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Art as an investment: Risk, return and portfolio diversification in major painting markets

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Abstract

This paper examines risk, return and the prospects for portfolio diversification among major painting and financial markets over the period 1976-2001. The art markets examined are Contemporary Masters, French Impressionists, Modern European, 19th Century European, Old Masters, Surrealists, 20th Century English and Modern US paintings. The financial markets comprise US Treasury bills, corporate and government bonds and small and large company stocks. In common with the literature in this area, the study finds that the returns on paintings are much lower and the risks much higher than conventional investment markets. Moreover, while low correlations of returns suggest that opportunities for portfolio diversification in art works alone and in conjunction with equity markets exist, the construction of Markowitz mean-variance efficient portfolios indicates that no diversification gains are provided by art in financial asset portfolios. However, diversification benefits in portfolios comprised solely of art works are possible, with Contemporary Masters, 19th Century European, Old Masters and 20th Century English paintings dominating the efficient frontier during the period in question.

Key words: Art and collectibles; Risk and return; Markowitz efficient frontier; Portfolio diversification

JEL classification: C61; D81; G11.

1. Introduction

In March 1987 Vincent Van Gogh's [1853-1890] *Sunflowers* sold at auction for $39.9 million (all dollar figures in USD), followed in November by the sale of *Irises* for $53.9 million. Additional record-breaking sales in art markets followed closely. In May 1989, Pablo Picasso's [1881-1973] *Yo Picasso* sold for $47.8 million, far exceeding the $5.8 million that it last commanded in May 1981: his *Noces de Pierette* later sold for $60.0 million. In May

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1990, Van Gogh's *Portrait of Docteur Gachet* sold for $82.5 million and Pierre-Auguste Renoir's [1841-1919] *At the Moulin de la Galette* for $78.1 million, becoming the two most expensive pictures ever sold at auction (Pesando and Shum, 1999). Indeed, even demand for Modern and contemporary paintings in the 1980s was so strong that works by (often still-living) artists such as Roy Lichtenstein, Jackson Pollock, Jasper Johns, Robert Rauschenberg, Willem de Kooning and Andy Warhol were frequently attracting prices in excess of $10 million (Anonymous, 2000). As a result, the international market for auctioned art grew dramatically during this time, from less than $150 million in 1970 to more than $1.8 billion in 1997 (Renneboog and Van Houtte, 2000).

Obviously, these examples and others indicate that at least some paintings have increased significantly in value and thereby generated large rates of return for their owners. For instance, *Irises* had last been bought in 1948 for $84,000 (some $0.5 million at 1989 prices), such that the record 1987 sale provided a 12 percent annual real rate of return (De la Barre *et al*., 1994). And despite the well publicised bear market in art during the period 1989-1992, there has been a sustained revival in picture prices over much of the last decade, especially in areas outside the sky-high prices of Impressionist, Modern and contemporary works a decade earlier (Curry, 1998). For example, Old Master sale prices have been rising strongly, with many paintings selling for more than their high estimates. A rediscovered El Greco [1541-1614] of *The Crucifixion* recently sold for more than six times its estimate at £3.6 million and a tiny flower painting by Ambrosius Bosschaert the Elder [1573-1621] realised five times expectations at £1.92 million (Anonymous, 2000).

In response to the commonly held belief that the art market yields huge profits in comparison to other more prosaic investment markets, a small but growing literature has examined the financial characteristics of the market in paintings, and art markets in general (paintings, sculpture, ceramics and prints, along with collectibles such as coins, stamps, antiques and furniture). This invariably accompanies a revival of interest in art investment by the business world (see Oleck and Dunkin, 1999; Peers and Jeffrey, 1999). Starting with the seminal work of Baumol (1986) much of this has been concerned with measuring the rate of return of paintings (see, for example, Frey and Pommerehne, 1989; Buelens and Ginsburgh, 1993; Goetzmann, 1993; Pesando, 1993; Chanel *et al*., 1994; Frey and Eichenberger, 1995a, 1995b; Guerzoni, 1995; Candela and Scorcu, 1997; Frey and Pommerehne, 1998; Pesando and Shum, 1999), however in recent years there has been an emerging emphasis on other analytical dimensions of art investment (Felton, 1998).

Importantly, if art is to be regarded as a valid (albeit imperfect) addition to traditional investments such as stocks and bonds amongst others, there is the requirement of examining the prospects for diversification in such portfolios (Flores *et al*., 1998). Moreover, it is also desirous to examine the prospects for diversification in portfolios composed primarily of art held by investors, collectors, dealers and museums, amongst others. If low correlations of returns exist between various art markets, diversifying across these markets may allow investors to reduce portfolio risk while holding expected return constant. Unfortunately, little empirical evidence currently exists concerning correlation among the differing art markets and the concomitant prospects for portfolio diversification, both among art works alone and in combination with financial assets.

Of course, it goes without saying that art markets differ substantially from financial markets, and this potentially limits the strict applicability of well-known financial techniques. Art works are not very liquid assets, almost never divisible, transaction costs are high, and there are lengthy delays between the decision to sell and actual sale. Investing in art typically requires extensive knowledge of art and the art world, and a large amount of capital to acquire the work of well-known artists. The market is highly segmented and dominated by a few large auction houses, and only a small number of works are presented for sale throughout the year. Risk is also pervasive, deriving from both the physical risks of fire and theft and the possibility of reattribution to a different artist, and the cost of insurance as a result can be prohibitive. And while auction prices represent, in part, a consensus opinion on the value of art works, values in turn are determined by a complex and subjective set of beliefs based on past, present and future prices, individual tastes and changing fashion.

Nevertheless, in recent years it has been widely accepted that most art markets have moved closer to the ideals set by financial markets. Turnover, for example, has increased dramatically among the auction houses and the larger proportion of transactions are pursued in these as against traditional dealers. Information on alternative art investments is now more accessible through the attention of the media, and the publishing and dissemination of catalogues and price index series has increased the amount of information available to both buyers and sellers. Likewise, art markets are increasingly globalised, and the widening of the asset pool to include collectibles, furniture, jewellery and wine, amongst others, has seen substantially greater participation in most art markets. Of course, caution must play its part when applying the tools of financial analysis to these scenarios, but such cross-disciplinary research can still offer valuable insights, even with qualification.

The purpose of this paper is to examine risk, return and portfolio diversification in major painting markets. Such information will provide important information to be both holders of exclusively art portfolios and investors desiring to include art within mixed asset portfolios comprising stocks and bonds, amongst others. The paper itself is divided into four main areas. Section 2 explains the data and empirical methodology employed in the present analysis. Section 3 discusses risk and return in art markets while Section 4 presents an analysis of portfolio diversification. The paper ends with some brief concluding remarks in the final section.

2. Data and methodology

The data employed in the study is composed of indices for nine major categories of paintings and five financial markets. All art index data is obtained from UK-based Art Market Research (AMR) (2003) and encompass the period January 1976 to December 2001. AMR art indexes are widely used by a variety of leading institutions concerned with prices in the arts, including Christie's, Sotheby's, the British Inland Revenue Service and the New York Federal Reserve, along with the *Financial Times*, *Wall Street Journal*, *The Economist*, *Business Week*, *The Art Newspaper* and *Handelsblatt* (AMR, 2003) [see, for example, Anonymous (2000)]. In brief, the indices are calculated by collecting all worldwide sales in each month by artist, converting these values to US dollars, trimming by ten percent to eliminate extreme values and calculating the ratio to the January 1976 base period. For schools, movements and periods, the individual artists are combined together to form an equal-weighted portfolio.

The nine major art indexes are as follows: (i) Contemporary Masters (*CM*), covering 5,106 sales of current masters including Basquiat, Clemente and Polke; (ii) 20th Century English (*TE*) encompassing 10,603 sales by artists such as Dawson, Flint, Moore and Munnings; (iii) 19th Century European (*NE*) with 50,510 sales by artists including Maris, Troyon, Constable and Corot; (iv) French Impressionist (*FI*) with sales of 6,242 works by painters including Degas, Monet and Renoir; (v) Modern European (*ME*) with 17,538 sales by artists like Bonnard, Picasso and Utrillo; (vi) Modern US Paintings (*US*) with 10,607 sales of works by painters such as Kooning, Rivers and Warhol; (vii) Old Masters (*OM*) with 6,412 sales by artists including Gainsborough, Reynolds and Storck; (viii) Surrealists (*SR*) with 10,395 sales by artists including Dali, Magritte and Picabia; and a general painting (*ART*) index with 94,514 sales by a selection of one hundred artists across all schools and periods including artists such as Boyd, Foster and Rivera. All data is monthly and specified in US dollar terms.

The indexes selected are consistent with studies in the area of art investment returns and risk and represent some of the most closely followed painting sub-sectors. It is also important to note that the aggregation of these art indices across schools, movements and periods produces a portfolio diversification effect when compared to artists in much the same manner as the aggregation of companies in industries and markets. This effect varies from index to index. For example, French Impressionists (*FI*) are drawn from a small number of artists from a single movement and a relatively narrow period (mostly Degas, Monet, Renoir and Pissarro from the 1860s until Post-Impressionism), whereas Old Masters (*OM*) comprises a larger number of artists drawn from several movements and periods (Renaissance, Mannerist and Baroque, especially Italian, Dutch and Flemish artists, largely pre-1700) [see AMR (2003) for details].

The five financial market indices represent major asset classes and are defined as: large company stocks (*LCS*), small company stocks (*SCS*), long-term corporate bonds (*LCB*), long-term government bonds (*LGB*) and treasury bills (*TBL*). All Ibbotson Associates (2002) indices are constructed using US equity and bond markets and this maintains consistency with the art data as defined in USD terms and with the position of the US as the world's leading art market [some 44 percent of the global art market followed by the UK with 29 percent (Renneboog and Van Houtte (2002)]. The series employed are total monthly returns, and where applicable, include capital appreciation and income. For both the art and financial indices the monthly returns are calculated such that the monthly return in market *i* is represented by the continuously compounded return or log return of the price index at time *t* such that $\Delta p_{it} = \log(p_{it} / p_{it-1}) \times 100$ where Δp_{it} denotes the rate of change of p_{it}.

The analysis of art risk, return and portfolio diversification in the paper is made as follows. To start with, two different data sets are examined. The first set of data is returns for the eight individual schools or periods of paintings and is examined in the context of an exclusively art portfolio. That is, *CM*, *FI*, *ME*, *NE*, *OM*, *SR*, *TE* and *US*. The second set of data relates to a broad art asset included in a multi-asset class portfolio with other financial assets: namely, *ART*, *LCS*, *SCS*, *LCB*, *LGB* and *TBL*. Two stages of analysis are followed in each case. First, the central tendency, dispersion and shape of all series are examined, along with their time series properties. Second, following Markowitz's (1952) well-known portfolio theory, combinations of these assets with different risk-return characteristics are constructed. Within this set of all possible combinations, the set of portfolio strategies with the least variance for a given mean return produces the mean-variance frontier (also known as the

mean-variance set). The mean-variance frontier is then further identified as an efficient frontier (efficient set) representing portfolios where portfolio return is maximized for a given level of portfolio risk. Portfolios are constructed employing both optimizing (mean-variance efficient investment) and naïve (single market and equally spread investment) strategies. One constraint placed on asset allocation within the portfolios is that negative (or short) positions are not allowable in order to correctly reflect the realities of investment in art markets. For simplification, cash is assumed to be zero

3. Risk and return

Table 1 presents descriptive statistics for the eight individual art markets. Arithmetic and geometric means, medians, maximums, minimums, standard deviations, coefficients of variation, risk-adjusted returns, skewness, kurtosis, Jacque-Bera statistics and *p*-values and Augmented Dickey-Fuller (ADF) unit root tests are reported. Within the period examined, the arithmetic mean annual returns for the art markets range from 1.90 percent for Surrealists (*SR*) to 4.22 percent for Contemporary Masters (*CM*). The geometric mean annual returns are all lower than the arithmetic means for each market, suggestive of the high volatility in returns over the period examined. The highest geometric mean returns are in Contemporary Masters (*CM*) and 20th Century English (*TE*) with 3.73 and 2.85 percent, respectively. The lowest geometric mean annual returns are in Modern European (*ME*) (1.49 percent) and Surrealists (*SR*) (1.25 percent). Risk, as measured by standard deviation of art returns, ranges from 7.24 percent for 20th Century English (*TE*) up to 13.86 percent for French Impressionists (*FI*). Of the eight art markets 20th Century English (*TE*) and 19th Century European (*NE*) are the least volatile, while French Impressionist (*FI*) and Modern US Paintings (*US*) are the most volatile.

<TABLE 1 HERE>

In terms of the relationships between risk and return, two measures are calculated and presented in Table 1. First, the value of the coefficient of variation (standard deviation divided by the mean return) measures the degree of risk in relation to return. The lowest coefficients of variation are 20th Century English (*TE*) (2.34) and Contemporary Masters (*CM*) (2.48). The Surrealists (*SR*) has the highest coefficient of variation of 5.96. Second, risk-adjusted returns are calculated using return divided by standard deviation in order to measure return in relation to risk. The results illustrate the dominance in risk-adjusted returns of 20th Century English

(*TE*) (0.43) and Contemporary Masters (*CM*) (0.40) over Surrealists (*SR*) (0.17) and Modern European (*ME*) (0.19) paintings.

To evaluate the shapes of the distributions, skewness, kurtosis and Jarque-Bera statistics are also presented in Table 1. Since the sampling distribution of skewness is normal with mean 0 and standard deviation of $\sqrt{6/T}$, where T is the sample size, then Contemporary Masters (*CM*) is significantly positively skewed at the .05 level (that is, with unusually high returns) and French Impressionists (*FI*), Modern European (*ME*), Surrealists (*SR*) and 20th Century English (*TE*) are significantly negatively skewed (with unusually low returns). For kurtosis the sampling distribution is also normal with mean 0 and standard deviation of $\sqrt{24/T}$. Accordingly, Contemporary Masters (*CM*), French Impressionists (*FI*), 19th Century European (*NE*), and Surrealists (*SR*) markets with kurtosis exceeding three can be represented by a leptokurtic distribution, whereas Modern European (*ME*), Old Masters (*OM*), 20th Century English (*TE*) and Modern US Paintings (*US*) with kurtosis of less than three have a platykurtic distribution.

The Jarque-Bera statistic and *p*-values in Table 1 are used to test the null hypothesis that the distribution for the art market returns is normally distributed. All *p*-values are greater than the 0.01 level of significance indicating that art returns can be approximated by a normal distribution with the exception of French Impressionists (*FI*). Finally, ADF unit root tests are calculated for the eight series of painting returns. In all instances, the null hypothesis of nonstationarity is tested. The analyses of the art market returns at levels indicate all painting markets are stationary at the 0.01 level of significance.

The correlation matrix for the eight art markets is included in the lower portion of Table 1. All pairwise correlations are positive and range from 0.41 to 0.86. French Impressionists (*FI*) shows a high correlation with 19th Century European (*NE*) (0.86), while here is also a high positive correlation of 0.83 between Contemporary Masters (*CM*) and Surrealists (*SR*). The lowest positive correlations are 0.41 between Modern European (*ME*) and Old Masters (*OM*) and 0.41 between 20th Century English (*TE*) and Modern US Paintings (*US*). The finding that the art markets are not perfectly positively correlated is suggestive of the potential benefits of portfolio diversification in exclusively art portfolios.

Table 2 depicts the summary of descriptive statistics for the returns of large company stocks (*LCS*), small company stocks (*SCS*), long-term corporate bonds (*LCB*), long-term government bonds (*LGB*), treasury bills (*TBL*) and the art market (*ART*). The arithmetic average annual returns for the six markets range from 3.03 percent for the art market (*ART*) to

17.86 percent for small company stocks (*SCS*). The lowest mean return next to art is treasury bills (*TBL*) (6.52 percent). Once again, the geometric means are all lower than the arithmetic means for each market. The highest geometric average annual returns are in small company stocks (*SCS*) and large company stocks (*LCS*) averaging 16.82 and 13.19 percent respectively. The lowest geometric mean annual returns are in art markets (*ART*) and treasury bills (*TBL*) with 2.54 and 6.49 percent, respectively. The standard deviations for the art, equity, bond and bills range from 2.62 to 15.29. Small company stocks (*SCS*) have the highest return and risk, while treasury bills (*TBL*) have the lowest return and risk. Of the six markets, small company stocks (*SCS*) and large company stocks (*LCS*) are the most volatile, while treasury bills (*TBL*) is the least volatile.

<TABLE 2 HERE>

The value of the coefficient of variation (standard deviation divided by the mean return) measures the degree of risk in relation to the mean return. The lowest coefficients of variation are treasury bills (*TBL*) (0.40) with very low risk and return and highest are in small company stocks (*SCS*) (0.86) with high risk and return. The art market (*ART*) has the highest coefficient of variation (3.34) with a very low arithmetic mean return relative to risk (as measured by standard deviation). There is a clear dominance in risk-adjusted returns of treasury bills (*TBL*) (2.49) and small company stocks (*SCS*) (1.17) over art markets (*ART*) (0.30) and long-term government bonds (*LGB*) (0.83).

In terms of skewness, all the asset classes are significantly skewed. For kurtosis, small company stocks (*SCS*), long-term corporate bonds (*LCB*) and treasury bills (*TBL*) can be represented by a leptokurtic distribution whereas art (*ART*), large company stocks (*LCS*) and long term government bonds (*LGB*) with kurtosis of less than three can be represented by a platykurtic distribution. The Jarque-Bera statistic and corresponding *p*-values in Table 2 fail to reject the null hypothesis that the distributions are normally distributed. The ADF unit root tests are presented for the six markets in the returns series. The analyses of the art, equity and bond market returns at levels indicate that returns in all markets are stationary with the exception of art (*ART*) and treasury bills (*TBL*), which are stationary in differences.

Finally, Table 2 also presents the correlation matrix for the six markets. The pairwise correlations range from -0.3058 to 0.9629 and are generally positive. The exceptions are that art markets (*ART*) are negatively correlated with small company stocks (*SCS*) and long-term corporate bonds (*LCB*) while long-term government bonds (*LGB*) and small company stocks (*SCS*) are also negatively correlated. The low correlations between art markets and most of

the financial markets are once again suggestive of the potential gains for portfolio diversification involving art investment.

4. Portfolio diversification

In the second part of the analysis, Markowitz portfolio theory is used to construct the efficient frontier for the exclusively art portfolio and the mixed asset portfolio where art is included alongside short and long term government debt and corporate debt and equity. Mean-variance portfolio optimisation is made using the Microsoft Excel-based program M-V Optimiser (Wagner Associates, 2003). Figure 1 depicts the efficient frontier derived from the various combinations of the eight art markets. One hundred and four different portfolios are included in the efficient set. Also included with the mean-variance frontier are several naïve portfolios that are either art investments made in a single market (*CM*, *FI*, *ME*, *NE*, *OM*, *SR*, *TE* and *US*) or an equally weighted portfolio across all markets (*EQW*).

<FIGURE 1 HERE>

The returns (risks) for the efficient frontier range from 2.71 percent (6.44 percent) at the minimum variance point to 4.22 percent (10.47) at its uppermost. All other things being equal, naïve strategies, where investment is made solely in one art market or equally in all markets, are dominated by the efficient set. Only Contemporary Masters (*CM*), with the highest risk and return, lies on the efficient frontier. However, due to the relatively narrow range of returns in the feasible set of mean-variance portfolios, even the dominance of the efficient frontier over the naïve strategies is small, such that the return of the equal weighting strategy is only 0.015 percent less than the highest return in the efficient set.

As often as not, it is expected that individual assets that are plotted farthest from the efficient frontier are excluded from the set of efficient portfolios and this is indeed the case with the naïve strategies of investing in French Impressionists (*FI*) and Modern US Paintings (*US*) alone. In fact, the efficient frontier is mostly comprised of just two or three of the eight art assets included in the calculations. For example, when return is equal to 2.71 percent (Point A) the only assets included (with their portfolio weight) are 19th Century European (*NE*) (21.12 percent), Old Masters (*OM*) (27.45 percent) and 20th Century English (*TE*) (51.43 percent). At Point B (3.16 percent return) the frontier point is composed of Contemporary Masters (*CM*) (19.27 percent), Old Masters (*OM*) (20.38 percent) and 20th Century English (*TE*) (60.35 percent). At Point C Contemporary Masters (*CM*) (52.74 percent) and 20th

Century English (*TE*) (47.26 percent) form the efficient portfolio, changing to 68.94 and 31.06 percent at Point D. Finally, at Point E the efficient portfolio is composed solely of Contemporary Masters (*CM*).

While the parameters used in constructing the efficient frontier for art investment are historical, there are a number of points to make regarding portfolio diversification. To start with, over the period 1976 to 2001 a relatively small number of separate art markets dominate the efficient set, mainly 19th Century European (*NE*), Old Masters (*OM*), 20th Century English (*TE*) and Contemporary Masters (*CM*). Moreover, Contemporary Masters (*CM*) with its relatively high returns over the period generally dominates portfolios with high risk-return characteristics, while 20th Century English (*TE*) dominates portfolios with low risk-return characteristics. Accordingly, taking as given an art investor's subjective risk preferences, less risk averse investors would tend to favour Contemporary Masters (*CM*) in their diversified portfolios, while more risk averse investors would tend to weight heavily in favour of 20th Century English (*TE*) works. Of the remaining painting markets, French Impressionists (*FI*), Surrealists (*SR*), Modern US Paintings (*US*) and Modern European (*ME*) painting are generally not included in the efficient set through their high risk-low return characteristics over the period in question. In general, it would appear that most of the gains from diversification achievable in art can be made with a small number of individual painting markets, though of course the performance of individual artists and schools within these markets could vary markedly from the market as a whole.

To construct the efficient frontier in Table 2, a general art asset class (*ART*) is included alongside short and long term government debt (*TBL* and *LGB*) and corporate debt (*LCB*) and equity (*SCS* and *LCS*). Six portfolios employing a naïve strategy are again plotted, being investment in a single art, bond or equity market or in an equally weighted portfolio (*EQW*), along with one hundred and five portfolios that form the efficient frontier. The returns (risks) for the efficient frontier of the art and equity markets vary from 6.87 percent (2.54) to 17.86 percent (15.29). Importantly, and unlike the experience with the exclusively art portfolio, most of the assets in the mixed-asset portfolio are included in some way in the efficient set. For instance, Treasury bills (*TBL*) average 34.54 percent weighting across all efficient portfolios, small company stocks (*SCS*) 44.69 percent, large company stocks (*LCS*) 10.43 percent and long-term corporate (*LCB*) and government (*LGB*) bonds 5.04 and 5.29 percent, respectively. Nonetheless, at points A and B (low risk-return) the portfolio is dominated by Treasury bills (*TBL*) and at C, D and E (high risk-return) by small company stocks (*SCS*). In

most cases, the mean-variance efficient portfolios out perform the naïve strategies, and in some the gains are quite substantial.

<FIGURE 2 HERE>

However, in none of the risk-return optimal portfolios that define the efficient frontier is the art market included. It is clear that even though art markets have very low and even negative correlations with financial market assets, their risk-return characteristics are so inferior to equity and debt markets that they are never included in the efficient set. This would suggest, for the most part, that the diversification benefits of art in a multi-financial asset portfolio are close to zero. Renneboog and Van Houtte (2002, p. 349) likewise concluded that "the Markowitz efficient frontier of an investment opportunity set consisting of both equity and art investment does not shift upwards…suggesting that the diversification potential of art in an equity setting is limited". However, it is the case that as the number of assets increases the risk of the portfolio collapses to the individual covariances, such that the creation of a portfolio with much finer detail than the broad asset classes used here should illustrate at least some diversification benefits.

5. Summary and conclusions

This paper investigates risk, return and portfolio diversification in major painting markets during the period 1976 to 2001. The art markets examined are Contemporary Masters, French Impressionists, Modern European, 19th Century European, Old Masters, Surrealists, 20th Century English and Modern US paintings. Comparison is also made between art and financial assets, including US government debt and corporate debt and equity. In common with most other work in this area, the results indicate that the returns to art investment is less, and the risks much higher, than in more conventional investment markets. However, there is also much variation across the different art markets, with Contemporary Masters, 19th Century European, 20th Century English and Old Masters offering superior risk-adjusted returns (at least among painting markets) during the period question.

At first impression, the low correlations of returns among art works and between art works and financial assets are suggestive of the benefits of portfolio diversification. Certainly, gains to portfolio diversification exist in the first respect, and this offers potential guidance for portfolios composed primarily of art held by investors, collectors, dealers and museums, amongst others. However, it is also the case that the risk-return attributes of art are so inferior

to financial assets such as stocks and bonds during the period in question that inclusion of these assets for diversification purposes in financial asset portfolios cannot be supported, at least in a portfolio composed of the broad asset classes as used here. Renneboog and Van Houtte (2000, 2002) also concluded that Markowitz efficient frontiers showed limited diversification potential for art, though just in the context of equity investment. Of course, the art returns as calculated do not reflect the fact that a substantial component of the return from art investment can be derived not from financial returns, rather its intrinsic aesthetic qualities. Equally, they also do not include the many and sizeable transaction and holding costs associated with art portfolios, the absence of which may serve to inflate financial returns.

There are many interesting opportunities to expand upon this work by applying some of the well-used tools of financial analysis to art markets. One possibility is to follow the work of Ginsburgh and Jeanfils (1995), Chanel (1995) and Czujack *et al*. (1996) and more closely examine the short and long run relationships between art and financial markets. A few studies have already investigated the wealth effect link between stock and art markets and concluded that booms in stock markets create booms in art markets (see, for instance, Goetzmann, 1993; Chanel, 1995), However, the exact strength and persistence of this causal relationship is less well known. Another avenue for research would be to examine the opportunities for arbitrage that exists between different geographical markets (say, New York, London and Paris). This would permit greater empirical certainty on the global efficiency of art markets. Asset-pricing models could also be applied to artworks in order to gain a greater awareness of price formation in these markets. A hedonic pricing equation as followed in Renneboog and Van Houtte (2002) is one option; another is Zanola and Locatelli Biey's (1998) short-run capital asset pricing model approach. Finally, there may be potential to examine art markets along the lines of the momentum-investing literature. Investor over and under reaction may go far in explaining the sustained bull market in art up to 1989 and the bear market in the following three years.

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Table 1
Selected descriptive statistics for returns in eight painting markets, 1976-2001

		CM	FI	ME	NE	OM	SR	TE	US
Central tendency, dispersion & shape	Arithmetic mean	0.0422	0.0331	0.0212	0.0223	0.0234	0.0190	0.0310	0.0284
	Geometric mean	0.0372	0.0229	0.0149	0.0197	0.0202	0.0125	0.0285	0.0203
	Median	0.0398	0.0606	0.0278	0.0118	0.0311	0.0275	0.0486	0.0155
	Maximum	0.2971	0.3420	0.2163	0.1703	0.1822	0.2268	0.1230	0.2647
	Minimum	-0.1526	-0.4051	-0.2372	-0.1610	-0.1449	-0.2938	-0.1106	-0.2741
	Standard deviation	0.1047	0.1386	0.1126	0.0734	0.0826	0.1131	0.0724	0.1294
	Skewness	0.4868	-0.8303	-0.4252	-0.0376	0.0859	-0.6550	-0.5302	-0.0762
	Kurtosis	3.5073	5.5636	2.5876	3.2626	2.2067	3.8093	2.0266	2.7382
	Coefficient of variation	2.4790	4.1926	5.3053	3.2972	3.5256	5.9603	2.3357	4.5656
	Risk-adjusted return	0.4034	0.2385	0.1885	0.3033	0.2836	0.1678	0.4281	0.2190
	Jarque-Bera statistic	1.3057	10.1067	0.9677	0.0809	0.7138	2.5685	2.2448	0.0994
	Jarque-Bera *p*-value	0.5206	0.0064	0.6164	0.9604	0.6999	0.2769	0.3255	0.9515
ADF tests	ADF (Level)	-4.5183	-4.5059	-4.4139	-4.0393	-4.7825	-4.9220	-4.1594	-4.4502
	Critical value .01 level	-3.9888	-3.9888	-3.9888	-3.9888	-3.9888	-3.9888	-3.9888	-3.9888
	Critical value .05 level	-3.4248	-3.4248	-3.4248	-3.4248	-3.4248	-3.4248	-3.4248	-3.4248
	Critical value .10 level	-3.1355	-3.1355	-3.1355	-3.1355	-3.1355	-3.1355	-3.1355	-3.1355
Correlation	CM	1.0000	–	–	–	–	–	–	–
	FI	0.7437	1.0000	–	–	–	–	–	–
	ME	0.6926	0.7061	1.0000	–	–	–	–	–
	NE	0.7605	0.8605	0.7470	1.0000	–	–	–	–
	OM	0.5060	0.5451	0.4057	0.7330	1.0000	–	–	–
	SR	0.8270	0.6602	0.7632	0.6931	0.5113	1.0000	–	–
	TE	0.5667	0.6392	0.7250	0.6520	0.4331	0.6143	1.0000	–
	US	0.6567	0.5447	0.4456	0.5440	0.4387	0.4169	0.4135	1.0000

Notes: Means, median, maximum and minimum are in annualised terms. CM – Contemporary Masters, FI – French Impressionists, ME – Modern European, NE – 19th Century European, OM – Old Masters, SR – Surrealists, TE – 20th Century English, US – Modern US Paintings. Critical values at the .05 level for skewness and kurtosis are 0.2718 and 0.5435, respectively. Risk adjusted return is the ratio of return to standard deviation; coefficient of variation is ratio of standard deviation to return. For Augmented Dickey-Fuller (ADF) tests hypotheses are H_0: unit root, H_1: no unit root (stationary). The lag orders in the ADF equations are determined by the significance of the coefficient for the lagged terms. Intercepts and trends are included in the levels series. Correlation is Pearson (product moment) correlation.

Table 2
Selected descriptive statistics for annualised returns in painting and financial markets, 1976-2001

		ART	LCS	SCS	LCB	LGB	TBL
Central tendency, dispersion & shape	Arithmetic mean	0.0303	0.1395	0.1786	0.0963	0.0975	0.0652
	Geometric mean	0.0254	0.1319	0.1682	0.0915	0.0916	0.0649
	Median	0.0305	0.1698	0.2234	0.1040	0.0886	0.0560
	Maximum	0.2281	0.3234	0.3928	0.3672	0.3487	0.1381
	Minimum	-0.2115	-0.1076	-0.2205	-0.0761	-0.0923	0.0286
	Standard deviation	0.1012	0.1321	0.1529	0.1051	0.1168	0.0262
	Skewness	-0.3145	-0.3538	-0.7648	0.5256	0.3250	0.9758
	Kurtosis	2.8978	1.9600	3.0898	3.1103	2.2580	3.5077
	Coefficient of variation	3.3417	0.9463	0.8562	1.0912	1.1971	0.4011
	Risk-adjusted return	0.2993	1.0567	1.1680	0.9165	0.8354	2.4929
	Jarque-Bera statistic	0.4399	1.7142	2.5432	1.2101	1.0542	4.4056
	Jarque-Bera *p*-value	0.8026	0.4244	0.2804	0.5460	0.5903	0.1105
ADF tests	ADF (Level)	-3.9616	-4.9445	-5.9095	-4.8880	-5.1064	-2.8936
	Critical value .01 level	-3.9888	-3.9888	-3.9888	-3.9888	-3.9888	-3.9888
	Critical value .05 level	-3.4248	-3.4248	-3.4248	-3.4248	-3.4248	-3.4248
	Critical value .10 level	-3.1355	-3.1355	-3.1355	-3.1355	-3.1355	-3.1355
	ADF (Difference)	-6.0253	–	–	–	–	-5.7827
	Critical value .01 level	-3.4520	–	–	–	–	-3.4520
	Critical value .05 level	-2.8710	–	–	–	–	-2.8710
	Critical value .10 level	-2.5719	–	–	–	–	-2.5719
Correlation	ART	1.0000	–	–	–	–	–
	LCS	0.1618	1.0000	–	–	–	–
	SCS	-0.3058	0.3800	1.0000	–	–	–
	LCB	-0.0724	0.3234	0.0175	1.0000	–	–
	LGB	0.0220	0.3297	-0.0247	0.9629	1.0000	–
	TBL	0.3009	0.0871	0.0808	0.0261	0.0485	1.0000

Notes: Means, median, maximum and minimum are in annualised terms. ART – art market, LCS – large company stocks, SCS – small company stocks, LCB – long-term corporate bonds, LGB – long-term government bonds, TBL – Treasury bills. Critical values at the .05 level for skewness and kurtosis are 0.1387 and 0.2773, respectively. Risk adjusted return is the ratio of return to standard deviation; coefficient of variation is ratio of standard deviation to return. For Augmented Dickey-Fuller (ADF) tests hypotheses are H_0: unit root, H_1: no unit root (stationary). The lag orders in the ADF equations are determined by the significance of the coefficient for the lagged terms. Intercepts and trends are included in the levels series, intercepts only in the first-differenced series. Correlation is Pearson (product moment) correlation.

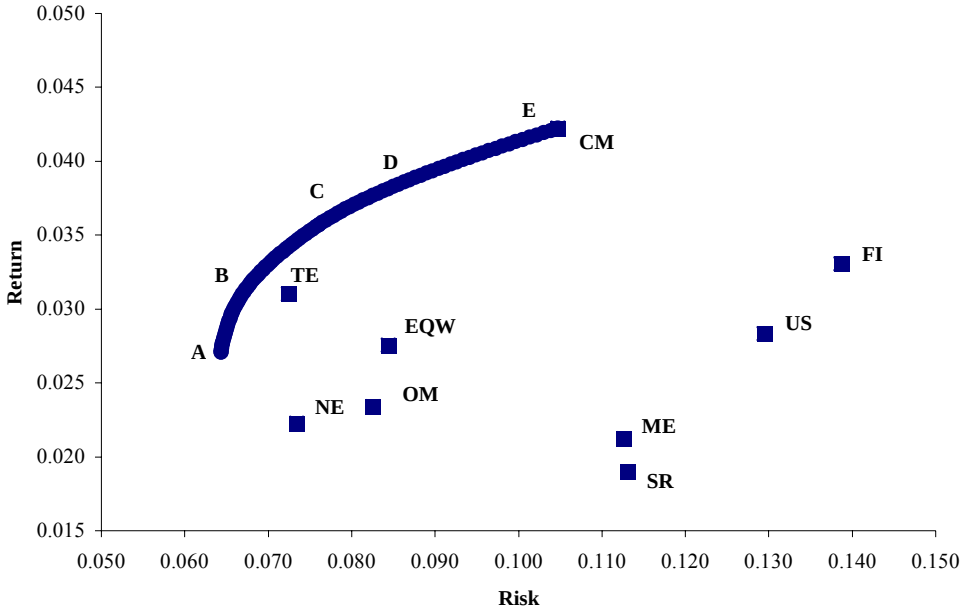

Fig 1. Efficient frontier for art investments

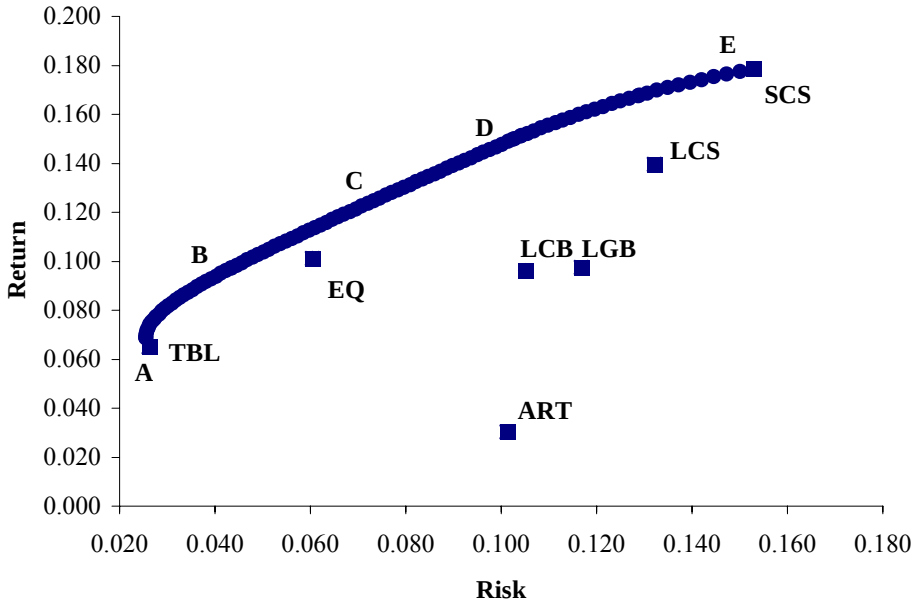

Fig 2. Efficient frontier for art and financial investments