**
2019	.317	.294	1.08	.28	-.259	.893	
2020	.721	.286	2.52	.012	.16	1.281	**
2021	.982	.303	3.24	.001	.387	1.576	***
2022	.639	.285	2.24	.025	.079	1.198	**
2023	-.582	.379	-1.53	.125	-1.325	.162	
2024	-.027	.345	-0.08	.939	-.703	.65	
Oil	.358	.38	0.94	.346	-.387	1.102	
Canvas	0	.	.	.	.	.	
Lithography	0	.	.	.	.	.	
Silkscreen	.801	.778	1.03	.303	-.725	2.327	
Collage	-.046	.738	-0.06	.951	-1.493	1.402	
Watercolor	0	.	.	.	.	.	
Ink	-1.664	2.511	-0.66	.508	-6.588	3.261	
Pencil	-3.442	1.695	-2.03	.042	-6.766	-.119	**
Charcoal	-3.562	1.438	-2.48	.013	-6.381	-.743	**
Gouache	4.801	1.449	3.31	.001	1.96	7.642	***
Bronze	5.301	2.592	2.04	.041	.217	10.384	**
Acrylic	.741	.431	1.72	.086	-.105	1.586	*
Silver	-6.39	.335	-19.10	0	-7.046	-5.734	***
Print	1.811	.707	2.56	.01	.425	3.196	**
Cardboard	-.994	.882	-1.13	.26	-2.724	.736	
Paper	-3.887	.437	-8.89	0	-4.745	-3.03	***
Chalk	3.709	1.536	2.41	.016	.697	6.72	**
Copper	0	.	.	.	.	.	
Landscape	-.023	.312	-0.07	.94	-.635	.588	

Portrait	.24	.352	0.68	.495	-.45	.93	
Dutch Artist	.797	.341	2.34	.019	.129	1.465	**
Constant	3.14	.479	6.55	0	2.2	4.08	***

Mean dependent var	5.812	SD dependent var	3.582
R-squared	0.093	Number of obs	2545
F-test	.	Prob > F	.
Akaike crit. (AIC)	13517.446	Bayesian crit. (BIC)	13663.493

*** p<.01, ** p<.05, * p<.1*

Table 14: Hedonic Pricing Model Silkscreen = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	-1.51	.135	0	0	
Top 20 Artist	-.095	.556	-0.17	.865	-1.198	1.008	
Signed	.41	.581	0.71	.482	-.742	1.562	
Dated	-1.235	.479	-2.58	.011	-2.185	-.286	**
Provenance	.124	1.436	0.09	.932	-2.726	2.973	
Literature	-.536	1.14	-0.47	.639	-2.797	1.725	
2019	-1.422	.89	-1.60	.113	-3.188	.344	
2020	.913	1.136	0.80	.424	-1.341	3.167	
2021	1.124	1.045	1.08	.285	-.949	3.198	
2022	-.025	.947	-0.03	.979	-1.904	1.855	
2023	.215	1.106	0.19	.846	-1.98	2.409	
2024	-.825	1.208	-0.68	.497	-3.222	1.573	
Oil	-.393	.673	-0.59	.56	-1.728	.941	
Canvas	-.211	1.437	-0.15	.883	-3.063	2.64	
Lithography	1.416	1.534	0.92	.358	-1.627	4.46	
Silkscreen	0	.	.	.	.	.	
Collage	-.352	1.347	-0.26	.795	-3.025	2.321	
Watercolor	0	.	.	.	.	.	
Ink	0	.	.	.	.	.	
Pencil	-1.058	1.062	-1.00	.322	-3.165	1.049	
Charcoal	0	.	.	.	.	.	

Gouache	1.043	.633	1.65	.102	-.212	2.299	
Bronze	0	.	.	.	.	.	
Acrylic	-.231	.467	-0.49	.622	-1.158	.696	
Silver	2.395	2.063	1.16	.248	-1.697	6.488	
Print	-1.821	.923	-1.97	.051	-3.652	.011	*
Cardboard	-1.317	.846	-1.56	.123	-2.994	.361	
Paper	0	.	.	.	.	.	
Chalk	0	.	.	.	.	.	
Copper	0	.	.	.	.	.	
Landscape	0	.	.	.	.	.	
Portrait	-1.407	.664	-2.12	.037	-2.723	-.09	**
Dutch Artist	1.004	.667	1.51	.135	-.319	2.327	
Constant	7.785	.962	8.09	0	5.876	9.694	***

Mean dependent var	6.688	SD dependent var	2.233
R-squared	0.276	Number of obs	125
F-test	.	Prob > F	.
Akaike crit. (AIC)	556.272	Bayesian crit. (BIC)	615.667

*** p<.01, ** p<.05, * p<.1*

Table 15: Hedonic Pricing Model Copper = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	0.11	.916	-.001	.001	
Top 20 Artist	0	.	.	.	.	.	
Signed	1.686	1.227	1.37	.182	-.847	4.219	
Dated	1.347	1.962	0.69	.499	-2.702	5.396	
Provenance	.991	1.775	0.56	.582	-2.672	4.655	
Literature	3.486	1.35	2.58	.016	.699	6.272	**
2019	8.157	1.057	7.72	0	5.976	10.338	***
2020	6.686	.85	7.87	0	4.933	8.439	***
2021	7.204	1.422	5.06	0	4.268	10.139	***
2022	2.965	1.897	1.56	.131	-.949	6.879	
2023	5.573	2.203	2.53	.018	1.026	10.12	**

2024	4.823	1.6	3.01	.006	1.521	8.126	***
Oil	-4.616	1.946	-2.37	.026	-8.632	-.6	**
Canvas	0	.	.	.	.	.	
Lithography	-8.383	2.88	-2.91	.008	-14.326	-2.44	***
Silkscreen	0	.	.	.	.	.	
Collage	0	.	.	.	.	.	
Watercolor	0	.	.	.	.	.	
Ink	0	.	.	.	.	.	
Pencil	0	.	.	.	.	.	
Charcoal	0	.	.	.	.	.	
Gouache	0	.	.	.	.	.	
Bronze	0	.	.	.	.	.	
Acrylic	0	.	.	.	.	.	
Silver	0	.	.	.	.	.	
Print	0	.	.	.	.	.	
Cardboard	0	.	.	.	.	.	
Paper	0	.	.	.	.	.	
Chalk	0	.	.	.	.	.	
Copper	0	.	.	.	.	.	
Landscape	-1.128	1.532	-0.74	.468	-4.29	2.033	
Portrait	1.624	1.503	1.08	.291	-1.478	4.726	
Dutch Artist	0	.	.	.	.	.	
Constant	4.602	1.982	2.32	.029	.512	8.692	**

Mean dependent var	6.724	SD dependent var	3.291
R-squared	0.540	Number of obs	40
F-test	.	Prob > F	.
Akaike crit. (AIC)	204.742	Bayesian crit. (BIC)	228.386

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 16: Hedonic Pricing Model Bronze = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	-1.79	.082	-.001	0	*

Top 20 Artist	0	.	.	.	.	.	
Signed	.116	1.24	0.09	.926	-2.414	2.646	
Dated	.973	1.186	0.82	.418	-1.446	3.392	
Provenance	1.062	1.306	0.81	.423	-1.603	3.726	
Literature	-.252	1.453	-0.17	.864	-3.215	2.712	
2019	0	.	.	.	.	.	
2020	-.809	1.667	-0.49	.631	-4.208	2.59	
2021	-.459	1.494	-0.31	.761	-3.506	2.589	
2022	-1.572	1.529	-1.03	.312	-4.691	1.548	
2023	-2.579	1.601	-1.61	.117	-5.844	.686	
2024	0	.	.	.	.	.	
Oil	0	.	.	.	.	.	
Canvas	3.722	1.669	2.23	.033	.319	7.125	**
Lithography	0	.	.	.	.	.	
Silkscreen	0	.	.	.	.	.	
Collage	0	.	.	.	.	.	
Watercolor	0	.	.	.	.	.	
Ink	0	.	.	.	.	.	
Pencil	0	.	.	.	.	.	
Charcoal	0	.	.	.	.	.	
Gouache	0	.	.	.	.	.	
Bronze	0	.	.	.	.	.	
Acrylic	0	.	.	.	.	.	
Silver	0	.	.	.	.	.	
Print	0	.	.	.	.	.	
Cardboard	0	.	.	.	.	.	
Paper	0	.	.	.	.	.	
Chalk	0	.	.	.	.	.	
Copper	0	.	.	.	.	.	
Landscape	0	.	.	.	.	.	
Portrait	.584	1.383	0.42	.676	-2.237	3.404	
Dutch Artist	-.923	1.488	-0.62	.54	-3.958	2.112	
Constant	9.034	1.28	7.06	0	6.422	11.645	***

Mean dependent var	6.985	SD dependent var	2.665
R-squared	0.324	Number of obs	44
F-test	.	Prob > F	.
Akaike crit. (AIC)	214.873	Bayesian crit. (BIC)	234.499

*** p<.01, ** p<.05, * p<.1

Table 17: Hedonic Pricing Model Landscape = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	-0.32	.748	0	0	
Top 20 Artist	-.31	.681	-0.45	.65	-1.65	1.031	
Signed	1.175	.535	2.19	.029	.121	2.228	**
Dated	.794	.466	1.70	.089	-.123	1.711	*
Provenance	1.185	.759	1.56	.119	-.308	2.678	
Literature	1.722	1.307	1.32	.189	-.851	4.295	
2019	-.217	.916	-0.24	.813	-2.02	1.586	
2020	.303	.79	0.38	.702	-1.252	1.858	
2021	1.752	.842	2.08	.038	.096	3.408	**
2022	-.426	.872	-0.49	.625	-2.142	1.29	
2023	-1.132	.983	-1.15	.25	-3.067	.802	
2024	-1.486	.933	-1.59	.112	-3.322	.351	
Oil	.951	.865	1.10	.273	-.752	2.653	
Canvas	-.308	.472	-0.65	.515	-1.237	.621	
Lithography	0	.	.	.	.	.	
Silkscreen	0	.	.	.	.	.	
Collage	-.569	1.145	-0.50	.619	-2.822	1.683	
Watercolor	0	.	.	.	.	.	
Ink	-.051	1.287	-0.04	.969	-2.583	2.481	
Pencil	-.576	1.516	-0.38	.704	-3.56	2.407	
Charcoal	-1.702	1.662	-1.02	.307	-4.973	1.57	
Gouache	1.703	1.215	1.40	.162	-.689	4.095	
Bronze	0	.	.	.	.	.	
Acrylic	.841	1.227	0.69	.494	-1.574	3.257	

Silver	0	.	.	.	.	.	
Print	0	.	.	.	.	.	
Cardboard	1.86	.769	2.42	.016	.347	3.373	**
Paper	0	.	.	.	.	.	
Chalk	.659	1.82	0.36	.717	-2.922	4.24	
Copper	.245	1.327	0.18	.854	-2.367	2.857	
Landscape	0	.	.	.	.	.	
Portrait	3.584	1.189	3.01	.003	1.243	5.925	***
Dutch Artist	1.39	.643	2.16	.031	.124	2.656	**
Constant	3.887	1.108	3.51	.001	1.706	6.068	***

Mean dependent var	5.642	SD dependent var	3.564
R-squared	0.127	Number of obs	330
F-test	.	Prob > F	.
Akaike crit. (AIC)	1777.672	Bayesian crit. (BIC)	1868.850

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 18: Hedonic Pricing Model Portrait = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	1.22	.225	0	0	
Top 20 Artist	.463	.778	0.60	.552	-1.07	1.996	
Signed	.3	.559	0.54	.592	-.801	1.401	
Dated	.023	.52	0.05	.964	-1.002	1.049	
Provenance	1.253	.888	1.41	.159	-.496	3.003	
Literature	.904	1.148	0.79	.432	-1.36	3.167	
2019	.44	.823	0.54	.593	-1.182	2.063	
2020	-.116	.799	-0.15	.884	-1.691	1.459	
2021	-.892	.955	-0.93	.351	-2.774	.99	
2022	.064	.726	0.09	.93	-1.366	1.495	
2023	-1.556	1.103	-1.41	.16	-3.729	.617	
2024	-2.151	1.038	-2.07	.039	-4.196	-.105	**
Oil	.91	.59	1.54	.125	-.254	2.074	
Canvas	-1.339	.553	-2.42	.016	-2.43	-.249	**

Lithography	-6.852	.688	-9.96	0	-8.207	-5.497	***
Silkscreen	1.121	.629	1.78	.076	-.118	2.361	*
Collage	-.271	.643	-0.42	.673	-1.538	.995	
Watercolor	0	.	.	.	.	.	
Ink	.063	.644	0.10	.922	-1.206	1.332	
Pencil	.443	.923	0.48	.632	-1.378	2.263	
Charcoal	1.158	1.338	0.87	.388	-1.478	3.794	
Gouache	0	.	.	.	.	.	
Bronze	1.279	1.362	0.94	.349	-1.405	3.962	
Acrylic	2.311	1.07	2.16	.032	.202	4.421	**
Silver	.38	1.804	0.21	.833	-3.175	3.935	
Print	-.355	1.611	-0.22	.826	-3.531	2.82	
Cardboard	-3.704	2.346	-1.58	.116	-8.328	.92	
Paper	0	.	.	.	.	.	
Chalk	1.138	.73	1.56	.12	-.3	2.576	
Copper	1.909	1.018	1.87	.062	-.098	3.916	*
Landscape	1.169	.88	1.33	.185	-.565	2.904	
Portrait	0	.	.	.	.	.	
Dutch Artist	-.925	1.335	-0.69	.489	-3.556	1.707	
Constant	6.036	.675	8.94	0	4.706	7.367	***

Mean dependent var	6.164	SD dependent var	3.133
R-squared	0.137	Number of obs	246
F-test	.	Prob > F	.
Akaike crit. (AIC)	1276.695	Bayesian crit. (BIC)	1371.339

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 19: Hedonic Pricing Model Cardboard = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	-0.66	.512	0	0	
Top 20 Artist	1.121	1.338	0.84	.406	-1.563	3.805	
Signed	.076	1.328	0.06	.954	-2.588	2.74	
Dated	.244	.742	0.33	.744	-1.244	1.732	

Provenance	.134	2.124	0.06	.95	-4.126	4.395	
Literature	-2.601	2.343	-1.11	.272	-7.301	2.1	
2019	-2.477	.969	-2.55	.014	-4.421	-.532	**
2020	-3.474	1.711	-2.03	.047	-6.906	-.043	**
2021	.058	.739	0.08	.938	-1.425	1.541	
2022	-1.789	.971	-1.84	.071	-3.736	.157	*
2023	-3.26	1.677	-1.94	.057	-6.623	.103	*
2024	-3.554	1.854	-1.92	.061	-7.272	.163	*
Oil	.774	1.034	0.75	.457	-1.3	2.849	
Canvas	-1.755	1.111	-1.58	.12	-3.984	.475	
Lithography	4.763	3.235	1.47	.147	-1.725	11.25	
Silkscreen	.155	1.119	0.14	.89	-2.089	2.399	
Collage	-.335	1.177	-0.29	.777	-2.696	2.025	
Watercolor	0	.	.	.	.	.	
Ink	2.857	1.401	2.04	.046	.046	5.667	**
Pencil	-.233	1.813	-0.13	.898	-3.869	3.402	
Charcoal	5.28	1.931	2.73	.008	1.407	9.153	***
Gouache	2.276	2.167	1.05	.298	-2.071	6.622	
Bronze	0	.	.	.	.	.	
Acrylic	1.714	1.16	1.48	.145	-.613	4.042	
Silver	2.515	2.683	0.94	.353	-2.867	7.897	
Print	-1.957	3.28	-0.60	.553	-8.536	4.621	
Cardboard	0	.	.	.	.	.	
Paper	3.758	1.577	2.38	.021	.594	6.922	**
Chalk	-6.507	4.38	-1.49	.143	-15.292	2.278	
Copper	0	.	.	.	.	.	
Landscape	1.796	1.359	1.32	.192	-.929	4.522	
Portrait	-3.184	1.996	-1.59	.117	-7.188	.821	
Dutch Artist	.287	2.69	0.11	.915	-5.109	5.682	
Constant	7.522	1.54	4.88	0	4.433	10.612	***

Mean dependent var	5.816	SD dependent var	2.878
R-squared	0.370	Number of obs	83

F-test	.	Prob > F	.
Akaike crit. (AIC)	427.631	Bayesian crit. (BIC)	495.359

*** p<.01, ** p<.05, * p<.1

Table 20: Hedonic Pricing Model Ink = 1

	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Surface Area	0	0	-0.56	.574	0	0	
Top 20 Artist	.139	.395	0.35	.726	-.639	.917	
Signed	.035	.48	0.07	.943	-.911	.98	
Dated	.727	.358	2.03	.043	.022	1.432	**
Provenance	1.983	.864	2.29	.022	.282	3.683	**
Literature	.158	2.028	0.08	.938	-3.833	4.148	
2019	-1.59	.396	-4.01	0	-2.37	-.81	***
2020	-.608	.391	-1.55	.121	-1.377	.162	
2021	-.632	.487	-1.30	.195	-1.589	.326	
2022	-.816	.554	-1.47	.142	-1.905	.273	
2023	-2.937	.884	-3.32	.001	-4.677	-1.198	***
2024	-4.121	.768	-5.37	0	-5.632	-2.61	***
Oil	-.066	4.115	-0.02	.987	-8.162	8.031	
Canvas	.656	2.719	0.24	.81	-4.695	6.006	
Lithography	.402	.691	0.58	.562	-.959	1.762	
Silkscreen	0	.	.	.	.	.	
Collage	-1.901	1.061	-1.79	.074	-3.989	.187	*
Watercolor	-.278	.333	-0.83	.405	-.933	.378	
Ink	0	.	.	.	.	.	
Pencil	.266	.569	0.47	.641	-.853	1.385	
Charcoal	-.8	.736	-1.09	.278	-2.249	.649	
Gouache	.835	.361	2.31	.021	.125	1.545	**
Bronze	3.146	2.678	1.17	.241	-2.124	8.415	
Acrylic	-.153	1.098	-0.14	.889	-2.314	2.007	
Silver	0	.	.	.	.	.	
Print	.26	.468	0.56	.579	-.661	1.18	
Cardboard	3.072	.613	5.02	0	1.867	4.278	***

Paper	-5.408	.419	-12.91	0	-6.232	-4.584	***
Chalk	-.097	.89	-0.11	.914	-1.848	1.655	
Copper	0	.	.	.	.	.	
Landscape	-.825	.89	-0.93	.354	-2.575	.925	
Portrait	1.735	.379	4.58	0	.99	2.48	***
Dutch Artist	.728	.566	1.29	.199	-.386	1.841	
Constant	6.435	.419	15.35	0	5.61	7.259	***

Mean dependent var	5.196	SD dependent var	3.154
R-squared	0.351	Number of obs	346
F-test	.	Prob > F	.
Akaike crit. (AIC)	1680.310	Bayesian crit. (BIC)	1784.164

*** *p<.01, ** p<.05, * p<.1*

Table 21: Copper - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	348670.78%	23.92%
2020.0	-77.03%	3.31%
2021.0	67.87%	27.75%
2022.0	-98.56%	-13.65%
2023.0	1257.19%	14.2%
2024.0	-52.76%	11.67%

Table 22: Bronze - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	0.00%	23.92%
2020.0	-55.47%	3.31%
2021.0	-36.81%	27.75%
2022.0	-79.24%	-13.65%
2023.0	-92.42%	14.2%
2024.0	0.00%	11.67%

Table 23: Oil - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	59.36%	23.92%
2020.0	78.43%	3.31%
2021.0	142.06%	27.75%
2022.0	78.60%	-13.65%
2023.0	-45.50%	14.2%
2024.0	-34.88%	11.67%

Table 24: Canvas - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	37.30%	23.92%
2020.0	105.65%	3.31%
2021.0	166.98%	27.75%
2022.0	89.46%	-13.65%
2023.0	-44.12%	14.2%
2024.0	-2.66%	11.67%

Table 25: Silkscreen - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	-75.88%	23.92%
2020.0	149.18%	3.31%
2021.0	207.71%	27.75%
2022.0	-2.47%	-13.65%
2023.0	23.99%	14.2%
2024.0	-56.18%	11.67%

Table 26: Portrait - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	55.27%	23.92%
2020.0	-10.95%	3.31%
2021.0	-59.02%	27.75%

2022.0	6.61%	-13.65%
2023.0	-78.90%	14.2%
2024.0	-88.36%	11.67%

Table 27: Landscape - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	-19.51%	23.92%
2020.0	35.39%	3.31%
2021.0	476.61%	27.75%
2022.0	-34.69%	-13.65%
2023.0	-67.76%	14.2%
2024.0	-77.37%	11.67%

Table 28: Cardboard - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	-91.60%	23.92%
2020.0	-96.90%	3.31%
2021.0	5.97%	27.75%
2022.0	-83.29%	-13.65%
2023.0	-96.16%	14.2%
2024.0	-97.14%	11.67%

Table 29: Ink - Yearly Returns

Year	Art Price Index (%)	AEX Index (%)
2019.0	-79.61%	23.92%
2020.0	-45.56%	3.31%
2021.0	-46.85%	27.75%
2022.0	-55.78%	-13.65%
2023.0	-94.70%	14.2%
2024.0	-98.38%	11.67%