The Journal of Alternative Investments

When Rationality Meets Passion: *On the Financial Performance of Collectibles*

Philippe Masset and Jean-Philippe Weisskopf

JAI 2018, 21 (2) 66-83
doi: https://doi.org/10.3905/jai.2018.1.065
http://jai.iijournals.com/content/21/2/66

Institutional Investor Journals
1120 Avenue of the Americas, 6th floor,
New York, NY 10036, Phone: +1 212-224-3589

When Rationality Meets Passion: *On the Financial Performance of Collectibles*

Philippe Masset and Jean-Philippe Weisskopf

Philippe Masset
is an assistant professor at the Ecole hôtelière de Lausanne, HES-SO, University of Applied Sciences Western Switzerland in Lausanne, Switzerland.
philippe.masset@ehl.ch

Jean-Philippe Weisskopf
is an assistant professor at the Ecole hôtelière de Lausanne, HES-SO, University of Applied Sciences Western Switzerland in Lausanne, Switzerland.
jean-philippe.weisskopf@ehl.ch

Buying a collectible for the sheer purpose of deriving pleasure and emotions has a longstanding history. Rulers in ancient Greece, China, and Babylonia are said to have collected pieces of art to take delight from it. Investing in collectibles for the purpose of profit making is also ancient and can be dated as far back as the 17th century, when the Dutch took to investing in tulips and instigated the Tulip Mania. The distinction between purchasing collectibles for pleasure or for pecuniary reasons is ambiguous and thus difficult to dissociate. This holds true today, in a market where amateurs meet collectors and investors to contest over a specific item.

Knight Frank Research (2016) in a recent report showed that ultra-high-net-worth individuals (UHNWI) have been increasingly purchasing collectibles and, on average, hold 2% of their wealth in this asset class.[1] Moreover, 36% plan to allocate a higher amount of their wealth to it over the next decade. This increase in demand coupled with a relatively scarce and inelastic supply has driven prices upward for most collectibles. Knight Frank Research indicated that prices of collectibles have overall increased by 189% over the last 10 years (with art going up by 206%, fine wine by 245%, and classic cars by 476%), thus depicting a favorable picture of passion investments.

Concurrently, the finance industry has started to cater to this increase in demand by issuing dedicated funds (Lucey and Devine 2015; Masset and Weisskopf 2015; Gouverneur 2016) and providing new, in-depth tools and information to analyze the market. Academic studies have also started to examine the performance of collectible markets and draw more nuanced conclusions. In a recent article, Dimson and Spaenjers (2014) analyzed the performance of stamps, musical instruments, and art over the past 100 years. They showed that these collectibles have outperformed T-bonds, T-bills, and gold over the 1900–2012 period. The art market has been shown to be underperforming as reported in recent articles (Renneboog and Spaenjers 2013; Korteweg et al. 2016), while others argue that including art in an investment portfolio may be beneficial (Campbell 2008a; Taylor and Coleman 2011). Evidence on the fine wine market is equally mixed but appears rather favorable, with some studies indicating a relatively good performance and diversification benefits (Sanning et al. 2008; Masset and Henderson 2010; Dimson et al. 2015). However, fine wine has also been shown to underperform financial assets in other studies (Burton and Jacobsen 2001;

[1] A report by Barclays Wealth and Investment Management (2012) even finds that wealthy individuals on average hold close to 10% of their wealth in collectibles.

Fogarty 2006). Finally, according to Martin (2016), classic cars have performed well over the last decade.

In this article, we analyze the financial performance of three broad classes of collectibles, namely, visual art, fine wine, and classic cars. The choice of these three categories is based on their popularity as alternative investments over the past 30 years, with art being especially favored in the 1990s, fine wine in the 2000s, and classic cars in the 2010s. Moreover, according to Knight Frank Research (2016), these were the best-performing collectibles over the past decade, making them ideal benchmarks for comparisons with traditional assets. In a first step, we review the literature on collectibles over the last two decades to gain a deeper understanding of the returns and risks associated with an investment into collectibles. We then perform an empirical study on the financial characteristics of the three collectible classes and their performance compared with financial and real assets. We further analyze the segmentation of these markets, which may lead to differing price evolutions of submarkets resulting in an interesting intra-asset diversification potential.

Our empirical study indicates that returns are higher for classic cars and fine wine than for U.S. equities, fixed income, and real estate. Volatilities appear low but tend to increase to the level of equity once adjusted for the inherent illiquidity on collectible markets, which leads to smoothed indices and downward-biased risk estimates. In a CAPM framework, we further find evidence that only classic cars yield an annual risk-adjusted outperformance (of around 5%), while other collectibles do not significantly outperform. This is paired with low systematic risk, hinting at potential diversification benefits. We further propose that these benefits exist not only cross class but also intra-collectible class. In the period after the Global Financial Crisis (GFC), collectibles tended to perform less strongly while keeping slightly higher systematic risk estimates. Finally, in a portfolio allocation simulation, we show that adding 10% collectibles to a financial portfolio leads to a 7% decrease in portfolio risk, confirming the interesting diversification benefits possessed by collectibles.

COLLECTIBLES AND THEIR INVESTMENT PERFORMANCE

The following section summarizes evidence on the investment returns of collectibles. We concentrate on the visual art, fine wine, and classic car markets over the past two decades and conclude by introducing other less researched submarkets for collectibles.[2]

Visual Art

The visual art market has been the first consistently and extensively researched collectibles area since the beginning of the 1990s. Most studies on the art market find evidence of a poor investment performance. Baumol (1986) and Frey and Eichenberge (1995) indicate that art performs consistently worse than classic financial assets (stocks and bonds), excluding costs associated with this market, which depress returns even more. Moreover, risk appears to be high compared with traditional assets, making an investment even less attractive in terms of risk–return characteristics. Over time, these features have been confirmed by multiple authors, such as Frey and Pommerehne (1989), Pesando (1993), Agnello and Pierce (1996), Flores et al. (1999), Agnello (2002), and Pesando and Shum (2008). In a more recent study, Renneboog and Spaenjers (2013) showed a real return of around 4% since 1957 for art. This is lower than for equity and similar to bonds but bearing a higher risk. However, art appears to outperform other real assets, such as gold, real estate, or commodities. A few, but influential, studies have found positive results to an investment in art. Goetzmann (1993) showed art has outperformed bonds and stocks since 1850 and has yielded returns of 15% since 1940. Mei and Moses (2002) found smaller returns of 4.9% over the 20th century, or 8.2% since 1950.

Subsequent evidence has examined art submarkets and found more positive results. Buelens and Ginsburgh (1993) showed that Impressionists perform especially well while other artistic streams such as English painters perform poorly in the long run. McQuillan and Lucey (2016) further illustrated that Islamic art outperformed both equity and bonds over the 1998–2007 period. Taylor and Coleman (2011) found evidence of a comparable performance of Aboriginal art but a superior risk-adjusted performance and low correlations with respect to traditional financial assets. This also holds true for French-Canadian art, as evidenced by Hodgson (2011).

[2] For a good survey on the financial performance of investments in collectibles before the mid-1990s, please refer to Burton and Jacobsen (1999).

Lee and Veld-Merkoulova (2011) specifically looked at Andy Warhol and Salvador Dali and found low returns and Sharpe ratios and a high risk of an investment in these two artists. However, a low beta of Dali with equity markets yields highly positive alpha coefficients in a CAPM framework, while this is not true for Warhol. Overall, evidence on submarkets hints at a segmentation of the art market with art picking being worthwhile and leading to differentiated investment outcomes.

Other studies turn to potential diversification benefits of art in a financial portfolio, but results also appear poor. Studies such as those by Hodgson and Vorkink (2004) or Worthington and Higgs (2004) indeed found that art maintains a rather low cross-correlation with other assets, but the diversification benefit it may offer remains nevertheless limited. Worthington and Higgs (2003) arrived at a similar conclusion when considering the art market as a whole, but they also showed that the various segments of this market behave differently and may thereby increase diversification potential. This observation may also explain findings by Kraeussl and Logher (2010). They found that paintings from Russia, China, and India constitute opportunities from a portfolio diversification viewpoint with good returns, low correlations, and negative or zero market betas.

Overall, results on the financial performance of art is mixed (Kraeussl and Logher 2010) with mostly poor average returns, especially in combination with the considerable risk associated with it. Moreover, while risk-adjusted returns do not appear attractive individually, diversification benefits may still exist considering the specific short- to mid-term price evolution of submarkets.

Fine Wine

The analysis of returns to investments in fine wine is more recent and truly started around the turn of the millennium.[3] Burton and Jacobsen (2001) were the first to look into fine wine returns between 1986 and 1996 and concluded that wine should be savored rather than saved. They indicate that wine is less interesting than equity and, considering risk, also than debt instruments. These poor results are further exacerbated by the institutional setting of this market and transaction costs. Only in rare instances of wine picking (e.g., the 1982 vintage) does wine outperform financial assets. Building on this study on risk–return characteristics, subsequent articles examined more advanced performance measures and the diversification potential of fine wine in a financial portfolio. Over periods ranging from the mid-1990s to the end of the 2000s, Sanning et al. (2008) on Bordeaux wines or Fogarty (2010) on Australian wines confirmed Burton and Jacobsen's study. However, they also found support for significantly positive risk-adjusted returns in a CAPM or Fama–French framework. Fine wine can further be used as a hedge against equity movements due to its low correlation with respect to financial assets. Masset and Henderson (2010) and Masset and Weisskopf (2010) extended these results by showing that the inclusion of fine wine in a portfolio is generally beneficial from a risk–return perspective and even more so during the recent Global Financial Crisis. Finally, in a study on Bordeaux wine prices over the period 1900 to 2012, Dimson et al. (2015) indicated that wine with an average return of 5.3% (4.1% after transaction costs) underperformed equity but outperformed other collectible markets such as art or stamps.

Kourtis et al. (2012) built on the preceding studies and indicated that while Australian, Portuguese, and Italian wines display some diversification benefits, French wines only do so in a limited scope. Lucey and Devine (2015) corroborated results that wine regions may not be homogenous in their risk–return characteristics by showing that returns for Rhone valley wines are in line with U.S. stocks but lower for Bordeaux wines, while both display a lower risk estimate than equity. More recently, Bouri (2015) and Bouri and Roubaud (2016) have deepened the fine wine investment analysis by challenging the use of unconditional correlation models in past studies. Using a DCC-GARCH model, they showed that fine wine is an effective hedge with respect to equity markets, but only weakly so in periods of high market stress.

Overall, wine does not appear to deliver a superior performance to financial assets. However, two interesting outcomes remain. First, fine wine does seem to display some favorable diversification features when included in a financial portfolio. Recent studies (Faye et al. 2015; Le Fur et al. 2016) looking into the spillover effects between financial markets and the wine market and the use of more advanced techniques to understand the evolution of wine prices go in this direction.

[3] Krasker (1979) and Jaeger (1981) denote two influential exceptions.

Second, the fine wine market appears to be segmented with respect to wine regions and thus considering it as a homogenous asset class may lead to erroneous results. Masset et al. (2016) or Fernandez-Perez et al. (2017) have thus started to look into wine market segmentation and indicate that the behavior of the client base (geography, investor vs. collector, experience) may lead to this segmentation.

Classic Cars

To the best of our knowledge, only one study has thus far considered investments in classic cars. This is rather astonishing considering that it constitutes the latest trend in collectible investment and has witnessed a dramatic surge in interest over the last years. Martin (2016) studied this asset class over the 2007–2016 period and found that it outperformed equity, fixed income, and gold and displayed favorable risk-adjusted returns and diversification benefits.

Other Collectibles

The performance of other collectibles has also been studied over the past 20 years. These include such markets as antique furniture (Graeser 1993), coins (Dickie et al. 1994), guidebooks (Erdős and Ormos 2012), and diamonds (Renneboog and Spaenjers 2012), but also stamps and violins for which interest is somewhat larger. A first study by Cardell et al. (1995) showed support on stamp investments between 1947 and 1980, with a fivefold increase in prices in the second half of the 1970s followed by a decline thereafter. Results from this study were further extended and confirmed by Veld and Veld-Merkoulova (2007), indicating that stamps display diversification benefits with near zero beta and positive alpha coefficients. Dimson and Spaenjers (2011) looked into the long-run performance of stamps (1900–2008), which is lower than for equity but better than for bonds. Risk remains rather similar to equity, but diversification benefits through low systematic risk confirm previous findings. Grable and Watkins (2016) found a poor performance of stamps as compared with stocks and bonds since WWII. Graddy and Margolis (2011) analyzed the market for violins over the period 1850 to 2008. They showed a real return of around 3.5% on average and low correlations with stocks, bonds, and the art market. This study is in line with a study by Ross and Zondervan (1989), finding 2% real returns to violins over the first 80 years of the 20th century, and Campbell (2008b), showing the desirability of the inclusion of violins in a financial portfolio.

RESEARCH DESIGN

In this section, we first present the sample and then explain the methodology used to assess the performance of collectibles in the empirical study.

Sample

In the following, we review the different indices used to examine the three major classes of collectibles in this study. Most of the collectible indices used in practice are constructed with a composite index approach, which is similar to the one used for financial assets. This methodological design can lead to statistical biases due to the limited and fragmented trading activity on collectible markets. This may, in particular, result in smoothed index returns and, as a consequence, underestimate volatilities and cross-relationships with other assets (see Masset and Weisskopf 2018 for a detailed discussion).

The classic car market uses indices published by Kidston, which is considered to provide some of the most comprehensive and accurate data and valuation tools for classic cars by market insiders. The K500 classic car index is used as a benchmark for the overall classic car market. We further obtain index values on submarkets combining production period and location such as pre- and post-war American and European cars. The indices are updated on a quarterly basis and start in 1994 at a level of 100.

As proxies for the fine wine market, we obtain price data directly from Liv-ex. These consist of indices representing the Fine Wine 100 Index (since 1998),[4] which is considered the benchmark for the overall fine wine market by practitioners and academics alike. This is complemented by different indices on the Bordeaux market and on other wine growing regions (since 2004).

[4] Liv-ex was founded in 1999, and the company started computing the Fine Wine 100 Index in 2001. For the 1998–2001 period, we therefore use the Fine Wine Investables Index that Liv-ex has recalculated using historical price data from a vast panel of wine merchants. This index has maintained a correlation of 0.99 with the Liv-ex 100 over the 2001–2017 period.

EXHIBIT 1
Index Descriptions

Collectible/Asset	Index	Provider	Currency	Periodicity	Start
Classic Cars	K500 global index	Kidston	USD	Quarterly	1994
	Pre-War European cars				
	Pre-War American cars				
	Post-War European cars				
	Post-War American cars				
Arts	Artprice global index	Artprice.com	USD	Quarterly	1998
	Paintings				
	Prints				
	Sculptures				
	Photographs				
	Drawings				
Fine Wine	Fine Wine 100	Liv-ex	GBP	Monthly	2001
	Bordeaux Legends 50				2004
	Burgundy 150				2004
	Champagne 50				2004
	Rhone 100				2004
	Italy 100				2004
	Rest of the World 50				2004
Equity	S&P 500 Composite	Standard & Poors	USD	Daily	<1994
Fixed Income	Citigroup U.S. Broad Investment-Grade	Citigroup	USD	Daily	<1994
Real Estate	FTSE EPRA/NAREIT United States	FTSE, EPRA, NAREIT	USD	Daily	<1994
Gold	Gold Bullion LBM U$/Troy Ounce	ICE Benchmark Administration	USD	Daily	<1994

Notes: This exhibit describes the indices used in this article with their respective providers, currency, periodicity, and earliest data available for analysis. The first index of each collectible represents its benchmark index, and the other indices indicate specific submarkets of the respective collectible class.

All indices are updated on a monthly basis and use data from the Liv-ex wine trading platform.

The art market is proxied by indices downloaded from artprices.com. These indices, which have been widely used by practitioners, consist of a general art market index and indices representing various visual art submarkets. These include paintings, sculptures, prints, drawings, and photographs.[5] All indices start on a base of 100 in January 1998, are updated on a quarterly basis, and are established with data from global art auctions.

To compare the risk and return characteristics of these collectibles, we download price data from Thomson Reuters Datastream on the most common financial and real asset classes. This includes the S&P 500 as proxy for the U.S. equity market and the Citigroup U.S. Broad Investment-Grade Bond Index composed of U.S. government and corporate investment-grade bonds as representative of the U.S. fixed income market. For the real assets, we analyze gold and U.S. real estate (FTSE EPRA/NAREIT U.S.), which both frequently enter investor portfolios and may serve as hedges during market downturns or periods of inflation. All indices are translated into U.S. dollars and downloaded on a quarterly basis over the period from January 1998 to December 2016. Exhibit 1 presents the different asset classes, the benchmarks used to represent them, and the starting date.

[5] We also have data on different artistic periods for paintings. We do not explicitly consider these in this article as they constitute subsegments of paintings, which itself is a submarket of visual arts. In unreported results, we nonetheless find that their prices evolve in individual manners that confirm intra-class segmentation.

Methodology

The composite index approach and stale prices due to the relative illiquidity on collectibles markets may lead

to biases. In order to take this into account we calculate (partial) autocorrelation functions (ACF–PACF) up to lag four for all collectibles indices and subindices. This corresponds to a year of quarterly returns and allows us to understand the potential impact of seasonality and stale prices on the indices. Following this analysis, we resort to the use of an autoregressive filter AR(1). We estimate the following model in which $R_{i,t}$ represents the return for quarter t and $R_{i,t-1}$ the return for quarter $t-1$ of an index i.

$$R_{i,t} = \rho_0 + \rho_1 R_{i,t-1} + \varepsilon \tag{1}$$

We then use the AR(1) parameter ρ_1 as desmoothing factor on index returns.

$$R'_{i,t} = (R_{i,t} - \rho_1 R_{i,t-1})/(1-\rho_1) \tag{2}$$

This method has been widely used in studies on the real estate market and has also been proposed on the fine wine market (Masset and Weisskopf 2018). The objective is not to eliminate autocorrelation in the data that reflects an economic phenomenon (on less liquid markets, information propagates more slowly, inducing progressive price adjustments and consequently autocorrelation). It rather intends to reduce a statistical bias brought by the use of the composite index methodology, which is not appropriate in the context of illiquid assets. In this article, returns are calculated with a desmoothing factor ρ_1 of 0.7 on the classic car market, 0.5 on the art market, and 0.3 on the fine wine market. These factor intensities were chosen based on the ACF of lag one of quarterly and biannual returns. Economically, the decrease in factor intensity reflects the specificities of the three markets. Due to the use of the composite index approach, the very low liquidity of the classic car market and the recent interest in it make it the most prone to these issues. The index methodology and very rich database used on the art market make it somewhat less biased to liquidity issues and their induced biases. The fine wine market, finally, is the most liquid of the three due to the large number of bottles in circulation and lower prices (relative to other collectibles), which allows wine to be more easily traded even by small investors.

In order to evaluate the risk and return features of collectibles, we resort to the use of the capital asset pricing model.[6] We estimate the model by regressing the excess returns of the respective index on market excess returns. The regression equation for the market model is represented as

$$(R_{i,t} - R_{f,t}) = \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + \varepsilon_{i,t} \tag{3}$$

where $R_{i,t}$ represents the return of an index i over quarter t; $R_{f,t}$, the risk-free rate in quarter t; and $R_{m,t}$, the market return over quarter t. All standard errors are Newey–West adjusted with lags of order four to account for autocorrelation and heteroskedasticity in the data. For all calculations, we use returns of the S&P 500 as the market proxy and the one-month T-bill rate as the risk-free rate.

Collectible indices may react with a delay to changes in economic and financial conditions. In a second specification, we therefore adjust the market model by following the method proposed by Dimson et al. (2015) using the sum of the contemporaneous and the one-lag market beta. This approach is conceptually similar to the one described in both Scholes and Williams (1977) and Dimson (1979) to obtain a total market beta.

$$(R_{i,t} - R_{f,t}) = \alpha + \sum_{k=0}^{K} \beta_k (R_{m,t-k} - R_{f,t-k}) + \varepsilon_t \tag{4}$$

EMPIRICAL RESULTS

In this section, we present descriptive statistics on the different collectibles and financial and real assets. We then present results for the market model and the different illiquidity adjustments and finish by performing a portfolio allocation simulation.

Descriptive Statistics

Exhibit 2 shows descriptive statistics for all indices. Classic cars display a return of 7.49% for the benchmark K500 index, which is higher than the 6% on the equity or 5% on the fixed income market. It also performs better than an investment in real estate, but not gold. Inside the

[6] We have also estimated all regressions using the Fama–French three-factor model. Results are available upon request but remain identical to those reported for the CAPM.

EXHIBIT 2
Descriptive Statistics

Index	Observations	Mean	Median	Standard Deviation	ACF(1)	Minimum	Maximum	Skewness	Kurtosis
K500 global index	76	7.49%	6.48%	4.02%	0.78	–1.78%	7.70%	0.59	0.51
Pre-War European cars	76	5.70%	6.48%	3.66%	0.73	–2.22%	7.26%	0.18	0.86
Pre-War American cars	76	5.37%	–2.16%	16.95%	0.67	–13.15%	29.31%	1.00	1.62
Post-War European cars	76	8.66%	9.82%	2.90%	0.89	–1.18%	5.36%	–0.40	–0.25
Post-War American cars	76	7.12%	4.06%	11.03%	0.12	–15.94%	24.68%	0.91	4.75
Artprice global index	76	4.69%	2.29%	21.49%	–0.52	–18.63%	36.23%	0.81	1.32
Paintings	76	1.51%	1.72%	7.07%	0.71	–13.45%	8.46%	–0.90	2.55
Prints	76	1.48%	1.59%	7.75%	0.69	–11.73%	8.40%	–0.61	1.34
Sculptures	76	1.34%	1.29%	9.78%	0.48	–14.78%	11.35%	–0.08	0.16
Photographs	76	2.19%	1.93%	13.98%	0.45	–16.61%	19.77%	0.06	–0.05
Drawings	76	5.02%	1.87%	14.74%	0.54	–18.01%	21.13%	0.08	0.67
Fine Wine 100	76	6.20%	5.39%	17.62%	0.28	–34.23%	30.63%	–0.15	4.90
Bordeaux Legends 50	51	9.16%	8.50%	16.67%	0.45	–23.74%	23.72%	–0.22	1.83
Burgundy150	51	8.78%	8.68%	12.71%	0.27	–17.00%	19.30%	–0.24	1.72
Champagne 50	51	7.63%	6.01%	11.87%	0.30	–16.96%	12.87%	–0.58	1.28
Rhone 100	51	2.94%	1.42%	11.33%	0.16	–17.52%	21.34%	0.24	3.99
Italy 100	51	5.58%	7.00%	11.56%	0.07	–14.75%	19.37%	0.22	1.91
Rest of the World 50	51	5.83%	5.79%	10.93%	0.18	–18.06%	15.24%	–0.58	2.46
Equity	76	5.91%	9.42%	17.22%	0.02	–22.20%	24.62%	–0.42	0.48
Fixed Income	76	5.09%	4.90%	3.60%	–0.00	–3.03%	5.65%	0.07	–0.33
Real Estate	76	6.30%	10.82%	22.02%	0.11	–39.40%	31.50%	–0.89	3.35
Gold	76	8.34%	12.25%	14.01%	0.05	–21.87%	16.77%	–0.39	0.51

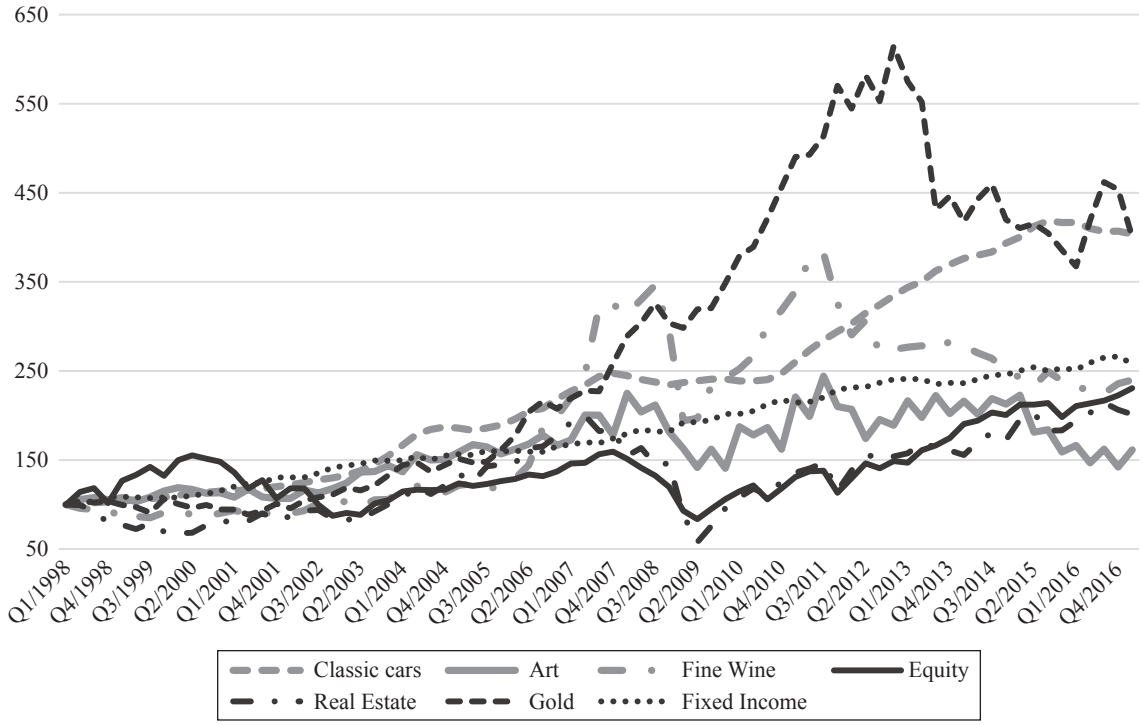
Notes: This exhibit shows descriptive statistics on collectible market benchmarks (first row of each collectible), submarkets of collectibles, and financial and real assets over the period from January 1998 to December 2016 unless stated otherwise in Exhibit 1. Data were compiled on a quarterly basis and annualized for means, medians, and standard deviations.

classic car market, it is noticeable that not all categories evolve homogenously. Post-War European cars perform better than the overall market in terms of returns, while American cars are performing less well and are more risky. It appears that even when considering large categories of classic cars, differences exist, which hints at a certain heterogeneity inside this market. In line with prior literature, the art market lags financial and real assets in terms of returns. Especially, the benchmark index displays low returns for a high risk. Inside the art market, differences are again noticeable, with drawings performing best and all other submarkets showing a low and more uniform return of 1.6%, on average. Finally, the fine wine market is situated in between the art and classic car markets, with a return of 6.20% for the benchmark index but with generally higher risk estimates. In the wine market, the Bordeaux, Burgundy, and Champagne regions yield high returns. Overall, there is a clear hierarchy with classic cars displaying the strongest return over the last 20 years, followed by fine wine and the visual art market. At the same time, equity, fixed income, and real estate performed better than art but worse than the two other collectibles, while gold was the best investment over this period.

Exhibit 3 graphs the evolution of the three benchmark collectibles indices and the four traditional asset classes. Gold and classic cars both show an increase in prices and a strong resiliency during the Global Financial Crisis. The performance of fixed income has been weaker but equally resilient during crises times.

Conversely, both fine wine and art experienced a decrease in prices during the GFC, but less than equity and real estate markets. Since the GFC, the evolution of the different asset classes has also followed different

EXHIBIT 3
Evolution of Collectibles and Financial Assets



Notes: The exhibit represents the evolution of three collectibles benchmark indices and four financial assets over the period 1998 to 2016. It is constructed using raw quarterly USD returns for each index.

patterns. While equity, real estate, and classic cars have rebounded, the gold, fine wine, and art markets have been under price pressure.

Filtering Returns

In Exhibit 4, we present a summary of descriptive statistics using desmoothed quarterly returns and biannual returns. Both should alleviate concerns about the biases induced by stale prices and the composite index methodology, as expected returns do not vary much. Considering volatilities and autocorrelations, we observe an increase of the former and a decrease of the latter once we adjust returns, with both tending toward those observed on traditional financial markets. Fine wine and art become as or even more risky than equity. Only the classic car market generally continues to display low risk. This result indicates that using the indices as given may downwardly bias investors' effective risk-taking, leading to poor investment decisions.

Correlation and Diversification

Exhibit 5 displays four correlation matrices. First, there is one with the financial/real assets and the benchmark indices of each collectible to analyze the relationship between asset classes. Second, there are three matrices looking into each collectible class separately to gauge a potential heterogeneity in the evolution of the market. All indices, be it for collectibles, financial assets, or real assets, display very low correlations, with coefficients of around –0.2 to 0.2. Only U.S. real estate and equity show a higher correlation of 0.61. Consequently, collectibles among each other appear differentiated and evolving in different patterns, leading to potential diversification benefits. This is also the case for collectibles with respect to traditional assets.

As mentioned, the classic car market appears to be segmented. This is confirmed in the correlation coefficients, with relations mainly ranging between 0 and 0.2. Only the subcategory for Post-War American

EXHIBIT 4
Performance Statistics

	Quarterly Returns			Quarterly Returns (filtered)			Biannual Returns		
Index	Mean	Standard Deviation	ACF(1)	Mean	Standard Deviation	ACF(1)	Mean	Standard Deviation	ACF(1)
K500 global index	7.49%	4.02%	0.78	7.25%	8.42%	0.23	7.62%	5.48%	0.62
Pre-War European cars	5.70%	3.66%	0.73	5.62%	8.31%	0.05	5.79%	4.86%	0.60
Pre-War American cars	5.37%	16.95%	0.67	4.94%	41.84%	0.09	6.36%	23.30%	0.43
Post-War European cars	8.66%	2.90%	0.89	8.59%	4.73%	0.53	8.79%	4.08%	0.76
Post-War American cars	7.12%	11.03%	0.12	6.54%	42.14%	–0.50	7.32%	12.50%	0.18
Artprice global index	4.69%	21.49%	–0.52	4.55%	12.26%	0.12	3.36%	12.84%	0.16
Paintings	1.51%	7.07%	0.71	1.30%	10.38%	0.47	1.68%	9.11%	0.42
Prints	1.48%	7.75%	0.69	1.44%	11.55%	0.47	1.66%	9.77%	0.38
Sculptures	1.34%	9.78%	0.48	1.37%	17.20%	0.24	1.45%	10.83%	0.15
Photographs	2.19%	13.98%	0.45	2.27%	24.91%	0.20	2.26%	14.63%	0.22
Drawings	5.02%	14.74%	0.54	4.73%	24.70%	0.27	5.47%	17.81%	0.22
Fine Wine 100	6.20%	17.62%	0.28	6.33%	24.18%	–0.01	6.99%	21.73%	0.09
Bordeaux Legends 50	9.16%	16.67%	0.45	8.97%	21.50%	0.19	9.90%	21.27%	0.37
Burgundy150	8.78%	12.71%	0.27	8.47%	17.38%	0.01	9.12%	14.05%	0.22
Champagne 50	7.63%	11.87%	0.30	7.33%	16.08%	0.04	7.92%	12.96%	0.36
Rhone 100	2.94%	11.33%	0.16	2.63%	16.03%	–0.07	3.21%	11.86%	–0.08
Italy 100	5.58%	11.56%	0.07	5.28%	16.81%	–0.15	5.88%	11.74%	–0.30
Rest of the World 50	5.83%	10.93%	0.18	5.67%	15.44%	–0.02	6.13%	12.28%	–0.23
Equity (entire period)	5.91%	17.22%	0.02				5.57%	14.92%	0.27
Fixed Income (entire period)	5.09%	3.60%	–0.00				5.12%	3.56%	–0.02
Real Estate (entire period)	6.30%	22.02%	0.11				5.68%	19.80%	0.08
Gold (entire period)	8.34%	14.01%	0.05				8.67%	16.09%	–0.04
Equity (short period)	6.91%	15.22%	0.17				6.57%	14.79%	0.13
Fixed Income (short period)	4.59%	3.48%	–0.14				4.29%	3.48%	–0.24
Real Estate (short period)	9.33%	24.84%	0.11				7.21%	21.51%	0.10
Gold (short period)	10.93%	14.45%	0.12				9.54%	18.01%	–0.04

Notes: The exhibit displays the average annualized return, the volatility, and the autocorrelation function with one lag for the different asset classes and their submarkets. The left panel uses the initial raw quarterly returns, the middle panel uses quarterly returns after the use of the auto-regressive filter, and the right panel uses raw biannual returns. Short period denotes statistics over the 2004–2016 period, which covers the period available for all fine wine subindices.

cars is more strongly correlated with the benchmark index. This fact constitutes an interesting feature of the classic car market, as not only does it differ from other assets but there is equally room inside the collectible class for diversification and car picking. The art market paintings are relatively correlated with other submarkets, but otherwise correlations tend to be low (0.15–0.45), which also hints at a relative segmentation in this market. Finally, the fine wine market is the least heterogeneous of the three, with correlations in the range of 0.55 to 0.9.

Performance of Collectibles

Exhibit 6 provides results on the performance of collectibles as compared with financial and real assets in a CAPM framework. Results from this approach allow us to draw insights on the attractiveness of investments in traditional assets and collectibles.

The main results on collectibles are twofold. First, classic cars have shown an impressive performance over the last 20 years and yielded a significant alpha coefficient of close to 5% in annual terms. Inside this class, Post-War

EXHIBIT 5
Correlation Coefficients

Panel A: Cross-Correlations in the Submarkets in the Classic Car Market

	K500 Global Index	Pre-War European Cars	Pre-War American Cars	Post-War European Cars	Post-War American Cars	Equity
K500 global index	1.00					
Pre-War European cars	0.17	1.00				
Pre-War American cars	0.83	0.09	1.00			
Post-War European cars	0.31	0.10	0.14	1.00		
Post-War American cars	0.45	–0.01	0.21	0.12	1.00	
Equity	0.15	0.12	0.15	0.09	0.09	1.00

Panel B: Cross-Correlations in the Submarkets in the Art Market

	Artprice Global Index	Paintings	Prints	Sculptures	Photographs	Drawings	Equity
Artprice global index	1.00						
Paintings	0.47	1.00					
Prints	0.29	0.77	1.00				
Sculptures	0.47	0.71	0.57	1.00			
Photographs	0.25	0.43	0.38	0.37	1.00		
Drawings	0.55	0.40	0.27	0.37	0.06	1.00	
Equity	0.18	0.41	0.30	0.40	0.21	0.12	1.00

Panel C: Cross-Correlations among Submarkets in the Fine Wine Market

	Fine Wine 100	Bordeaux Legends 50	Burgundy 150	Champagne 50	Rhone 100	Italy 100	Rest of the World 50	Equity
Fine Wine 100	1.00							
Bordeaux Legends 50	0.58	1.00						
Burgundy 150	0.67	0.76	1.00					
Champagne 50	0.72	0.75	0.87	1.00				
Rhone 100	0.68	0.69	0.89	0.83	1.00			
Italy 100	0.61	0.61	0.78	0.80	0.82	1.00		
Rest of the World 50	0.63	0.54	0.77	0.76	0.84	0.74	1.00	
Equity	0.21	0.40	0.42	0.39	0.44	0.32	0.31	1.00

Panel D: Cross-Correlations among the Benchmark Indices of the Collectible Classes and the Indices Proxying Financial and Real Assets

	K500 Global Index	Artprice Global Index	Fine Wine 100 Index	Real Estate	Gold	Fixed Income	Equity
K500 global index	1.00						
Artprice global index	0.04	1.00					
Fine Wine 100 index	0.04	0.22	1.00				
Real Estate	0.08	0.18	0.21	1.00			
Gold	0.00	0.03	0.28	0.05	1.00	0.31	
Fixed Income	0.03	–0.19	–0.27	–0.08	0.31	1.00	
Equity	0.15	0.18	0.21	0.61	–0.08	–0.45	1.00

Notes: Data were collected for the period from January 1998 to December 2016 unless stated otherwise in Exhibit 1. Data were compiled on a quarterly basis, and the autoregressive filter applied to all returns.

EXHIBIT 6
Asset and Collectibles Performance

	Alpha (1)	Beta (2)	Alpha (4)	Beta (5)	Lagged Beta (6)	Total Beta (7)	Sharpe Ratio/ Treynor Ratio (8)	Sortino Ratio (9)	No of Obs/R^2 (10)
K500 global index	0.012**	0.079	0.012**	0.084	0.023	0.107	0.62	1.22	76
	(2.131)	(1.363)	(2.160)	(1.395)	(0.542)		0.49		0.022
Pre-War European cars	0.008	0.063*	0.010*	0.072*	–0.114**	–0.042	0.43	0.77	76
	(1.556)	(1.715)	(1.773)	(1.840)	(–2.129)		–0.90		0.014
Pre-War American cars	0.004	0.369	0.004	0.381	0.109	0.490	0.07	0.13	76
	(0.158)	(1.242)	(0.152)	(1.233)	(0.453)		0.06		0.022
Post-War European cars	0.016***	0.031	0.016***	0.037	0.000	0.037	1.39	2.66	76
	(3.699)	(1.092)	(3.762)	(1.331)	(0.008)		1.77		0.008
Post-War American cars	0.009	0.218	0.010	0.224	–0.064	0.160	0.11	0.12	76
	(0.712)	(1.371)	(0.798)	(1.347)	(–0.389)		0.28		0.008
Artprice global index	0.005	0.129	0.003	0.117	0.195**	0.312	0.21	0.35	76
	(0.672)	(1.301)	(0.443)	(1.424)	(2.077)		0.08		0.031
Paintings	–0.004	0.247**	–0.005	0.246**	0.122**	0.368	–0.07	–0.10	76
	(–0.614)	(2.199)	(–0.736)	(2.421)	(2.448)		–0.02		0.170
Prints	–0.003	0.202*	–0.004	0.202*	0.121	0.323	–0.05	–0.08	76
	(–0.454)	(1.677)	(–0.547)	(1.849)	(1.567)		–0.02		0.088
Sculptures	–0.006	0.400***	–0.006	0.406***	0.119	0.525	–0.04	–0.07	76
	(–0.751)	(3.373)	(–0.781)	(3.526)	(1.224)		–0.01		0.163
Photographs	–0.002	0.305*	–0.001	0.330*	0.069	0.399	0.01	0.02	76
	(–0.205)	(1.850)	(–0.123)	(1.984)	(0.456)		0.01		0.044
Drawings	0.005	0.189	0.002	0.166	0.211	0.377	0.11	0.19	76
	(0.400)	(0.984)	(0.172)	(0.874)	(1.190)		0.07		0.016
Fine Wine 100 index	0.008	0.288	0.007	0.302	0.197	0.499	0.18	0.25	76
	(0.585)	(1.088)	(0.535)	(1.212)	(1.148)		0.09		0.043
Bordeaux Legends 50	0.012	0.542***	0.015	0.589***	–0.247*	0.342	0.36	0.53	51
	(0.744)	(3.838)	(0.907)	(3.234)	(–1.718)		0.23		0.157
Burgundy 150	0.011	0.469***	0.015	0.519**	–0.266*	0.253	0.42	0.61	51
	(1.184)	(3.134)	(1.377)	(2.624)	(–1.695)		0.29		0.175
Champagne 50	0.009	0.405**	0.010	0.421**	–0.085	0.336	0.38	0.57	51
	(0.989)	(2.505)	(1.055)	(2.312)	(–0.573)		0.18		0.153
Rhone 100	–0.003	0.455***	–0.000	0.496**	–0.219	0.277	0.09	0.13	51
	(–0.446)	(3.260)	(–0.053)	(2.503)	(–1.101)		0.05		0.190
Italy 100	0.005	0.356**	0.008	0.402*	–0.249	0.153	0.24	0.44	51
	(0.782)	(2.273)	(1.107)	(1.926)	(–1.210)		0.26		0.105
Rest of the World 50	0.007	0.311	0.007	0.318	–0.038	0.280	0.29	0.43	51
	(0.897)	(1.535)	(0.936)	(1.413)	(–0.234)		0.16		0.095
Real Estate	0.003	0.782***	0.003	0.802***	0.174	0.976	0.19	0.23	76
	(0.278)	(3.264)	(0.259)	(3.652)	(1.322)		0.04		0.367
Gold	0.016*	–0.059	0.015*	–0.066	0.077	0.011	0.45	0.78	76
	(1.900)	(–0.679)	(1.804)	(–0.787)	(1.033)		5.74		0.006
Fixed Income	0.009***	–0.088***	0.009***	–0.088***	–0.014	–0.102	0.85	1.76	76
	(4.518)	(–5.251)	(4.480)	(–4.924)	(–0.654)		–0.30		0.202

*Notes: This exhibit shows results for the capital asset pricing model for each collectible and its respective submarkets as well as for the real and financial assets using desmoothed returns. It also reports one-period lagged beta coefficients and total beta (sum of the contemporaneous and one-period lagged) coefficients following Dimson et al. (2015) and the Sharpe (top), Treynor (bottom), and Sortino ratios. Finally, it displays the number of observations (top) and R^2 (bottom) for each specification. The S&P 500 is used as the market benchmark and the one-month T-bills as the risk-free rate. All specifications were run with Newey–West corrected standard errors with a lag of 4. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.*

European cars outperformed other submarkets.[7] Art and fine wine, conversely, have not yielded superior risk-adjusted returns. Second, systematic risk is insignificant or close to zero for classic cars and art. Only fine wine has higher betas of around 0.45 to 0.55, but these remain nevertheless low. These findings also hold for total market betas, accounting for the slower price adjustments on collectible markets. Beta coefficients tend to increase but remain relatively low in a range between 0 and 0.5. This constitutes a positive outcome in terms of portfolio diversification, with collectibles behaving differently from the U.S. equity market.[8]

So, have investments in collectibles been more appealing than traditional investments? The answer tends to be no, especially considering the potential difficulties when investing in collectibles that cannot be quantified. Over the same period, U.S. fixed income and gold yielded significantly positive risk-adjusted returns that are in line with classic cars and thus better than the art or fine wine market.[9] At the same time, these two assets display negative or insignificant systematic risk factors that are lower or in line with collectibles. Only U.S. real estate did not perform better than collectibles. It did not significantly outperform and has a beta coefficient tending toward unity. Other performance measures, such as the Sharpe, Treynor, and Sortino ratios, yield results that are in line with alpha coefficients. In other words, the art market does not perform well, the fine wine market does slightly better, and classic cars perform at least as well as fixed income or gold.

Overall, collectibles are good investments from the point of view of portfolio diversification and compared with equity markets. However, compared with other popular asset classes, a clear-cut outperformance is lacking.

[7] We also have data on Porsche and Ferrari subindices, which both are major components of the Post-War European index evidenced among others by their strong correlation. All three display similarly strong returns.

[8] We have also run all calculations in this section with unfiltered raw returns and obtain qualitatively very similar results. We further have calculated total beta with two and three lags and again obtain very similar results.

[9] We performed the same calculations using the Barclays Capital U.S. Treasury index. In this case, the bond market yields negative returns and thus becomes the worst-performing investment. However, the low systematic risk remains valid.

Performance of Collectibles Since the GFC

Due to the high liquidities put on the market by the Federal Reserve and various European central banks, investors have been on the outlook for alternative investments. This has, among other things, strongly favored capital inflows into collectibles. In Exhibit 7, we therefore rerun specifications for the period March 2009 to December 2016.[10]

Over this period, results remain similar to those for the entire period with some nuances. Collectibles, overall, do not outperform equity anymore. Only Post-War European cars outperform in risk-adjusted terms, while paintings, sculptures, and photographs significantly underperform. Beta and total beta coefficients tend to increase for this subperiod. Performance ratios (Sharpe, Treynor, and Sortino) show very good results for the overall classic car market, Post-War European cars, and Burgundy wines. Generally, it appears that collectibles could not profit from the high capital inflows since 2009. This may be due to the already high prices of many collectibles at the end of the Global Financial Crisis, which made profitable investments more complicated to come by. Furthermore, some submarkets experienced severe corrections during or just after the GFC and have not yet recovered. Finally, the simultaneous positive price trends of equity and other asset classes including collectibles due to the increased liquidity of the market may explain the higher beta coefficients. This final result may also be related to the increased financialization of collectible markets in recent years with the appearance of investors and funds that do not trade for the pure pleasure that collectors pursue and make collectibles more cyclical and dependent on financial markets.

Collectibles and Portfolio Allocation

Investors will very rarely hold collectibles on their own but will care about their benefits as an addition to a financial portfolio. Exhibit 8 reports results from a portfolio allocation exercise using the indices and asset classes from the previous sections and mimicking the typical holdings of a (ultra-) high-net-worth individual. In it, we create three portfolios.

[10] We have run identical specifications for the period before the Global Financial Crisis. Results remain qualitatively similar.

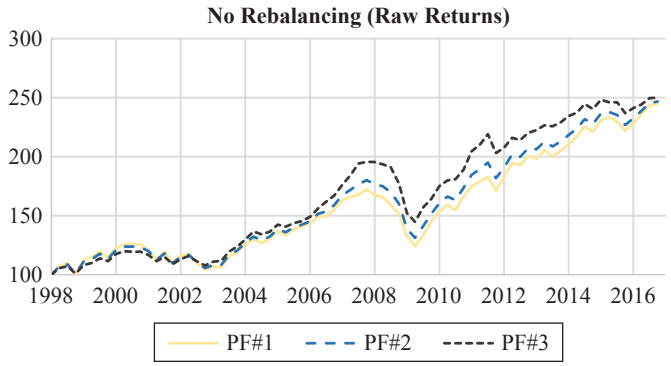
EXHIBIT 7

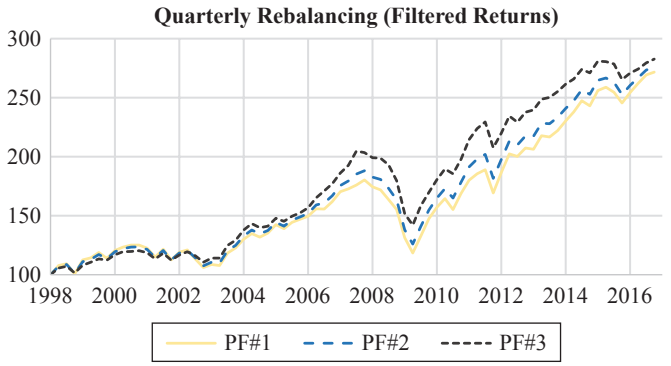
Asset and Collectibles Performance since the Global Financial Crisis

	Alpha (1)	Beta (2)	Alpha (4)	Beta (5)	Lagged Beta (6)	Total Beta (7)	Sharpe Ratio/ Treynor Ratio (8)	Sortino Ratio (9)	No of Obs/R^2 (10)
K500 global index	0.013	0.092	0.012	0.110	0.023	0.133	0.85	1.80	31
	(1.562)	(1.150)	(1.367)	(1.252)	(0.250)		0.48		0.039
Pre-War European cars	0.008	0.123	0.018	0.071	–0.256*	–0.185	0.50	1.05	31
	(0.670)	(1.105)	(1.302)	(0.599)	(–1.784)		–0.30		0.179
Pre-War American cars	–0.022	0.683	–0.030	0.693	0.196	0.889	0.02	0.04	31
	(–0.658)	(1.484)	(–0.911)	(1.287)	(0.331)		0.01		0.058
Post-War European cars	0.017**	0.078*	0.016*	0.083	0.043	0.126	1.62	3.67	31
	(2.401)	(1.866)	(1.780)	(1.698)	(0.831)		0.64		0.037
Post-War American cars	–0.010	0.449	–0.009	0.582	0.024	0.606	0.04	0.05	31
	(–0.331)	(0.991)	(–0.367)	(1.279)	(0.054)		0.04		0.011
Artprice global index	0.007	0.081	–0.007	0.099	0.346	0.445	0.28	0.61	31
	(0.462)	(0.447)	(–0.479)	(0.503)	(1.619)		0.09		0.178
Paintings	–0.019***	0.393***	–0.028***	0.378***	0.221***	0.599	–0.20	–0.38	31
	(–5.142)	(4.234)	(–7.126)	(5.301)	(5.246)		–0.03		0.420
Prints	–0.010*	0.317***	–0.019***	0.274***	0.184**	0.458	0.04	0.09	31
	(–1.966)	(3.188)	(–3.184)	(4.097)	(2.643)		–0.01		0.196
Sculptures	–0.017**	0.401**	–0.033***	0.405**	0.397*	0.802	–0.10	–0.15	31
	(–2.273)	(2.371)	(–3.344)	(2.429)	(1.925)		–0.01		0.217
Photographs	–0.030**	0.708***	–0.040**	0.816***	0.277	1.093	–0.10	–0.17	31
	(–2.460)	(4.289)	(–2.393)	(4.779)	(0.921)		–0.02		0.209
Drawings	0.006	0.396	–0.022	0.529	0.738**	1.267	0.26	0.42	31
	(0.265)	(0.784)	(–0.846)	(1.029)	(2.117)		0.06		0.094
Fine Wine 100 index	–0.010	0.520*	–0.022	0.416	0.259	0.675	0.18	0.28	31
	(–0.415)	(1.763)	(–0.827)	(1.215)	(1.317)		0.05		0.095
Bordeaux Legends 50	–0.010	0.563***	–0.002	0.405***	–0.237***	0.168	0.24	0.47	31
	(–0.779)	(3.861)	(–0.160)	(2.847)	(–2.959)		0.26		0.333
Burgundy 150	0.006	0.370**	0.015	0.176	–0.300**	–0.124	0.44	1.13	31
	(0.570)	(2.712)	(1.155)	(1.051)	(–2.175)		–0.62		0.258
Champagne 50	0.002	0.241	0.002	0.127	–0.048	0.079	0.31	0.68	31
	(0.218)	(1.530)	(0.167)	(0.660)	(–0.341)		0.56		0.102
Rhone 100	–0.009	0.371**	–0.007	0.169	–0.125	0.044	0.11	0.25	31
	(–1.007)	(2.562)	(–0.700)	(1.336)	(–0.978)		0.43		0.203
Italy 100	0.001	0.228	0.003	0.051	–0.122	–0.071	0.23	0.53	31
	(0.124)	(1.277)	(0.229)	(0.273)	(–0.664)		–0.54		0.154
Rest of the World 50	0.011	0.097	0.009	–0.042	–0.008	–0.048	0.42	0.96	31
	(1.059)	(0.535)	(0.773)	(–0.227)	(–0.088)		–1.20		0.057
Real Estate	0.009	1.041***	0.003	0.938***	0.099	1.037	0.89	1.56	31
	(0.774)	(5.223)	(0.307)	(6.000)	(0.606)		0.18		0.606
Gold	0.012	–0.040	0.009	–0.028	0.078	0.058	0.26	0.39	31
	(0.663)	(–0.282)	(0.511)	(–0.182)	(0.447)		0.71		0.006
Fixed Income	0.012***	–0.077**	0.013***	–0.086**	–0.020	–0.106	1.13	1.73	31
	(4.023)	(–2.615)	(3.379)	(–2.675)	(–0.457)		–0.36		0.084

*Notes: This exhibit shows results for the capital asset pricing model for each collectible and its respective submarkets as well as for the real and financial assets using desmoothed returns. It also reports one-period lagged beta coefficients and total beta (sum of the contemporaneous and one-period lagged) coefficients following Dimson et al. (2015) and the Sharpe (top), Treynor (bottom), and Sortino ratios. Finally, it displays the number of observations (top) and R^2 (bottom) for the respective specifications. The S&P 500 is used as the market benchmark and the one-month T-bills as the risk-free rate. All specifications were run with Newey–West corrected standard errors with a lag of 4. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.*

EXHIBIT 8
Collectibles and Portfolio Allocation





	PF#1	PF#2	PF#3
Average	5.23%	5.21%	5.22%
Volatility	9.22%	8.58%	7.82%

	PF#1	PF#2	PF#3
Average	5.93%	5.94%	5.97%
Volatility	10.65%	9.93%	8.87%

Notes: The exhibit shows the evolution, average return, and volatility for different portfolios. PF#1 denotes a portfolio invested 50% in equity, 30% in fixed income, 15% in real estate, and 5% in gold. PF#2 and PF#3 decrease these weights by, respectively, 10% and 30% to allow for an investment of 10% or 30% into collectibles (for both equally invested in classic cars, art, and fine wine). The left-hand panel uses raw quarterly USD returns without rebalancing, and the right-hand panel desmoothed quarterly USD returns and rebalancing.

First, there is a classic financial portfolio investing 50% in equity, 30% in fixed income, 15% in real estate, and 5% in gold. Second, there is a portfolio that additionally invests 10% in collectibles (equally weighted between the classic car, fine wine, and art benchmarks). Finally, a third portfolio invests 30% in collectibles (also equally weighted for the different collectible classes). In the left panel, we report the evolution of the three portfolios without rebalancing and using raw returns. This setting would be the one faced by a buy-and-hold investor who cannot rebalance due to timing and liquidity constraints on collectible markets. The right panel uses a setting with desmoothed returns and quarterly rebalancing.

As can be observed in the two panels, results remain very similar in both settings. The addition of collectibles to a financial portfolio reduces overall portfolio risk. The inclusion of 10% collectibles decreases portfolio risk by 7% (from 9.22% to 8.95% for the first setting and from 10.65% to 9.93% for the second setting). Investing 30% in collectibles doubles the diversification effect (i.e., the risk drops by more than 15% as compared with the base case). Our results thus illustrate that while collectibles generally did not deliver a superior performance, their diversification benefits nevertheless remain intact and help investors reduce portfolio risk.

CONSIDERATIONS WHEN INVESTING IN COLLECTIBLES

Collectibles do not appear to be superior investments as compared with other alternatives, but can nonquantifiable characteristics improve their attractiveness? Although every collectible has its own characteristics, some are common to all. A potential advantage of collectibles is related to the tax treatment. In several countries, collectibles are exempt from wealth or capital gains taxes. For example, in the United Kingdom both classic cars and fine wines are, under certain circumstances, considered wasting assets and are excluded from capital gains tax. The complexity of the market coupled with a lack of efficiency may represent another benefit. Being knowledgeable helps informed investors to detect market trends or to source collectibles at lower prices through private networks. It thus becomes easier for informed investors to pick the a priori most promising collectible.

The specific characteristics of this market are also at the origin of some drawbacks. The market segmentation reduces liquidity and makes collectibles vulnerable

to liquidity squeezes or the impossibility of timely sales. Informational and liquidity concerns also lead to valuation issues. Each single bottle of wine, classic car, or piece of art is unique and its value will depend on its condition, its provenance, sales channel, and location. This is reinforced by the lack of cash flows from collectibles, which make price movements more erratic. This is further supported by the scarcity of most collectibles, which may become more acute the more time passes. There will, for example, only be a unique Picasso painting, a few Ferrari 250GTs, and due to consumption, a steadily decreasing amount of bottles of a given vintage of Petrus.

For retail investors, entry costs may be high. The most straightforward way to gain an exposure is to directly buy the physical good. This can amount to several hundred U.S. dollars for bottles of fine wine but may increase to millions in the case of art or classic cars. The relatively high entry cost and the lack of collective investment schemes further make the creation of a diversified portfolio of collectibles difficult to achieve. Recently, some funds have been launched that invest in respective collectible classes. This reduces entry costs and allows for some diversification, but it remains a small niche market with its own issues (see, for example, Masset and Weisskopf 2015) and may be restricted to a particular investor type.

Costs of investing and holding collectibles are likely to be higher than for traditional assets. Fine wine, classic cars, and art can be traded through a variety of channels, and transaction costs will vary depending on the chosen channel. Search and information costs will equally be higher and more time consuming than for financial assets. Finally, storage and insurance further inflate the costs to holding collectibles. While these expenses are difficult to evaluate, they will diminish returns rather considerably.

Finally, collectibles may be more prone to bubble-like price evolutions and changing trends than financial instruments. This is partly due to the emotional aspect of the goods traded but also to the difficulty in properly valuing collectible items. Since the 17th century, collectibles have witnessed bubbles as investors flock into different collectible markets on the back of seemingly good returns and low risk. This has been observed on the art market in the 1990s with a surge of interest from mainly Japanese investors (Hiraki et al. 2009), in the 2000s with a surge in Chinese demand for top fine wines from Bordeaux (Masset et al. 2016), and today on parts of the market for classic cars in which prices have been steadily increasing but stagnating very recently (see Verhage 2016).

CONCLUDING REMARKS

This article gives an overview of the financial performance of collectibles over the last 20 years and provides an empirical analysis of the classic car, art, and fine wine markets over the same period. Prior literature mainly provides evidence that collectibles do not perform better than financial assets. However, results remain somewhat mixed due to limited data availability, difficulties in performance and risk measurements, and the use of different time periods and market segments.

Our empirical study indicates that classic cars and fine wines have delivered a stronger performance than U.S. equity, fixed income, and real estate. Risk appears low, but tends to increase to the level of equity once adjusted for the inherent illiquidity in collectible markets, which leads to downward-biased risk estimates. In a CAPM framework, we further find evidence that only classic cars yield an annual risk-adjusted outperformance (of around 5%) while other collectibles do not significantly outperform. This is paired with low systematic risk, suggesting potential diversification benefits. We further propose that these benefits exist not only cross class, but also intra collectible class. In the period after the Global Financial Crisis, collectibles tend to perform less strongly while keeping slightly higher, but still low, systematic risk estimates. Finally, in a portfolio allocation exercise, we show that adding 10% collectibles to a financial portfolio leads to a 7% reduction in portfolio risk, thus confirming the interesting diversification benefits possessed by collectibles.

REFERENCES

Agnello, R. J. 2002. "Investment Returns and Risk for Art: Evidence from Auctions of American Paintings." *Eastern Economic Journal* 28 (4): 443–463.

Agnello, R. J., and R. K. Pierce. 1996. "Financial Returns, Price Determinants, and Genre Effects in American Art Investment." *Journal of Cultural Economics* 20 (4): 359–383.

Barclays Wealth and Investment Management. 2012. "Profit or Pleasure?" In *Wealth Insights*. London: Barclays.

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

Bouri, E. I. 2015. "Fine Wine as an Alternative Investment During Equity Market Downturns." *The Journal of Alternative Investments* 17 (4): 46–57.

Bouri, E. I., and D. Roubaud. 2016. "Fine Wines and Stocks from the Perspective of UK Investors: Hedge or Safe Haven?" *Journal of Wine Economics* 11 (2): 233–248.

Buelens, N., and V. Ginsburgh. 1993. "Revisiting Baumol's 'Art as Floating Crap Game'." *European Economic Review* 37 (7): 1351–1371.

Burton, B. J., and J. P. Jacobsen. 1999. "Measuring Returns on Investments in Collectibles." *Journal of Economic Perspectives* 13 (4): 193–212.

——. 2001. "The Rate of Return on Investment in Wine." *Economic Inquiry* 39 (3): 337–350.

Campbell, R. 2008a. "Art as a Financial Investment." *The Journal of Alternative Investments* 10 (4): 64–81.

——. 2008b. "Fine Violins as an Alternative Investment: Strings Attached?" *Pensions: An International Journal* 13 (1–2): 89–96.

Cardell, N. S., J. L. Kling, and G. Petry. 1995. "Stamp Returns and Economic Factors." *Southern Economic Journal* 62 (2): 411–427.

Dickie, M., C. D. Delorme, Jr., and J. M. Humphreys. 1994. "Price Determination for a Collectible Good: The Case of Rare US Coins." *Southern Economic Journal* 61 (1): 40–51.

Dimson, E. 1979. "Risk Measurement when Shares Are Subject to Infrequent Trading." *Journal of Financial Economics* 7 (2): 197–226.

Dimson, E., P. L. Rousseau, and C. Spaenjers. 2015. "The Price of Wine." *Journal of Financial Economics* 118 (2): 431–449.

Dimson, E., and C. Spaenjers. 2011. "Ex Post: The Investment Performance of Collectible Stamps." *Journal of Financial Economics* 100 (2): 443–458.

——. 2014. "Investing in Emotional Assets." *Financial Analysts Journal* 70 (2): 20–25.

Erdős, P., and M. Ormos. 2012. "Pricing of Collectibles: Baedeker Guidebooks." *Economic Modelling* 29 (5): 1968–1978.

Faye, B., E. Le Fur, and S. Prat. 2015. "Dynamics of Fine Wine and Asset Prices: Evidence from Short- and Long-Run Co-Movements." *Applied Economics* 47 (29): 3059–3077.

Fernandez-Perez, A., B. Frijns, A. Tourani-Rad, and J. P. Weisskopf. 2017. "Are There Bubbles in Wine?" Working paper.

Flores, R. G., V. Ginsburgh, and P. Jeanfils. 1999. "Long- and Short-Term Portfolio Choices of Paintings." *Journal of Cultural Economics* 23 (3): 191–208.

Fogarty, J. J. 2006. "The Return to Australian Fine Wine." *European Review of Agricultural Economics* 33 (4): 542–561.

——. 2010. "Wine Investment and Portfolio Diversification Gains." *Journal of Wine Economics* 5 (1): 119–131.

Frey, B. S., and R. Eichenberger. 1995. "On the Rate of Return in the Art Market: Survey and Evaluation." *European Economic Review* 39 (3): 528–537.

Frey, B. S., and W. W. Pommerehne. 1989. "Art Investment: An Empirical Inquiry." *Southern Economic Journal* 56 (2): 396–409.

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

Gouverneur, V. 2016. *Art & Finance Report 2016*. Deloitte Luxembourg and ArtTactic, eds. Luxembourg.

Grable, J. E., and K. Watkins. 2016. "Quantifying the Value of Collecting: Implications for Financial Advisers." *Journal of Family and Economic Issues* 37 (4): 639–648.

Graddy, K., and P. E. Margolis. 2011. "Fiddling with Value: Violins as an Investment?" *Economic Inquiry* 49 (4): 1083–1097.

Graeser, P. 1993. "Rate of Return to Investment in American Antique Furniture." *Southern Economic Journal* 59 (4): 817–821.

Hiraki, T., A. Ito, D. A. Spieth, and N. Takezawa. 2009. "How Did Japanese Investments Influence International Art Prices?" *Journal of Financial and Quantitative Analysis* 44 (6): 1489–1514.

Hodgson, D. 2011. "An Analysis of Pricing and Returns in the Market for French Canadian Paintings." *Applied Economics* 43 (1): 63–73.

Hodgson, D. J., and K. P. Vorkink. 2004. "Asset Pricing Theory and the Valuation of Canadian Paintings." *Canadian Journal of Economics/Revue canadienne d'économique* 37 (3): 629–655.

Jaeger, E. 1981. "To Save or Savor: The Rate of Return to Storing Wine." *Journal of Political Economy* 89 (3): 584–592.

Knight Frank Research. 2016. *The Wealth Report 2016*. A. Shirley, ed. London: Knight Frank.

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

Kourtis, A., R. N. Markellos, and D. Psychoyios. 2012. "Wine Price Risk Management: International Diversification and Derivative Instruments." *International Review of Financial Analysis* 22: 30–37.

Kraeussl, R., and R. Logher. 2010. "Emerging Art Markets." *Emerging Markets Review* 11 (4): 301–318.

Krasker, W. S. 1979. "The Rate of Return to Storing Wines." *Journal of Political Economy* 87 (6): 1363–1367.

Le Fur, E., H. B. Ameur, E. Braune, and B. Faye. 2016. "Financial Market Contagion and Fine Wines: The Evidence of the ADCC GARCH Model." *International Journal of Entrepreneurship and Small Business* 29 (4): 583–601.

Lee, B., and Y. Veld-Merkoulova. 2011. "The Persistence of Memory of Marilyn: The Diversification Potential of Individual Artists." *Applied Economics Letters* 18 (11): 1049–1052.

Lucey, B. M., and L. Devine. 2015. "Was Wine a Premier Cru Investment?" *Research in International Business and Finance* 34: 33–51.

Martin, S. 2016. "The Road Less Traveled: The Case for Collectible Automobiles as an Asset Class." *The Journal of Wealth Management* 19 (3): 131–139.

Masset, P., and C. Henderson. 2010. "Wine as an Alternative Asset Class." *Journal of Wine Economics* 5 (1): 87–118.

Masset, P., and J. P. Weisskopf. 2010. "Raise Your Glass: Wine Investment and the Financial Crisis." Working paper.

———. 2015. "Wine Funds: An Alternative Turning Sour?" *The Journal of Alternative Investments* 17 (4): 6–20.

———. 2018. "Wine Indices in Practice: Nicely Labeled but Slightly Corked." *Economic Modelling* 68: 555–569.

Masset, P., J. P. Weisskopf, B. Faye, and E. Le Fur. 2016. "Red Obsession: The Ascent of Fine Wine in China." *Emerging Markets Review* 29: 200–225.

McQuillan, W., and B. Lucey. 2016. "The Validity of Islamic Art as an Investment." *Research in International Business and Finance* 36: 388–401.

Mei, J., and M. Moses. 2002. "Art as an Investment and the Underperformance of Masterpieces." *American Economic Review* 92 (5): 1656–1668.

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

Pesando, J. E., and P. M. Shum. 2008. "The Auction Market for Modern Prints: Confirmations, Contradictions, and New Puzzles." *Economic Inquiry* 46 (2): 149–159.

Renneboog, L., and C. Spaenjers. 2012. "Hard Assets: The Returns on Rare Diamonds and Gems." *Finance Research Letters* 9 (4): 220–230.

———. 2013. "Buying Beauty: On Prices and Returns in the Art Market." *Management Science* 59 (1): 36–53.

Ross, M. H., and S. Zondervan. 1989. "Capital Gains and the Rate of Return on a Stradivarius." *Economic Inquiry* 27 (3): 529–540.

Sanning, L. W., S. Shaffer, and J. M. Sharratt. 2008. "Bordeaux Wine as a Financial Investment." *Journal of Wine Economics* 3 (1): 51–71.

Scholes, M., and J. Williams. 1977. "Estimating Betas from Nonsynchronous Data." *Journal of Financial Economics* 5 (3): 309–327.

Taylor, D., and L. Coleman. 2011. "Price Determinants of Aboriginal Art, and Its Role as an Alternative Asset Class." *Journal of Banking & Finance* 35 (6): 1519–1529.

Veld, C., and Y. V. Veld-Merkoulova. 2007. "Portfolio Diversification Benefits of Investing in Stamps." *The Journal of Alternative Investments* 10 (1): 56–61.

Verhage, J. 2016. "The Collectible Car Market Is Getting the Air Kicked Out of Its Tires." Bloomberg.com, September 22: https://www.bloomberg.com/news/articles/2016-09-22/the-collectible-car-market-is-getting-the-air-kicked-out-of-its-tires.

Worthington, A. C., and H. Higgs. 2003. "Art as an Investment: Short- and Long-Term Comovements in Major Painting Markets." *Empirical Economics* 28 (4): 649–668.

——. 2004. "Art as an Investment: Risk, Return and Portfolio Diversification in Major Painting Markets." *Accounting & Finance* 44 (2): 257–271.