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Investing in superheroes? Comic art as a new alternative investment

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Abstract

Drawing on a dataset of more than 106,000 items of comic art sold at auction, we build quarterly and semi-annual indices for American and European comic art. We find that this new type of alternative investment showed a capacity to outperform US and European equities and bonds. Between 2002 and 2017, annualized returns of US comic artworks clearly outperformed most asset classes with a solid 11% annualized return, while European comic art achieved 25% yearly returns on average in the period after 2009. We show that comic art delivers significant diversification benefits to an investment portfolio thanks to low correlations with other assets and to the geographical diversification between European and American markets. These outcomes contrast with fine art in general, which delivered few diversification benefits when compared to equities and bonds between 2002 and 2017, and whose geographical markets are closely tied to each other.

JEL classification: **C2; G1; Z1; Z11**
Keywords: Comic Art; Alternative Investments; Auctions; Hedonic regressions; Price index; Portfolio

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1 Introduction

Investment in art has generated great interest amongst academics and finance practitioners alike over recent years. According to the Deloitte Art and Finance Report, 2017, an increasing number of ultra-wealthy individuals are willing to invest in artworks along with other collectibles, motivated both by their aesthetic and investment rewards. Academic studies to date have focused primarily on analyzing price determinants and estimating financial returns of fine art, especially of paintings and drawings. These studies have focused on a diversity of fine art movements and media, in different markets and over different periods of time (Goetzmann, 1993; Higgs and Worthington, 2005; Higgs, 2012; Mei and Moses, 2002; Pesando and Shum, 2008; Renneboog and Spaenjers, 2013; Taylor and Coleman, 2011). The most comprehensive of these studies examines the price determinants and returns of fine art for some 1.1 million auction transactions in the period 1957-2007 (Renneboog and Spaenjers, 2013). The authors conclude that the fine art market exhibited a similar performance to that of corporate bonds but with higher risks. Indeed, results are usually mixed when it comes to art bearing any benefits to a diversified portfolio (Goetzmann, 1993; Renneboog and Spaenjers, 2013).

Whereas fine art as an investment is a well-debated topic, the comic art market has received little academic attention. Ang et al. (1983) investigated the hedging characteristics of comic books while Wyburn and Roach (2012, 2013) studied the consolidation of comic books market and their price determinants. However, to date, no academic study has addressed the price formation and returns of original comic art, by which we mean cover drawings, splashes, pages and comic strips drawn by comic creators. Unlike comic books, these originals are unique and non-reproducible. Such artworks can bear traces of penciling and other marks of creative processes produced by comic artists, writers and editors. The artistic appreciation of original comic art has gradually increased since the 1970ies due to the growth of the collectors' market and the emergence of comic art exhibitions and museums (Beaty, 2012). Original comic art collectors are not merely nostalgic veteran fans of comics, but also include more sophisticated types of collectors with an extensive knowledge of comic works and their creators. These collectors are eager to own original comic artwork and are appreciative of any indications of the authenticity of the creative process they might display (Gabilliet, 2016).

Recognizing the enhanced status of comic art, the market has seen record prices being paid for comic artwork in recent years, prices that had previously only been seen in the fine art market. A good example of this is the sale by auction of an original cover

by the underground comic artist, Robert Crumb, for 717,000 U.S. dollars in May 2017, surpassing the fee of 657,250 U.S. dollars paid in May 2014 for the final page of a comic book, the Incredible Hulk #180 by Herb Trimpe and Jack Abel, and for Todd McFarlane's Spider-Man #328 cover art sold at auction in July 2012 for a similar price (Forbes, 2017). However, the record is held by Egyptian Queen (1969), painted by Frank Frazetta and used as the cover of a comic magazine, which was sold for 5.4 million U.S. dollars in May 2019. In Europe, too, there is a growing interest in the work of the continent's comic artists, including that of Hergé, the Belgian author of Tintin. For instance, the original artwork of the last two pages of Hergé's Tintin comic book "Le Sceptre d'Ottokar" was sold for 1.2 million U.S. dollars in April 2016 at an auction in Paris.

The objective of our study is to examine the investment performance of original comic art in the US and Europe. We treat these comic traditions separately due to their distinct cultural backgrounds and the different investment sentiments they may evoke. Methodologically, we follow Wyburn and Roach (2012) and adapt their taxonomy of price determinants to the original comic art market. We use hedonic regressions with Kalman filter to estimate the returns and pricing indexes of comic art for the US and Europe. Additionally, we compare these price indexes with those of fine art and traditional financial assets such as equities and bonds for both Europe and the US. We use Sharpe ratios and Markowitz's efficient frontier approach to investigate whether comic art investments add diversification benefits to an investment portfolio.

For the purposes of our study we collected two original data sets of comic art: 103,289 observations from Heritage Auctions held in the US between 2002 and 2017, and 3,124 observations from Artcurial auctions held in Europe between 2007 and 2018. The two periods include the years of the last financial and economic crisis, a fact that enables us to observe the performance of comic art investment during times of turmoil. Fine art indexes are provided by Artnet A.G.

Our results indicate that comic art investment, especially in the US, performed better than investments in equity and bonds. US comic art showed exceptionally good performance during the crisis, outperforming all other asset classes. Since March 2007, annualized returns of US comic artworks have reached 10%. Returns of European comic art outperform the market with a 26% annualized nominal return, but at the expense of considerable volatility (64% annualized volatility). In contrast, fine art assets exhibit very low returns (average annualized returns of 0 and 3% for European and US art, respectively) coupled with high volatility (average annualized volatility of 14 and 22% for

European and US art, respectively).

Comic art, both from the US and Europe, deliver significant diversification benefits to an investment portfolio. This contrasts with other asset classes, such as fine art, that contribute little to diversification benefits when compared with equities and bonds, a result previously emphasized by Renneboog and Spaenjers (2013). The reasons are multiple. First, both US and European comic art correlates little with other assets. Indeed, the highest correlation of US comic art is with European fine art (17%). On the other hand, European fine art returns correlate highly with the European stock market (55%), the S&P 500 (61%) and oil (60%). American paintings offer a little more diversification, with only a 35% correlation with the S&P 500. The optimal portfolio in the sense of Markowitz (1952) almost systematically includes European and US comic art as asset classes.

This article is structured as follows: first, we briefly retrace the history of comic art and the consolidation of the comic art market. Next, we describe the data, variables and methodology employed. We then report and interpret the results obtained. Finally, we conclude.

2 Comic art - history, market, and prices

2.1 A brief history of American and European comic art

Both American and European comic art traditions have their origins in the mid –nineteenth century with appearance of the first graphic narratives (see Lefèvre, 2018). Notwithstanding, in US it was only with the appearance of the newspaper strip - also known as the comic strip - that its development received a marked stimulus (Goulart, 2000). "Yellow kid" comic strips series by the artist Richard Outcalt is regarded as one of the foundational works in this genre. A comic strip represents a sequence of drawings arranged sequentially into related horizontal panels and accompanied by text balloons and captions, printed in black and white format in daily newspapers and in longer panels in colors in Sunday newspapers and magazines. In parallel to the comic strip, in the mid-1930s, small journals began to appear in newsprint and four-color format which were sold mainly at newsstands. Goulard (2004) regards the 36-page "Famous Funnies: A Carnival of Comics", published in 1933 by Eastern Color Printing Company and distributed by Dell Publishing, as the first American comic book. These early comic books were no more than compilations of comic strip reprints. The comic book with all-original stories was born with the arrival of New Fun Comics in 1935 published by the recently founded National Allied Publica-

tions, the future DC Comics (Beerbohm and Olson, 2009). With the appearance of the first superhero, Superman, created by Jerry Siegel and Joe Shuster and first published in the magazine Action Comics #1 in June 1938, the comic book began to gain public acceptance, especially among children and young people. In the following decades this popularity grew exponentially. Superman was quickly followed by other superheroes (e.g. Batman, Wonder Woman, Captain Marvel, and Captain America, among many others), generating an entire industry, and ushering in the period of the so-called Golden Age of Comics. First TV series "Adventures of Supermen" were launched in 1952 and this event marked the beginning of TV era for comics adaptions, which greatly contributed to comics acceptance in popular culture. After several years of decline in the quality of comic books due to the censorship in comics production, the genre was boosted with the publication of a new version of the Flash superhero in Showcase #4 in October of 1956. This marked the beginning of the Silver Age, which lasted until the early 1970s. Silver Age comic art flourished thanks to the renowned artists Stan Lee and Jack Kirby who, in the early 1960s, introduced via Marvel Comics, a superhero profile with a more human and natural character (e.g. The Fantastic Four, Spider-Man, the Hulk, the X-Men, and the Iron-Man, among others). This period as well was characterized by creation and explosive development of comic fandom and appearance of the first comic fanzines, specialized comic journals. Silver Age comic art had a consequential influence on the next period, the Bronze Age (which lasted until the mid-1980s), a period characterized by the emergence of underground and alternative comics. Finally, the Bronze Age was followed by the Modern Age, dominated by characters with a tendency to be antiheroes, dark and psychologically complex. In this period, the comic art industry, previously consolidated under large, well-established publishing houses, had begun to adopt a new commercial policy. New independent publishers had appeared which, unlike the traditional publishers, grant their authors greater freedom of creation and permission to hold the copyright on their work (Gabilliet, 2010).

The European comic tradition is more fragmented than that of the US since it includes several local comic traditions with some comic series remaining in their original language. The most internationally recognized form of European comic is bande dessinée, originating primarily in Francophone countries such as Belgium, France and Switzerland. This expanded throughout Europe in the 1930s, thanks to the quality and popularity achieved by series such as Hergé's Les Aventures de Tintin and several serial comics published in the Belgian weekly magazine Spirou (Miller, 2007). Countries such as Belgium and

France have attracted talented artists from other countries (Lefèvre, 2018). Examples of the most famous series for children include Lucky Luke, Tintin, Astérix, Les Schtroumpfs (The Smurfs), Thorgal, and Storm XIII. Comic series from other countries, such as Italy (eg Tex Willer and Dylan Dog) and Spain (eg Mortadelo and Filemon), also received international recognition. Apart from these famous series, many countries have produced local comic series that are not so well known among international audiences and not commercialized globally.

European Comic art tradition does not have well defined periods of development like in the US. With some similarities with US comic art, it transitioned from the first comics for children and newspaper comic strips at the beginning of the 20th century to dissemination via specialized comic journals in the period of 1945-1960 (see Lefèvre, 2018). Between 1960 and 1980, TV series were launched based on popular comics series, accompanied by the merchandising of toys and other items. During this period, associations of comic fans were set up, such as the Club des Bandes Dessinees in France and Het Stripschap in the Netherlands. These associations started to publish fanzines (special journals for comic fans) and to organize comic festivals, giving an impulse to widespread acceptance of comic art in popular culture. Starting from 80ies and at present the comic albums gained in popularity. Comic art development has been supporting by increasing media coverage, new animated TV series, comic festivals and merchandising in specialized stores.

2.2 Comic art market

According to Wyburn and Roach (2012), the market for original comic art has been consolidating on the basis of the well-established market for comic books, which evolved from the second-hand market stage to mature investors market. As these authors comprehensively describe, the modern speculative market evolved from the late 1950ies comic book market's consolidation in US. Collectors were willing to pay higher than cover price for comic books, driven by nostalgia (see also Roach and Wyburn, 2009). The constitution of comic fandom in 1960ies, the emergence of specialized comics journals ("fanzines"), the launch of TV series based on comics characters and increased media attention enhanced the cultural and economic value of comics. The Overstreet Comic Book Price Guide launched by R. Overstreet in November of 1970 (and since then published annually) facilitated the analysis of investment potential of comic books by providing information about book condition (grade) and the range of possible prices as well as laying foundations for organized and transparent trade. In the case of original comic art, similar pricing guides

appeared only in 1992 (Weist, 1992). As cultural acceptance of comics widened and comic creators were consecrated as artists, collectors became eager to own original comic drawings, in view of preserving the roots of the artists' creative process. Starting from the mid 1970ies, comic books and comic art started to be sold at auction. In 1991, the auction house Sotheby's organized a special auction of comic books and original comic art, which was covered extensively by mass media (Beaty(b), 2012). Heritage Auctions also stepped into the market for comic books and comic art. The establishment of independent companies able to certify condition and authenticity of original comic art, dealers and restoration services supported the market's development. As the secondary market developed, the possibility to own comic art and comic books both as a consumption and investment good emerged. Nevertheless, comic book market and original comic art markets differ. Books are mass-produced, with most issues comprising thousands of copies (and, after all, scarcity is recognized as one of the main factors contributing to the worth of a comic book). Conversely, original comic art alike is one-of-a-kind, as there is only one original of each individual cover, splash or interior page from a comic book. Original comic art pieces are unique, making them similar to fine artworks. Nowadays, collectors/investors can buy or sell original comic art in several ways. First, they can buy works directly from the artist (e.g. at a fandom convention or via the artists' webpage), or through an artist's representative who obtains a commission for the works sold. Second, they can contact a dealer, who generally owns an inventory of several artists and generally buys or sells works of art on a well-established webpage, as a convention exhibitor, or online auctions. Third, they can trade original works with other collectors at conventions, in collecting community forums (e.g. the CGC Forum), or by browsing members' galleries on Comic Art Fans, which is a website targeting the collecting community (i.e. collectors, dealers, artists, etc.). Finally, auction houses (e.g. Heritage Auctions, Artcurial, ComicLink, etc.) play a major role as a channel for buying and selling original art. It is unfeasible to estimate the exact size of the original comic art market for all of the aforementioned channels comprehensively and very often the sales of comic books and original comic art are reported jointly. According to our estimates, original comic art as one of the most dynamically growing market segments of collectibles. The sales of original comic art at Heritage auctions house grew at CAGR of 13.2% for the period of 2002-2017) reaching almost 22 million dollars in 2017. The Heritage auctions house claims to have around 60% share of comic sales globally. This tendency is confirmed more recently: in 2019 the Heritage auctions announced record sales of over 79 million dollars, more than 20 million

up from 2018 in their comic sales (both originals and books) (Rowe, 2020).

3 Data and variables

The value of original comic art has a strong anchor on the value and popularity of the printed comic books and strips. Therefore the price determinants of original comic art share a number of common factors with those outlined by Wyburn and Roch (2012) for collectible comic books. The data for our study were obtained from Heritage Auctions, in the case of US comic art, and from Artcurial, in the case of EU comic art. They are the largest collectible comic art auctioneers in their respective regions, not only in terms of number of auctions, but also the number of original art works at auction and the total amount of revenue raised at auction. Moreover, Heritage Auctions and Artcurial both handle a broad representation of artists and titles from a range of artistic periods. Our final data set contains 103,289 individual transactions from December 2001 to December 2017 for the US, and 3,124 individual transactions from the last quarter of 2006 to the first quarter of 2018 for the EU. Exhibit 1 reports the yearly number of original comic art transactions auctioned by Heritage Auctions (for the US) and Artcurial (for the EU), excluding charity auctions. We have downloaded all the auction sales records available from both Heritage Auctions and Artcurial webpage historical datasets. We have extracted data from their corresponding titles and descriptions: for instance, we extracted the artist's name from the title and we checked for pseudonyms and different spellings of the artist's name when relevant. We manually checked every single record manually to minimize the presence of errors, and we checked that our database does not contain double entries.

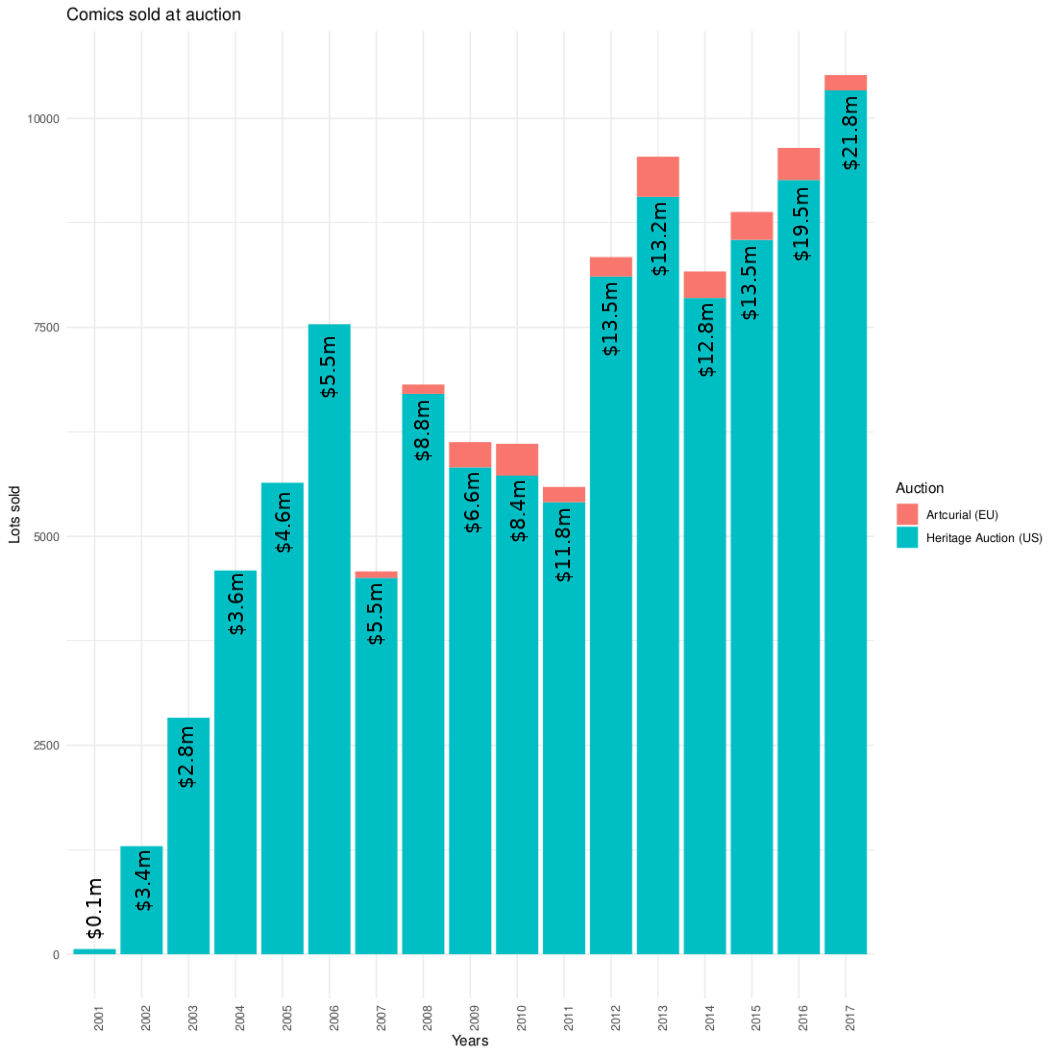

Exhibit 1: Sold items of comic art per year at Heritage Auction (US Comic Art) and Artcurial (EU Comic Art)

For each comic artwork sold at auction, different attributes were collected to capture the price determinants of comic art as close as data allows. In a similar spirit to Ginsburgh et al. (2006)'s hedonic model for fine art, we do not aim at defining a specific theoretical model for comic art prices, but focus on finding one that has the best explanatory power given our data at hands in order to build price indices. Variables are defined according to their respective markets, either American (for US Comic art) or European (for EU Comic art).

Artist: Each comic artwork's creator name is recorded. The artist is the person who imagined and drew the work. For example, a "Superman" drawn by Joe Shuster, his

co-creator, could be expected to fetch a higher price than a "Superman" drawn by Kurt Schaffenberger. The US dataset focuses on the 100 most sold artists at auction, whereas in the European dataset, 450 authors are recorded.

Special characters: According to Weist and Butterworth (2012), characters carry an important weight in determination of value of comics. In the case of American comic art, special importance is attached to superheroes, groups of superheroes, and even Disney characters. We have assigned a dummy variable for the fourteen most important US Comics characters, which represent the majority of sales at auction. In European comic art, the most important and influential character is Tintin, for which a dummy is created.

Publishers: While DC Comics (dummy "ed dc") and Marvel Comics (dummy "ed marvel") are the principal mainstream superhero publishers, there are other noticeable historical publishers including EC Comics ("ed ec"), Warren Publishing ("ed warren") and Kitchen Sink Press (dummy "ed kitchen"), as well as modern, independent publishers such as Dark Horse (dummy "ed dark") and Image Comics ("ed image"). Finally, the main historical comic strip syndicates are King Features Syndicate ("ed king") and Chicago Tribune Syndicate ("ed chicago"). We also included Disney ("ed disney"), given its activity in the field of printed comics involving characters with a household name.

Periods: Given the importance of the different periods in which American comics are classified, several dummies have been included to capture these periods. Platinum Age includes comics prior to 1938, the Golden Age ranges from 1938 to 1955, the Silver Age from 1956 to 1970, the Bronze Age from 1970 to 1985, and the Modern Age is from 1986 to the present. The periods in the European comic art are divided into the following dummies, according to their correspondent decades: pre-fifties, fifties, sixties, seventies, eighties, nineties and the noughties.

First appearance of a character: For US comic art, the first appearance of one of the main characters may boost the significance of a given artwork. A dummy variable is used to represent that variable.

Art categories: US Comics can be essentially subdivided into both comic books and comic strip traditions. Likewise, comic art can be subdivided and is widely discerned by collectors as comprising comic art and comic strip art (dummy "cat strip"). The former can come to auction either as a complete story ("cat completestory"), as a cover ("cat cover") or a painting designed specifically for a cover ("cat painting"), as a single panel page ("cat panelpage"), or as a splash ("cat splash"). Alternative types of comic art can be identified in keeping with the classification provided by Heritage Auctions,

including a single illustration, a sketch, miscellaneous art, or any other unknown or non-classifiable arts (all of them summarized here under the dummy "cat other imsu"). Given the specific features of European comic art and our database, we introduce dummies for a cover ("ouverture"), a single page ("planche") and a strip ("strip") for European data. A cover of a specific comic book issue could have more value than a double-page splash, which in turn may be more valuable than an individual splash. Finally, an ordinary or interior panel page could be less valuable on average. Likewise in the case of a comic strips, Sunday strips are those which usually are more significant in their story and size.

Daily/Sunday strip: for US Comics, prices can differ according to the timing of the strip: they are generally categorized as daily (dummy "strip daily") or a Sunday strip. The former, published on weekdays, is less scarce and usually displayed horizontally as a linear sequence of gags (i.e. it is usually greater in height but smaller overall than a Sunday strip). The latter, appearing in the Sunday edition of newspapers, is usually characterized by a much more elaborate story and artwork (e.g. they conclude a story or a gag). Sunday strips are more scarce and are usually bigger (i.e. they comprise several horizontal strips).

Art provenance: A dummy variable captures the artworks provenance from either a collection of a well-known artist or that of a collector with a household name ("collection").

Size: The size of the object is represented by both its width ("width") and height ("height") in inches, and by its area ("area").

Medium: We introduce dummies for the different traditional media used to produce European comic art: carton, ink ("encre"), gouache and watercolor ("aquarelle").

Condition: Although the condition of the work is much more relevant in the valuation of comic books, it can also apply to original comic art. The dummy "cond exvf" reflects an art object that is in excellent or very fine condition.

Nude or pinup figure: The depiction of a nude or pinup figure in the comic art (dummy "nudeorpinup title").

Auction type: For US Comics, Heritage Auctions holds two types of auction (i.e. ordinary or weekly auctions, and featured or quarterly auctions which may be more important), a dummy variable was assigned to distinguish between the two.

Financial indices are provided by Bloomberg and consist of quarterly returns of the S&P 500, the EuroStoxx 600, the U.S. 10 years Treasury Bond, the German 10 years Bund, the Dow Jones Corporate Bond Index which is a Total Return bond index, the Bloomberg Barclays Pan European Aggregate Corporate TR Index, which also includes

total returns, the spot gold prices and the West Texas Intermediate oil prices. American and European quarterly fine art indices are provided by Artnet A.G. and consist of the aggregated returns of the 500 artists most sold at auction since 2002, and that are of American and European origin.

4 Methodology

The financial returns of physical assets, such as art, have to be statistically estimated since such assets are typically heterogeneous. Generally, two methodologies are used to address this problem: the repeat sale methodology (RSM) and hedonic regression. Hedonic regression involves eliminating heterogeneity and measuring the marginal impact of time on a pool of assets, while RSM can be viewed as a particular case of hedonic regression, involving the computation of average returns of the exact same assets sold and re-sold through time. RSM has been criticized for the fact that it focuses on a small sample of goods that can exhibit survival bias (see Collins et al., 2009). RSM has been used to estimate real-estate returns in the U.S. by Case and Shiller (1987) and Goetzmann (1992). Drawing on auction resale data, Pesando (1993), Goetzmann (1993) and Mei and Moses (2002) use RSM to estimate the performance of the art market. Generally speaking, the hedonic regression methodology consists in regressing the price of different goods on their relevant characteristics and, hence, controlling for heterogeneity. The classical approach is to include time dummy variables in the regression, whose coefficients constitute the basis for building an index. Hedonic regression has been extensively used to build price indices of, above all, collectibles. Wyburn and Roach (2012) employed hedonic analysis for collectable comic books. De la Barre et al. (1994), Collins et al. (2009), Hodgson and Vorkink (2004), Renneboog and Spaenjers (2013) and Bocart and Hafner (2012, 2015) used it for visual art, Engle, Lilien and Watson (1985), Schulz and Werwatz (2004) and Gouriéroux and Laferrère (2009) for real estate, Combris et al. (1997) and Fogarty (2006) for wine and Graddy and Margolis (2011) for violins. A major challenge in applying the hedonic regression methodology is the choice of a functional form. The most common form is to regress the log price of a good on a linear combination of its characteristics. In the art market, Ginsburgh et al. (2006) show that hedonic regression outperforms RSM when the sample size is small, but that the results converge as the sample size increases. In the present case, repeat sales are practically absent from the dataset, leaving us with little choice but to use the hedonic regression methodology.

Bocart and Hafner (2015) introduced a Kalman filter estimator of the time series as a random effect as opposed to estimating the coefficients of fixed effect time dummies. The model can be written as follows:

$$Y_{it} = \beta_t + X'_{it}\alpha + u_{it}, \quad t = 1, \ldots, T; \quad i = 1, \ldots n_t, \tag{1}$$

where Y_{it} is the log price of the i-th sale at time t, and n_t is the number of sales at time t. u_{it} is an error term with $u_{it} \sim N(0, \sigma_u^2)$. The vector X_{it} contains the K characteristics of the i-th sale at time t, and α is a $(K \times 1)$ parameter vector, measuring the price contributions of each characteristic across assets. Defining the $(n_t \times 1)$ vector $a_t = (1, \ldots, 1)'$, the model can equally be represented as

$$Y_t = X'_t\alpha + a_t\beta_t + u_t, \quad t = 1, \ldots, T \tag{2}$$

where $u_t = (u_{1t}, \ldots, u_{n_t,t})'$. The latent process β_t is assumed to follow a random walk:

$$\beta_t = \beta_{t-1} + \xi_t, \tag{3}$$

with $\beta_0 = 0$, and ξ_t is an i.i.d. error term with mean zero and variance σ_ξ^2. In a first stage, α can be estimated by a consistent estimator $\hat{\alpha}_{LS}$, with a least square regression. If we impose a normality assumption on the error terms of equations (**??**) and (**??**), maximum likelihood and the Kalman filter can be applied to efficiently estimate β_t in a second stage. In practice, a major advantage of this approach is the possibility of significantly increasing the frequency of the estimated time series compared to assuming time as a fixed effect, as shown by Bocart and Hafner (2015).

In order to obtain the series of returns, the methodology needs to be applied to our two datasets: US comic art and European comic art. A key step in the methodology is the selection of characteristics in the first stage. To achieve that goal, we first eliminate variables that exhibit near multicollinearity with other explanatory variables. For the US comic art sample, the authors are quasi-collinear with the characters of their comics, the publisher and the periods. For the European comic art sample, the same problem occurs with the characters and authors, so that characters are subsequently removed. The remaining variables are selected following the Akaike information criterion (Akaike, 1974). After estimating the returns of comics with the Kalman filter at a quarterly and semi-annual frequency for both US and European comics, these returns are compared with those of other assets in the classical mean-variance framework developed by Markowitz

(1952).

5 Empirical results

5.1 Hedonic regressions

As described in the preceding section, a first step consists in selecting variables and estimating their associated parameters in the framework of a hedonic model. For US comic art, K=37 variables are included in the final regression. Robustness checks show a maximum variance inflation factor of 3.27 for the panel pages category while all others are under 3 while the maximum cook distance is of 1.60. The R^2 of 54% is in line with existing literature for art price indices (eg: Renneboog et al, 2013).

For European comics, K=57 variables are selected. Robustness checks show a maximum variance inflation factor of 2.76 while the maximum cook distance is of 0.014[1]. Exhibits 2 and 3 provide the results for European and US comics, respectively. Unsurprisingly, both for US and European comic art, the area of the artwork has a significant positive impact, as do the type of art and the period: the older the comic, the more expensive it is. In both the US and EU cases, original drawings for covers are the most expensive categories of drawings.

[1]Further robustness checks involved comparing the kalman-filter based index with a time-dummy based index at lower frequencies, the indices follow each other with remarkable consistency

Variable	Estimate (Std. Error)	Variable	Estimate (Std. Error)
(Intercept)	3.396 (0.279)***	druillet	0.882 (0.163)***
log(area)	0.383 (0.036)***	peyo	1.675 (0.184)***
framed	0.574 (0.048)***	pratt	2.037 (0.197)***
rare	0.397 (0.099)***	craenhals	-1.099 (0.212)***
superbe	0.438 (0.083)***	juillard	0.649 (0.167)***
pre-fifties	0.555 (0.148)***	greg	-0.564 (0.156)***
fifties	0.511 (0.126)***	uderzo	1.353 (0.413)***
sixties	0.446 (0.096)***	morris	1.452 (0.307)***
seventies	0.286 (0.082)***	hermann	0.592 (0.166)***
eighties	0.104 (0.070)	ledroit	0.235 (0.165)
nineties	0.159 (0.081)*	crecy	1.219 (0.192)***
oughties	0.108 (0.074)	chaland	1.621 (0.275)***
encre	0.456 (0.077)***	attanasio	-0.839 (0.318)***
gouache	0.303 (0.048)***	funcken	-1.085 (0.264)***
aquarelle	0.515 (0.059)***	cuvelier	0.959 (0.269)***
couverture	0.552 (0.068)***	calvo	0.452 (0.232)*
planche	0.172 (0.052)***	forton	-0.889 (0.286)***
strip	0.223 (0.087)**	schuiten	2.347 (0.291)***
dupuis	0.179 (0.082)**	loisel	1.455 (0.285)***
dargaud	0.236 (0.072)***	gibrat	1.556 (0.226)***
sale_typethemed	0.678 (0.068)***	aidans	-1.102 (0.230)***
studios_herge	-1.230 (0.227)***	sfar	2.114 (0.224)***
herge	1.946 (0.095)***	March	-0.564 (0.097)***
bilal	2.552 (0.121)***	April	0.036 (0.103)
franquin	2.323 (0.149)***	May	-0.115 (0.093)
jeangiraud_moebius	1.875 (0.122)***	June	-0.669 (0.109)***
reiser	0.285 (0.126)**	September	-0.354 (0.260)
jacobs	1.043 (0.271)***	October	-0.259 (0.129)**
charlier	-2.526 (0.647)***	November	-0.157 (0.089)*
Observations	3,124		
R^2	0.540		
Adj-R^2	0.532		
F Statistic	62.119*** (df = 58; 3,065)		
Notes:	***Significant at the 1 percent level.		
	**Significant at the 5 percent level.		
	*Significant at the 10 percent level.		

Exhibit 2: Hedonic Regression of log prices on variables for EU Comic art

Variable	Estimate (Std. Error)		
(Intercept)	4.061 (0.014)***	bronze_age	0.231 (0.012)***
cat_completestory	0.566 (0.017)***	modern_age	-0.198 (0.012)***
cat_cover	0.831 (0.016)***	log(area)	0.0002 (0.000)***
cat_splash	0.378 (0.022)***	cond_EXVF	0.211 (0.008)***
cat_panelpage	0.256 (0.014)***	signed	0.189 (0.009)***
cat_painting	0.692 (26.046)***	collection	0.353 (0.012)***
cat_other	0.189 (0.014)***	auc_big	1.879 (0.008)***
strip_sunday	0.380 (0.017)***	superman	0.224 (0.032)***
ed_dc	0.176 (0.014)***	iron_man	0.236 (0.057)***
ed_marvel	0.420 (0.014)***	batman	0.556 (0.031)***
ed_ec	0.241 (0.021)***	wonder_woman	0.399 (0.067)***
ed_warren	0.467 (0.050)***	spider_man	0.368 (0.030)***
ed_kitchen	0.538 (0.064)***	hulk	0.216 (0.045)***
ed_dark	0.450 (0.042)***	thor	0.377 (0.051)***
ed_king	0.208 (0.017)***	captain_america	0.380 (0.045)***
ed_chicago	-0.260 (0.026)***	wolverine	0.395 (0.055)***
platinum_age	0.612 (0.021)***	x_men	0.606 (0.047)***
golden_age	0.469 (0.015)***	fantastic_four	0.960 (0.051)***
silver_age	0.410 (0.013)***	donald_duck	0.101 (0.052)*
Observations	103,289		
R^2	0.4764		
Adj-R^2	0.4762		
F Statistic	2,539*** (df = 37; 103,251)		
Notes:	***Significant at the 1 percent level.		
	**Significant at the 5 percent level.		
	*Significant at the 10 percent level.		

Exhibit 3: Hedonic Regression of log prices on variables for US Comic art

For the US series, artworks traded in more important sales command a premium over those auctioned weekly. This may be attributed to the fact that higher quality artworks and authors are more likely to be included in seasonal sales. As for publishers, Marvel Universe seems to impact prices positively, and to do so more than DC Comics, although the highest impact is associated with alternative and specialized publishers such as Warren, Dark Horse and, above all, Kitchen Sink Press, which selectively published adult and underground stories by artists of high repute (e.g. Robert Crumb, Will Eisner, Chris Ware, Daniel Clowes, and Charles Burns). The condition, the presence of a signature, and provenance from a well-known collection also have an influence on auction prices. Finally, the characters also seem to play a major role. The Fantastic Four command the highest premium, followed by X-Men. Batman's marginal impact on prices is higher than

that of Ironman and Superman. This can be attributed to a positive link between the marginal impacts and the presence of these characters in movies (i.e. cinema, TV series, etc.) during the decades covered by our study. For instance, following an inspection of the archives of films produced in recent years, it is not surprising to see that The X-Men film saga comprises twelve films produced between 2000 and 2019. Similarly, the Fantastic Four film saga is made up of three films produced in 2005, 2007 and 2015, while the production studios are preparing different spin-offs of this saga (i.e. Doctor Doom, Silver Surfer) to be released in the near future and many other films integrated in the Marvel Cinematic Universe. Finally, the most recent Batman movies (i.e. Christopher Nolan's trilogy) were released in 2005, 2008 and 2012. A possible explanation for the long-term strong performance of American comic art, compared for example to that of the fine art market, may be the emergence of online peer-to-peer transactions and the growing influence of auction houses in organizing the market in the early 2000s.

As for European comic art, in addition to the influence of periods and types of art, the presence of certain specific authors has a very high positive impact on prices. In particular, well-known illustrators such as Enki Bilal, Pratt and de Crecy command high prices for their artworks. The same is true of authors of highly popular series (Peyo and The Smurfs, Hergé and Tintin). By contrast, works by animators (Studio Hergé) and authors of lesser known comics fetch lower prices at auction.

We turn next to the construction of price indices and returns, and an analysis of diversification benefits associated with comic art. Due to the differences in data availability of European and American comic art, we opted to split the analysis into two parts: A first analysis focuses on US Comic Art at a quarterly level from 2002 onwards. In a second step, the same analysis is performed at a semi-annual frequency starting in 2007 to include European comic art. In order to check the robustness of our results with respect to the 2008 financial crisis, the semi-annual analysis is performed for the periods 2007-2017 and 2009-2017.

5.2 Price indices and returns: 2002 to 2017, quarterly frequency

At a quarterly frequency for the period 2002-2017, price indices for US comic art are obtained using the methodology outlined in Section 4 and compared to other asset classes. The price indices are all normalized to unity in the first quarter of 2009. Exhibit 4 compares the evolution of comic art prices with those of equities. The striking performance of American stocks since 2009 is self-evident, but it is also clear that American comic art

has performed very well since the end of the global lows attributable to the financial crisis. Furthermore, the index showed remarkable stability during both the 2008 financial crisis and the 2011 European debt crisis. European comic art also seems to have suffered drastically from the effects of the 2008 financial crisis. The price index for European comic art dropped more than 50% between the first semester 2008 and the second semester 2009. However, it quickly recovered and rallied back to the same level as American comics in subsequent years.

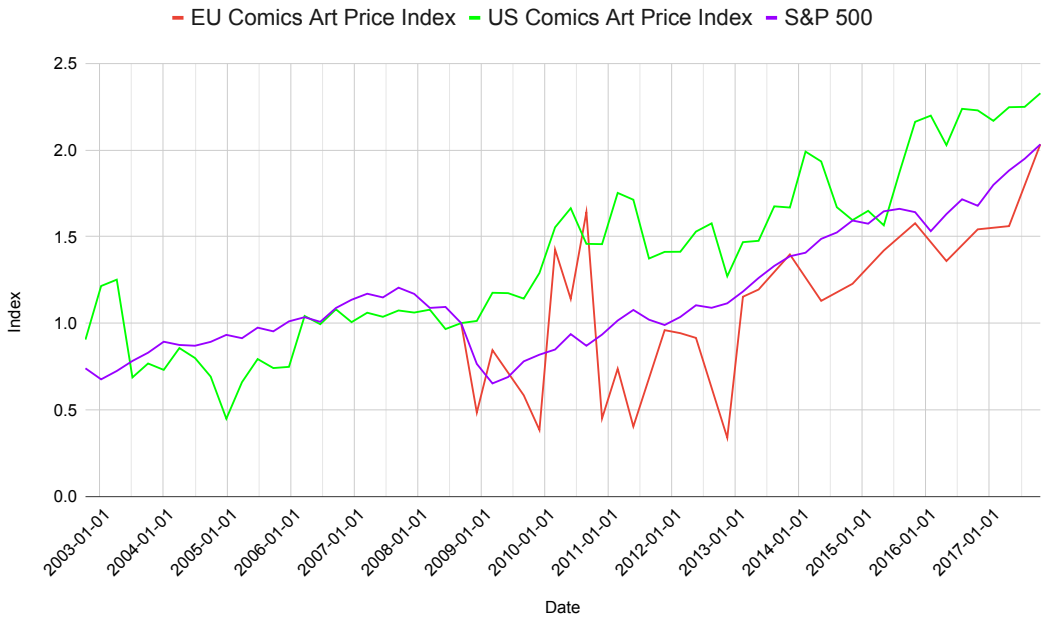

Exhibit 4: Price indices, quarterly frequency, 2003-2017.

To analyze the long-term performance of comic art, Exhibit 5 summarizes annualized returns and volatility for each asset class. Volatilities have been annualized in accordance with the assumption that securities follow a Wiener process. Over the whole period, US Comics have delivered the largest returns (11.22%), a performance that is similar to both oil (10.90%) and gold (10.68%). At 0.37, the Sharpe ratio of US Comics over the 15-year period is comparable to that of our reference basket of commodities (0.38), oil (0.35) and European Stocks (0.38).

The diversification benefits of US comics over the period 2002-2017 are self-evident. We find that US Comics have been uncorrelated to most assets, with the exception of oil (+17%) and European fine art (+14%). Other asset classes are either slightly negatively

correlated (S&P 500: -11%, US Corporate bonds: -11%, American fine art: -10%) or not correlated at all. By contrast, American fine art and European fine art are strongly correlated and co-move at a quarterly frequency with the S&P 500 (40 and 47% correlation, respectively), European stocks (29 and 47%) and commodities (22 and 54%). As expected, US and EU equity returns strongly correlate (86%), as do US and EU corporate bonds (63%) and US and German government bonds (85%).

	Returns	Volatility	Sharpe Ratio
US Treasury 10Y	1.69%	0.18%	9.26
German Bund 10Y	1.37%	0.34%	4.06
US Corpo. Bonds	1.45%	5.71%	0.25
EU Corpo. Bonds	4.37%	4.73%	0.92
S&P 500	9.21%	14.38%	0.64
Stoxx Euro 600	5.99%	15.96%	0.38
Commodities	4.89%	12.90%	0.38
Gold	10.68%	14.32%	0.75
Oil	10.90%	30.95%	0.35
US Comic Art	11.22%	29.94%	0.37
American Fine Art	7.53%	24.59%	0.31
European Fine Art	3.97%	13.98%	0.28

Exhibit 5: Annualized returns and volatilities for asset classes: 2002 - 2017

Keeping this in mind, Markowitz's (1952) classical mean-variance framework offers an opportunity to further confirm the diversification benefits of US comics in a portfolio. The individual assets are represented in risk-return space in Exhibit 6 together with the efficient frontier. Similar to oil, US comics bear a relatively high risk, compensated by high returns, and are close to the efficient frontier.

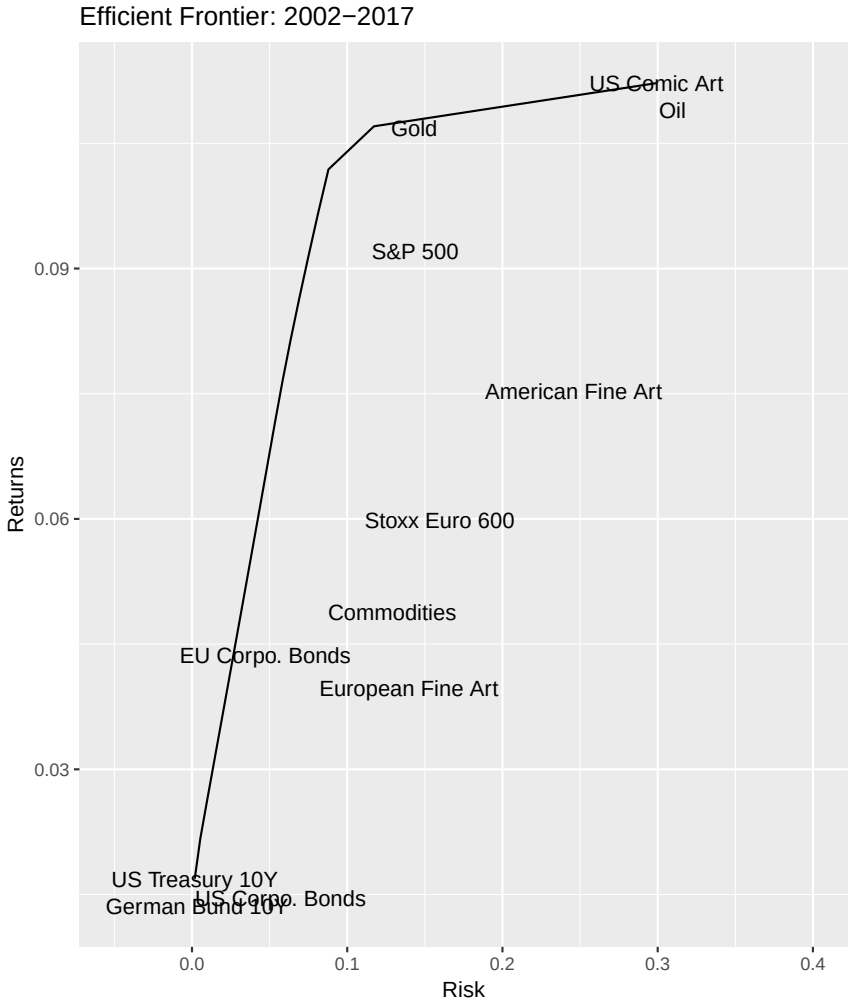

Exhibit 6: Efficient frontier: 2002-2017, quarterly frequency

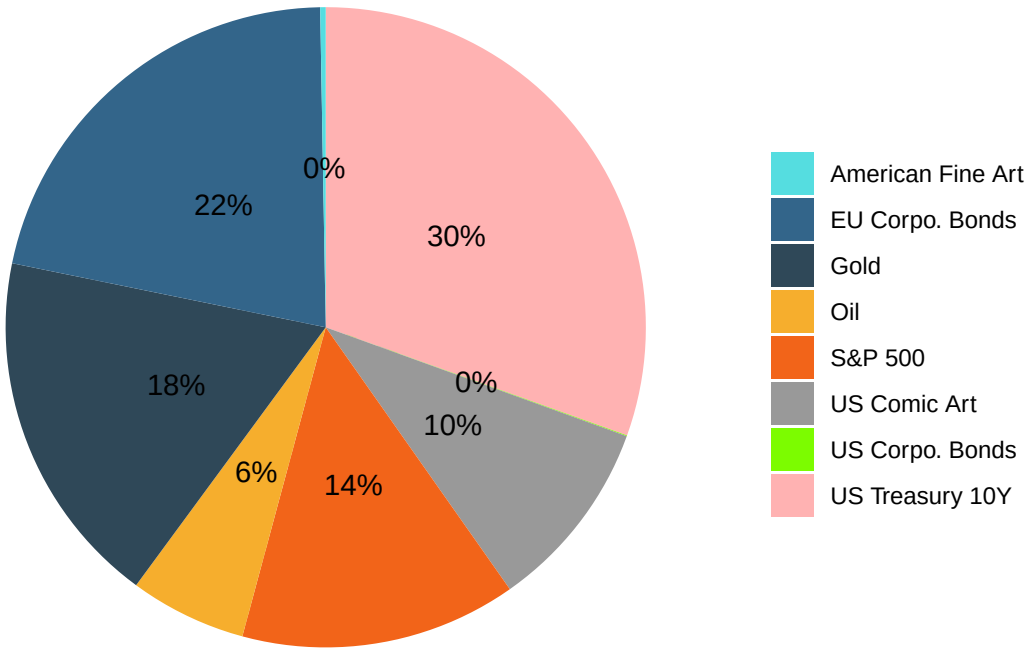

Exhibit 7: Average of the Portfolio weights of twenty efficient portfolios along the efficient frontier, equally spaced: 2002-2017, quarterly frequency

Exhibit 7 shows the average weights of portfolios along the efficient frontier. Clearly, US comics should form part of a balanced portfolio, together with equities, oil, gold, and corporate bonds. Other types of American fine art are much less useful according to the mean-variance framework, with a maximum allocation of 1% of the portfolio compared to an average of 9.7% for US comics. Because US treasuries are not based on Total Returns compared to European Corporate Bonds, it might be that their weight in the portfolio be slightly underestimated.

In practice, it should be recalled that the Markowitz (1952) framework assumes frictionless markets, which is far from being the case for collectibles as they can suffer from liquidity restrictions as well as high transaction costs. However, the main result of the analysis is that under ideal conditions, US Comics enter into a portfolio where other forms of artwork do not. An investigation of optimal portfolio allocation for collectibles that takes liquidity and transaction costs into account is left for future research.

5.3 Inclusion of European comic art: 2007/2009 to 2017, semi-annual frequency

As the European comic art price index is only available at semi-annual frequencies from 2007 onwards, a similar analysis is performed with six-month intervals for all assets for two periods: 2007 to 2017 and 2009 to 2017, in order to check the robustness of our results with respect to the 2008 financial crisis. Results from the quarterly observations between 2002 and 2017 for American comic art are confirmed at the semi-annual frequencies, both directly before and after the 2008 financial crisis. Annual returns for US comics are estimated to be 9.25% over the last decade (9.95% for the period 2009-2017). Because of the significantly smaller amount of European data than for the US and the related estimation uncertainty, the returns of European comic art must be treated with some caution. When considering a 95% confidence interval for the returns, European comic art prices have grown between 205 and 516% over the period 2007-2017, which translates to a compound annual growth rate (CAGR) anywhere between 10.5 and 18% for an expected annual growth rate of 60% with a 119.15% annual volatility. In practice, this means that the overall upward trend has brought at least 10.5% return per year over the full 10-year period, but any given year is expected to grow 60%. The large gap between the two measures is due to the huge volatility that impacts this asset class and the uncertainty tied to measurement errors.

2007-2017	Returns	Volatility	Sharpe Ratio	**2009-2017**	Returns	Volatility	Sharpe Ratio
US Treasury 10Y	1.53%	0.20%	7.82	US Treasury 10Y	1.44%	0.16%	8.83
German Bund 10Y	1.14%	0.46%	2.48	German Bund 10Y	0.93%	0.40%	2.29
US Corpo. Bonds	1.68%	4.74%	0.35	US Corpo. Bonds	2.72%	4.67%	0.58
EU Corpo. Bonds	4.13%	5.54%	0.75	EU Corpo. Bonds	6.54%	4.85%	1.35
S&P 500	6.83%	15.34%	0.44	S&P 500	14.48%	11.13%	1.30
Stoxx Euro 600	1.99%	17.06%	0.12	Stoxx Euro 600	9.56%	13.52%	0.71
Commodities	2.49%	13.76%	0.18	Commodities	3.48%	12.37%	0.28
Gold	7.65%	14.07%	0.54	Gold	4.96%	13.85%	0.36
Oil	1.41%	30.04%	0.05	Oil	-2.31%	28.78%	-0.08
US Comic art	9.25%	17.74%	0.52	US Comic art	9.95%	19.48%	0.51
EU Comic art	60.06%	119.15%	0.50	EU Comic art	25.83%	68.46%	0.38
American Fine Art	0.71%	14.31%	0.05	American Fine Art	3.65%	12.14%	0.30
European Fine Art	-0.34%	12.16%	-0.03	European Fine Art	1.52%	10.00%	0.15

Exhibit 8: Annualized returns and volatilities for asset classes: 2007/2009 - 2017

For the period 2009-2017, the CAGR of European comic art stands at between 0 and 8.5% with an annual average growth rate of 26%. The difference in returns pre- and post- crisis is naturally attributed to the 75% negative hit taken by European comic art prices during the financial crisis, as previously mentioned. The 95% confidence interval for the shock due to the financial crisis is [-88%; -22%]. Despite this temporary contagion, European comics have been overall uncorrelated with other asset classes. Between 2007 and 2017, European comics have been most positively correlated to American fine art (+38%), oil (+24%) and European fine art (+22%) and negatively correlated to American and European bonds (-23% and -21% respectively) and to US equities (-19%). Unlike comic art, American and European fine art exhibit volatilities comparable to stocks with mediocre returns: between 2007 and 2017, American fine art recorded only a +0.17% yearly return on average, whereas European fine art suffered strongly during the financial crisis to the extent that prices in 2017 were still lower than those in 2007, accounting for an average -0.34% annual yield. Both asset types are excluded from the mean-variance efficient portfolios. Similar results hold after the financial crisis. However, the financial returns of US comics have a relatively low correlation with those of European comics (correlation of +12%). This may explain why the mean-variance framework includes both European and US comics along the entire length of the efficient frontier. When including the financial crisis in the analysis, the diversification benefits of comics is so strong that the average optimal allocation of comic art sold at auction reaches a total of 65% of the portfolio. Even when considering all asset classes in the immediate aftermath of the crisis, European comic art still amounts to +26% of exposure in a perfectly liquid world. Obviously, such allocations would be impractical, mostly due to the low liquidity

and small transaction volumes. However, the main result of this empirical investigation is that comic art outperforms fine art on three key levels: returns, risk, and diversification benefits.

6 Conclusion

Since the beginning of the century, interest in comic art as a collectible asset has grown. We have focused on two traditions of comic art: American and European. Our results show that the American comic artworks that command the largest premiums are the oldest, belonging to the Platinum (early XXth century) and Golden ages (1940ies and 1950ies). Batman, for example, yields on average higher prices than Superman, but the market's favorite collectibles are artworks depicting the Fantastic Four and the X Men. All of these superheroes have benefited in recent decades from tremendous media exposure thanks to their adaptation to the movie screen. Moreover, Disney's acquisition of Marvel for $ 4.24 billion in 2009 may have contributed to further popularizing these comic characters in recent years. European comic markets, in contrast, behave differently from their American counterparts: here, the market seems ready to pay more for the work of illustrators of adult comics, with artists such as Enki Bilal and Hugo Pratt commanding the highest premiums. Artists like Hergé and Peyo, the Belgian authors of Tintin and Smurfs, respectively, also benefit from premiums at auction.

In general, investors in both American and European comic artworks are eager to pay a larger premium for older editions of comic art, revealing scarcity of such work and the growing recognition of this new art form in popular culture, its historical relevance to contemporary forms of entertainment and its impact on modern culture. This growing interest is also apparent in the way auction markets have rewarded collectors and investors over the last few decades. As the 2008 financial crisis has left the world in quest of safe havens and assets that deliver diversification to a portfolio, our results suggest that comic art has outperformed most common asset classes, including blue chip stocks and commodities. Using a Kalman filter-based index to construct comic art price indices, we report that the price, in particular, of American comic art did not fall during the financial crisis and has grown at 11% per year on average since 2002. While the prices of European comic art were hit heavily by the 2008 financial meltdown, according to a mean-variance analysis, their high returns since 2007 justify their inclusion in a portfolio. Interestingly, the diversification benefits of comic art seem largely to outstrip those of

other forms of fine art, which are heavily correlated to stocks and whose returns have been close to zero since the financial crisis, in particular the returns of European fine art. Furthermore, the correlation between American comic art and European comic art is very low, delivering additional diversification benefits given the separate geographical nature of the two markets, a feature long lost for other asset types, especially in the case of Europe and America.

Additional questions concerning the role of comic art as a new alternative investment that merit further research include the following: What impact does the movie industry have on the returns of comic art? What type of liquidity would be needed for these collectibles to be included in a liquidity-adjusted portfolio? Finally, Bocart et al. (2011) point to a bubble on Impressionist art at the end of the 1980ies in which prices of artworks suddenly rose in prices, only to collapse as rapidly. Could a similar phenomenon happen in the comics market? These questions need to be addressed in future research.

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