Australian Art Market Prices during the Global Financial Crisis and two earlier decades[*]

HELEN HIGGS

Department of Accounting, Economics and Finance,
Griffith University, Brisbane, Australia

ABSTRACT

This study constructs a quarterly hedonic price index using 64,203 artworks, by seventy-one well-known modern and contemporary Australian artists, sold at auction houses over the period 1986-2009. The hedonic regression model includes characteristics such as name and living status of the artist, the size and medium of the painting, and the auction house, quarter and year in which the painting was sold. The resulting index indicates that returns on Australian fine-art averaged one percent in nominal terms over the period from quarter one 1986 to quarter four 2009 with a standard deviation of seventeen percent. During the global financial crisis spanning quarter one 2008 and quarter four 2009, the average art returns declined in nominal terms by close to six percent with a standard deviation of twenty-one percent. This study also shows that over the entire period the art market only marginally underperformed the stock and housing markets. The low correlations between these markets suggest the benefits of portfolio diversification.

JEL classifications: C23, C33, G11.

Keywords: Art prices, hedonic price index, Australia, global financial crisis.

I Introduction

In 2008 the global financial crisis (GFC) hit the Australian stock market and it plummeted by 41 percent. The GFC also ended the long bull market in Australian artworks. Between January to June 2008, auction revenue in fine arts had reached a record high but by the end of 2008 art sales in terms of a global price index had presented a severe downturn of 30 percent from this record high level (Art Market Insight 2009). With falling stock values, many investors were questioning whether artworks (such as paintings, sculpture, ceramics and prints) along with collectibles such as coins, stamps, antiques and furniture were still a reasonable alternative investment.

The global art world had experienced major fluctuations in prices before. It went through a significant downturn in the early 1990s and the slump continued for another five years. Over

[*] The author acknowledges John Forster for his invaluable comments on the Australian art market and Terry Higgs for his brilliant reformatting of the large data set.

the period from January 1990 to January 1991 the global art price index fell by 21 percent followed by another contraction of 27 percent in January 1992. For a number of years after this downturn, art prices remained flat.

This study is motivated by the downturn of the global art market precipitated by the GFC and seeks to answer questions as to how the Australian art market performed between 1986 and 2009 including the GFC. Over the last three decades, the more recent contemporary artists namely Arthur Boyd, Charles Blackman, David Boyd, Ray Crooke, John Olsen, William Robinson and Brett Whitely have also reached the international world stage and their works inevitably commanded high prices. In 2004 a painting of Sydney Harbour by Brett Whiteley set a $2 million record price for modern Australian art and an explosive atmospheric painting by contemporary artist Tim Storrier sold for a personal best of $165,000. In 2007 *The Olgas for Ernest Giles* by Brett Whiteley set a record price of $3.48 million and later in the same year a painting by John Brack was sold for $3.36 million (Australian Art Sales Digest, 2009). There has been an increased demand for Australian paintings, especially those included among the fifty most collectable by the Australian Art Collector magazine (Australian Art Collector Magazine, 2010).

Accordingly, the purpose of this study is to construct a quarterly price index for the Australian art market spanning the period from quarter one 1986 to quarter four 2009 covering the sold works of seventy-one well-known Australian artists. The index allows the tracking of short-term price movements and returns in this market. This allows a better understanding of how this market performed not only over the entire period but also during the global financial crisis. The performance of this market can then be compared to investments in traditional financial assets such as the Australian stock and housing markets. This permits a greater understanding of diversification of investment across these three markets.

This is not the first art price index. For example, Buelens and Ginsburgh (1993) calculated price indices for works by English, Dutch and Italian painters; Agnello and Pierce (1996) created an index of average price movements of leading American artists; Pesando and Shum (1999) used French auction prices to construct a semi-annual price index and Mei and Moses (2002) created an annual art price index for American, Old Master, Impressionist and Modern paintings. Mok et al. (1993); Candela and Scorcu (1997); Rennboog and Van Houtte (2002) and Higgs and Worthington (2005) produced price indices for Chinese, Italian, Belgian and Australian art. In addition, Candela and Scorcu (1997), Pesando and Shum (1999) and Rennboog and Van Houtte (2002) compared returns to paintings to that of financial assets. The Australian art index estimated by Higgs and Worthington (2005) was an *annual* index

using data from art auctions spanning 1973 to 2003. In this study a *quarterly* Australian art index is calculated from 1986 to 2009 which allows a deeper understanding of the short- term movements of the art price index over this period.

The remainder of the study is organised as follows. The second section discusses the methodology used to estimate the quarterly Australian art index. The third section explores the data employed in the analysis and presents summary statistics. The empirical results are dealt with in the fourth section. The study ends with some brief concluding remarks in the final section.

II Model Specification

The analytical approach employed is the hedonic price index method. In this approach, all sales (including repeat sales) are considered as single sales, which capture characteristics such as the name of the artist, size of painting, medium of execution, auction house and date of sale. This allows the price appreciation of a 'standard' painting be stripped of its physical characteristics (Renneboog and Van Houtte 2002). The implicit (or shadow) prices for the artistic characteristics for all sales are estimated and deducted from the auction prices, leaving only the effect of time and random error. Buelens and Ginsburgh (1993), de la Barre *et al*. (1994), Chanel (1995) and Agnello and Pierce (1996), Renneboog and Van Houtte (2002) and Higgs and Worthington (2005) used the hedonic price index method to estimate art price indices.

The hedonic price index method captures the willingness to pay for perceived differences in the characteristics of the artwork. The hedonic price equation is specified as:

$$\ln p_{kt} = f(X_{1kt},...,X_{mkt},...,X_{Mkt}) + g(t) + \varepsilon_{kt} \quad (1)$$

where $\ln p_{kt}$ is the natural logarithm of the price of painting k ($k = 1,...,K$) sold in year and quarter t ($t = 1,...,T$), X_{mkt} is the measurable characteristics m ($m = 1,...,M$) of painting k at time t, $g(t)$ is a function of time, and the error term $\varepsilon \sim N(0, \Sigma_k \otimes I_T)$. The measurable characteristics of the paintings comprise the personal characteristics of the artist, the physical characteristics of the work itself, and the characteristics of the auction at which the sale of the work took place. The regression equation is then specified as:

$$\ln p_{kt} = \sum_{m=1}^{M} \alpha_m X_{mkt} + \sum_{t=1}^{T} \beta_t Z_t + \varepsilon_{kt} \quad (2)$$

where α_m are parameter estimates of the implicit prices of the specified art characteristics, Z_t is a dummy variable which takes the value of one for a sale occurring in month and year t and

zero elsewhere, β_t is a parameter estimate, $e^{\beta t}$ gives the art price index and all other variables are as previously defined.

The first set of information gathered is the price of each artwork. This comprises the dependent variable in the hedonic price regression. Each artwork included is sold exclusively at public auction and its value is specified in Australian dollars. The price is the hammer price plus the buyer's premium. The premium may fluctuate between 10 and 30 percent above the hammer price depending on the auction house. The amount of premium is stated in the auction house terms and conditions of sale. Higgs and Worthington (2005) used the hammer price from auction houses, which could underestimate the coefficients for each artist. All prices are nominal and the price index calculated is also in nominal terms. Since the price obtained in auctions is the outcome of a competitive process, it could be suggested that the prices achieved are higher for well-known artists and lower for newcomers into the art world. The auction prices may also differ from expert valuations and those offered in galleries. On the other hand, auction prices are perceived to be artificially high as the auction houses have financial overheads not shared by art galleries, while large auction houses may also exercise market power to attract more valuable works. In this instance, the prices included may be higher than those obtained from other sales channels. However, as the true or intrinsic value is not observable, it is not possible to make a definitive statement on whether there is systematic under or overbidding in the Australian auction market.

The next three sets of variables are considered to be major determinants of the price of an individual artwork and are specified as explanatory variables in the hedonic pricing regression. The first set of explanatory variables relate to the personal characteristics of the artist who painted the work. The second set corresponds to the physical characteristics of the work itself. The final set includes the sale characteristics of the work.

The first variable included in the set of personal characteristics is the name of the artist. It is recognised that one of the most important factors determining the price of a painting is the reputation and quality of the artist. In addition, other factors thought to determine prices are closely related to the artist's name, including style and subject matter, historical importance and medium. For instance, most artists are ordinarily identified with a single school or movement throughout their careers, such as James Gleeson and Surrealism. Other artists included cover famous artistic families (Theodore Penleigh, Arthur, David and Jamie Boyd and Hans and Nora Heysen), members of the renowned Heidelberg school (Frederick McCubbin, Arthur Streeton and Tom Roberts) and Aboriginal artists (Albert Namatjira and Clifford Tjapaltjarri). Dummy variables are used to link each artist with their work, with William Coleman being the reference category. A full listing of the artists, their year of birth

and death and the number of works included in the sample are given in Table 1. The earliest born artists in the sample are John Glover (1767), John Gould (1804) and Walter Withers (1854) and the youngest born are John Kelly (1965), Tim Maguire (1958) and Howard Arkley (1951). The number of works sold range from 34 (Rosalie Gascoigne) to 4,419 (Norman Lindsay). On average, 905 works for each artist are included in the sample.

Another personal characteristic included represents the living status of the artist, taking the form of a dummy variable with a value of one if the painter is deceased at the time of the auction (*DTH*) and zero otherwise (Agnello and Pierce, 1996; Higgs and Worthington, 2005). All other things being equal, the price of artworks are likely to increase once an artist has died such that the sign on the coefficient is expected to be positive. However, as the sample of artists is drawn across a very long time period, the effect may be less than if only works from artists who were still living or died during the sample period were included. Of the seventy-one artists, thirty-one died prior to the sample period, twenty-four died during this period and sixteen are still living.

The next set of variables represents the physical characteristics of the artwork. The first group are dummy variables identifying the medium of the work: namely, acrylic (*ACR*), charcoal (*CHA*), crayon (*CRA*), etching (*ETC*), the heavy, opaque watercolour paint known as gouache, (*GCH*), lithograph (*LTH*), mixed media (*MIX*), oil (*OIL*), pastel (*PAS*), pencil (*PEN*) and watercolour (*WCO*). The reference category is all other mediums. Of the mediums included in the analysis, the largest numbers of works sold during the sample period are watercolours (*WCO*) followed by etchings (*ETC*) and then oils (*OIL*). However, the most desirable medium is usually oil since many high quality works are executed in this long-lasting media, though a variety of other potentially valuable media are found in most fine-art collections. The second group of physical characteristics comprises the dimensions of the painted work as represented by surface area (*ARE*) in square metres (m^2) and surface area squared (*ASQ*) as the non-linear component. A positive relationship is generally hypothesised when price is regressed against *ARE,* although it is difficult for all but the largest public galleries to display very large works. On this basis, and given most sales are to private collectors, the expected sign on the coefficient for *ASQ* is thought to be negative (Agnello and Pierce 1996; Higgs and Worthington 2005). Of course, there are any number of other physical characteristics that could be included if data were available. These include the painting's genre, provenance and the date it was completed.

The final set of explanatory variables incorporate the sales characteristics of the work. The first of these are dummy variables identifying in which of the six major auction houses the sale took place: that is, Australian Art Auctions (*AUS*), Christies (*CHR*), Deutscher-Menzies

(*DEU*), Lawson Menzies (*LAW*), Leonard Joel (*LEO*), and Sotheby's (*SOT*). The reference category is all other auction houses. During the sample period, the largest number of works was sold through Leonard Joel (*LEO*), followed by Sotheby's (*SOT*) and then Christies (*CHR*). In the absence of transaction costs, the law of one price dictates that no significant price difference should exist for paintings of similar quality. However, Pesando (1993), de la Barre *et al*. (1994), Renneboog and Van Houtte (2002) and Higgs and Worthington (2005) amongst others, have found that Christies and Sotheby's systematically obtain higher hammer prices, chiefly because of reputation and market power. The second set of sales characteristics identifies the quarter and year when the work is sold. This consists of ninety-six quarterly dummy variables with 1986 quarter one as the reference category. Accordingly, 1986 quarter one provides the base period for the index.

III Data and Descriptive Statistics

The data employed in this study consist of 64,203 sales transactions of artworks by seventy-one leading Australian artists. All data are obtained from Australian Art Sales Digest (2010) and span the period 1986 quarter one to 2009 quarter four. The selection of artists to be included in the index is highly subjective. It was arrived at after discussion with various art auctioneers, curators and dealers on those artistic works most sought after and frequently sold at auctions. The data collection procedure aimed to capture, in so far as possible, of the longest continuous time trend, schools and genres in Australian art history and is predominantly restricted to artists who lived most of their lifetime in Australia.

Table 1 presents the summary of statistics of the characteristics of the artworks sold. The first part of Table 1 is grouped according to the artwork prices of the seventy-one artists (including the reference artist), the second part grouped according to the twelve types of media (plus the reference medium) and the third by the seven auction houses (with the reference auction houses). Samples means and standard deviations are presented, along with measures of skewness and kurtosis, the coefficient of variation and the Jarque-Bera statistic and its *p*-value.

The average price achieved for each artist's work ranges from $570 for works by Lionel Lindsay (*LNL*) to $87,997 for those by Frederick McCubbin (*MCC*). Other artists whose works have a high average value are Cecil Brack (*BRA*), John Peter Russell (*RUS*), Jeffrey Smart (*SMA*), Rover Thomas (*THO*) and William Robinson (*ROB*), with means of $77,187, $75,158, $65,454, $ 64,221 and $62,977, respectively. On average, the lowest prices are for works by John Gould (*GOU*), Jamie Boyd (*BYJ*), Frank Hodgkinson (*HOD*), William Coleman (*COL*) and George Duncan (*DUN*) with average prices of $1,272, $1,293, $1,507,

$1,649 and $2,080, respectively.

The standard deviations of art prices range from $943 (*LNL*) to $280,600 (*BRA*). On this basis, works by Jamie Boyd (*BYJ*), Thomas Garrett (*GAR*), William Colman (*COL*), Frank Hodgkinson (*HOD*) and George Duncan (*DUN*) are less variable with standard deviations of $1,493, $1,676, $2,211, $2,528 and $3,162, respectively, whereas works by John Glover (*GLO*), George Russell Drysdale (*DRY*), Brett Whiteley (*WHI*), John Peter Russell (*RUS*), and Frederick McCubbin (*MCC*) are the most volatile with standard deviations of $164,874, $170,924, $193,201, $202,359 and $248,945, respectively. According to the coefficient of variation, which measures the standard deviation relative to the mean, the prices of paintings by John Glover (*GLO*) and Clifford Tjapaltjarri (*TJA*) are some of the most variable, with works by Ernest Buckmaster, (*BUC*) and Thomas Garrett (*GAR*) less variable.

By and large, the distributional properties of the artwork prices appear non-normal. The measures of skewness are all positive and range from 1.05 (*OLL*) to 25.12 (*GOU*). Since the asymptotic sampling distribution of skewness is normal with a mean of 0 and standard deviation of $\sqrt{6/n}$ where n is the sample size, and given that the smallest sample size is 34, the standard deviation under the null hypothesis of normality is 0.4201. All estimates of skewness are then significant at < 0.05 level of significance, suggesting a long right tail of high prices for work by all seventy-one artists. The kurtosis, or degree of excess, for all artists is also larger than 3, ranging from 3.04 (*OLL*) to 774.56 (*GOU*), therefore all of these series can be represented by a leptokurtic (or fat-tailed) distribution. Given the sampling distribution of kurtosis is normal with a mean of 0 and standard deviation of $\sqrt{24/n}$ = 0.8402 (for the smallest sample size of 34), then all estimates are once again statistically significant at any conventional level. The calculated Jarque-Bera statistics and corresponding *p*-values in Table 1 are used to test the null hypothesis that the distribution for the art prices is normally distributed. All *p*-values are < 0.01 level of significance indicating that the prices are not well approximated by a normal distribution.

<TABLE 1 HERE>

Table 1 also includes the descriptive measures of art prices categorised according to the twelve different types of media. Of these, the prices for oils (*OIL*) and acrylic (*ACR*) are respectively the most expensive, averaging $27,579 and $27,417, and the cheapest are etchings (*ETC*) and crayons (*LTH*), averaging $1,507 and $1,540, respectively. The most volatile prices are also for oils (*OIL*) and acrylic (*ACR*) with standard deviations of $99,225 and $88,433, respectively and the least volatile are etching (*ETC*) and crayon (*LTH*) with standard deviations of $2,394 and $3,337 respectively. The distributional properties of art

prices across the different media are likewise non-normal, positively skewed and leptokurtic. Finally, descriptive measures of the sales by auction house are also presented in Table 1. Generally, Deutscher-Menzies (*DEU*), Sotheby's (*SOT*) and Christies (*CHR*) achieved the highest prices for art sold over the sample period, averaging $37,947, $33,379 and $18,063, respectively. The most volatile sale prices are those for Deutscher-Menzies (*DEU*) and Sotheby's (*SOT*) with standard deviations of $125,480 and $108,913, respectively, and the least volatile sales prices are from Australian Art Auctions (*AUS*) with a standard deviation of $4,125 and Leonard Joel (*LEO*) with a standard deviation of $16,473. Similar to the other variables, the distributional properties of art prices by auction house are positively skewed, leptokurtic and non-normal.

VI Empirical Results

The estimated coefficients of the hedonic pricing regression model are presented in Table 2. The null hypothesis of no heteroskedasticity in the least squares residuals was initially rejected using White's (1980) test (*F*-statistic = 78.6794, *p*-value = 0.0000) and therefore the standard errors and *p*-values incorporated White's (1980) corrections for an unknown form of heteroskedasticity. Also included are the percentage effect of a unit change for the zero-one dummy variables and the continuous variables. The adjusted R^2 of 0.6976 is high for cross-sectional data. The estimated parameters are all significant at the < 10 percent level of significance and also appear sensible in terms of both the precision of the estimates and the anticipated signs on the coefficients. To test for multicollinearity, variance inflation factors are calculated (not shown). As a rule of thumb, a variance inflation factor (VIF) significantly greater than 10 indicates the presence of harmful collinearity. Among the explanatory variables the highest VIFs are for Norman Lindsay (5.786), Charles Blackman (5.318), John Gould (5.017), Sidney Nolan (4.727) and Pro Hart (4.575) with an average VIF of 1.551 for all artists. This suggests that multicollinearity, while present, is not too serious a problem.

<TABLE 2 HERE>

According to the first set of explanatory variables relate to the personal characteristics, significantly higher values are placed on the works by Rover Thomas (*THO*), Rosalie Gascoigne (*GAS*), Jeffrey Smart (*SMA*), Ian Fairweather (*FAI*) and Frederick McCubbin (*MCC*) associated with percentage price increases of 35.3815, 30.8833, 21.9457, 20.9691 and 19.8322 percent over the standard painting, respectively. On the other hand, lower values are placed on artworks by William Dargie (*DAR*), David Rankin (*RAN*), George Duncan (*DUN*), Frank Hodgkinson (*HOD*) and Jamie Boyd (*BYJ*) with percentage increases over the standard painting of just 1.6590, 1.2033, 1.1653, 1.1435 and 1.1251 percent, respectively. A deceased

artist at the time of auction (*DTH*) is associated with a price increase of 1.2498 percent with 61 percent of the artworks included in the sample are by artists who deceased prior to or die during the auction period. By way of comparison, Higgs and Worthington (2005) found that a deceased artist at the time of auction is associated with a price increase if 1.1338 percent.

The physical characteristics in the regression model comprise the medium of execution (i.e. oil, acrylic, charcoal, crayon, gouache, etc.) and the size of the work. As hypothesised, the percentage changes in value in Table 2 indicate that works executed in acrylic (*ACR*) and oil (*OIL*) command higher prices, with percentage increases over the standard work of 3.0312 and 6.4840 percent, respectively. This classifies that oil is the most sought after medium according to its long lasting quality and cannot be easily faded by natural light, and is therefore more likely to fetch higher prices. Acrylic, as a relatively modern alternative, also commands high prices at auction, while gouache (*GCH*), water colour (*WCO*), mixed media (*MIX*) and pastels (*PAS*) have price increases of between 2.6927 and 2.9661 percent. The more affordable media such as lithograph (*LTH*), etchings (*ETC*), pen (*PEN*), crayon (*CRA*) and charcoal (*CHA*) are associated with respective percentage increases of just 0.4944, 0.6415, 1.1248, 1.4184 and 1.7153 percent. As a comparison, Higgs and Worthington (2005) concluded that *OIL* and *ACR* artworks increased price by 6.1552 and 6.0376 percent respectively and *GCH*, *MIX*, *PAS* and *WCO* achieved price increases ranging from 3.0289 to 3.7781 percent.

Other physical characteristics included in the regression model are the size of the work. These are the area of the work in square metres (*ARE*) and its nonlinear component, area squared (*ASQ*). The positive sign of the area coefficient (0.6598) and the negative sign of its squared term (-0.0628) indicate that Australian art prices first tend to increase with size, then decrease as the paintings become too large and difficult to house. The price-maximising size for works by the seventy-one Australian artists is 5.25 square metres. By comparison, Agnello and Pierce (1996) found the price-maximising size for American artists' work to be 6.53 square metres while de la Barre et al. (1994) calculated this optimal size to be 5.89 square metres for Old Masters and 1.70 square metres for Modern and Contemporary European works and Higgs and Worthington (2005) estimated the optimal size for Australian Modern and Contemporary artwork to be 6.70 square metres. Artists do paint for inclusion in public museums and galleries to increase their sales value in the private market.

The final set of variables relates to the sale characteristics of the works. The sales characteristics show that auctions at Sotheby's (*SOT*), Deutscher-Menzies (*DEU*) and Christies (*CHR*) increase the standard price by 2.2235, 1.8819 and 1.7879 percent, respectively, over other auction houses. Alternatively, Australian Art Auctions (*AUS*), James

Lawson (*JAM*) and Leonard Joel (*LEO*) are associated with systematically lower auction prices. This strongly suggests that the top three auction houses can exercise market power luring owners of works by well-known artists to sell their works in the larger auction houses rather than the smaller and not so productive ones. In addition, auction house professionals argue that auction pricing is inefficient as art auction prices are set artificially low in catalogues in order to lure buyers to join in the excitement of the bidding process. The low prices also provide a satisfaction to the sellers with perceived satisfaction of obtaining a sufficient price. Pesando (1993), de la Barre et al. (1994), Agnello and Pierce (1996), Renneboog and Van Houtte (2002) and Higgs and Worthington (2005) also found that Sotherby's typically fetched higher prices than Christies and in turn these two auction houses commanded higher, prices than all other houses.

Table 3 presents the nominal quarterly art, stock and housing price indices. The nominal Australian art index using the hedonic price index method is calculated as $100e^{\beta t}$ spanning the first quarter 1986 to the fourth quarter 2009. As a means of direct comparison with Australian financial assets, the All Ordinaries stock price index (in nominal terms) is also presented for this period. The All Ordinaries index is a broad market-weighted price index which tracks movements on the Australian Stock Exchange and currently accounts for more than ninety-five percent of market capitalisation. The Australian housing price index (in nominal terms) is the weighted prices for eight Australian capital cities produced by Australian Bureau of Statistics (ABS) and this series covers the period from the second quarter 1986 to the fourth quarter 2009. The art price index is comparable to the housing price index as both can be considered as consumption goods as well as investment goods. In addition there are sizeable transaction and holding costs (Frey and Eichenberger, 1995a; 1995b). Candela and Scorcu (1997: 190) presented the suitability of comparing these two investments suggesting that "…the aesthetic dividend effect is closely related with the heterogeneity of the objects traded and with the low degree of liquidity of the art market, features that make the art market more similar to the real estate market". It is expected that the art market be always dependent on the stock and housing markets as it has no income stream attached to it. Housing has the implicit rental even if owner-occupied and stock has dividends. This also means that their indices underestimate their financial returns.

Plots of the trends of the Australian price art (API), All Ordinaries (AOI) and housing price (HPI) indices are depicted in Figure 1. On the basis of the estimated art index, the art market appears to be strongly cyclical with peaks in 1987 quarter two, 1987 quarter four, 2002 quarter two, 2007 quarter four and 2008 quarter one. While the Australian stock and housing price indices gradually increase over the entire period. There is evidence the

Australian art bear market began in 1990 and continued until 1995. This mirrored the world art market downturn in the 1990s. To compare the API and AOI, in the mid 1990s the art bear market and the long running equity bull market forced the two indices apart until the beginning of the next decade. From 2003 these two markets continued to rise strongly peaking in 2007 quarter four and both plummeted in 2008 quarter one during the GFC. In general, the API and AOI tracked each other more closely than the HPI. Conversely, the HPI depicts a smoother trend as the housing price index is the weighted index employing the median house prices sold in the eight capital cities and the median prices ignore the high and low peaks. The HPI remained buoyant from 1986 to 2009 with only a sight down turn in 2009 quarter one. Fortunately, the Australian housing market did not suffer the same fate as the US. The pattern of Australian art market index presented in this analysis is generally comparable to other studies in this area. Locatelli Biey and Zannola (1999) observed that US art investment performed well from 1987 to the first semester 1992 as compared with alternative forms of investment, such as US stocks while returns fell in second semester 1992 to 1995. Similarly, de la Barre et al. (1994) concluded that the nominal art index from Great Masters from 1962 to 1991 peaked in 1990, while Candela and Scorcu (1997) produced the nominal Italian art index from 1983 to 1994 where the index peaked in 1989 and continued to fall until 1992. Higgs and Worthington (2005) estimated an annual Australian art index spanning 1973 to 2003 showing that the art market peaked in 1989 and continued to gradually decline until 1993.

<FIGURE 1 HERE>

Table 3 also presents the returns of the three markets. For the art, housing and financial indices the quarterly 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 highest returns in the Australian art market occurred in 1987 quarter two (34.38 percent), 1991 quarter one (30.48 percent), 1993 quarter one (30.03 percent), 1997 quarter one (37.38 percent) and 2007 quarter two (44.53 percent). While the price cycles of the Australian stock market are less dramatic with peak returns in 1986 quarter four (15.72 percent), 1987 quarter three (22.98 percent) and 1988 quarter two (14.67 percent). Yet the pattern of returns in the Australian housing market is more restrained with the highest returns in 1988 quarters three and four with respective returns of 9.34 and 9.54 percent. The returns of the art market achieved the highest return and also the largest negative returns with contractions exceeding 30 percent in 1991 quarter two (31.14 percent), 1993 quarter two (30.70 percent), 1994 quarter four (32.92 percent), 1997 quarter two (35.67 percent) and

2008 quarter one (38.54 percent). Whereas the returns of the Australian stock market experienced major contractions in 1987 quarter four stock market crash of 57.19 percent and at the start of the GFC in 2008 quarter one with a downturn of 19.73 percent and a further downturn of 33.90 percent in the last quarter of 2008. The housing market also experienced the highest downturns during the GFC with highest negative returns in 2008 quarter two of 0.84 percent; 2009 quarter three of 2.65 percent; 2008 quarter four of 1.35 percent and 2009 quarter one of 1.35 percent. Clearly the GFC has affected all three markets with the greatest impact on the art market and the least impact on the housing market. On the other hand, Renneboog and Van Hutte (2002; 349) pointed out that the returns on art do not include the aesthetic qualities "…art investor believe that owning a thing of beauty is a joy forever, this non-monetary value may compensate them for the lack of financial reward". As a comparison, the Australian art market followed that of the well-documented London art market, in 15-16 September 2008 the top end of the art market in London was still buoyant with 80 percent of auction estimates above $1m finding buyers. But by "black" October 2008, the art market plummeted coinciding with violent contractions of the stock markets (Art Market Insight, 2010).

<TABLE 3 HERE>

Table 4 compares the risk and returns on the Australian art, stock and housing markets over three periods: the entire period, the period prior to the GFC or prior to 2007 quarter four and the period during the GFC from 2008 quarter one to 2009 quarter four. The uppermost panel of Table 4 presents the risk and returns for the three markets over the entire sample period. During this period the arithmetic mean art return (1.1731 percent) is lower than the stock market (1.5380 percent) which in turn is lower than the housing market (1.8550 percent). There is no significant difference between the average returns in these three markets. Returns in the art market are more volatile with a standard deviation of 17.3477 percent which is significantly higher than the stock market of 9.7820 percent and the housing market of 2.1886 percent. The next-to-uppermost panel of Table 4 shows the risk and returns covering the period prior to the GFC. The average returns for the art, stock and housing markets are respectively 1.8193 percent, 2.0427 percent and 1.9274 percent with the respective standard deviations being 16.9846 percent, 8.8303 percent and 2.1056 percent. Over this sample period there is no significant difference in the average returns between the three markets with the art market being more risky. The lowermost panel of Table 4 presents the risk and returns during the GFC, the average returns plummeted by 5.8548 percent in the art market and 3.9509 percent in the stock market while the housing market did not follow the same trend with an average upturn of 1.0764 percent. Once again over this period the art market was most

volatile with a standard deviation of 20.8675 percent, the stock market of 17.0108 percent and the housing market being more stable having a standard deviation of 3.0071 percent. The GFC did not impact on the Australian housing market as it was artificially boosted by the federal government's First Home Owner Grant. As of 14 November 2008, the qualifying first home buyers purchasing established homes received a $7000 boost, doubling the standard grant of $7,000 to $14,000. First home buyers who built a new home or purchase a newly constructed home received an extra $14,000 to take their grant to $21,000. This boost/scheme was extended to 31 December 2009. As a comparison, Baumol (1986), Frey and Pommerehne (1989), Goetzmann (1993), Chanel *et al*. (1994), Candela and Scorcu (1997), Pesando and Shum (1999), Renneboog and Van Houtte (2002), Mei and Moses (2002) and Worthington and Higgs (2004) found art investments underperformed equity investments.

<TABLE 4 HERE>

The average quarterly return of one percent in Australian art market over the sample period appears to be lower than other studies using annual data but is more compatible to average returns calculated from longer time series. Higgs and Worthington (2005), for example, found Australian nominal annual returns over the period 1973 to 2003 averaged 6.96 percent with a standard deviation of 16.51 percent. Similar average returns are evident in Pesando and Shum (1999) using semi annual data from 1997 to 1996 produced an average returns of 1.48 percent with a standard deviation of 21.86 percent for Picasso prints, Candela and Scorcu (1997) also estimated Italian artists averaged 1.92 percent used semi annual data from 1953 to 1994 and Frey and Pommerehne (1989) using a much longer time series spanning 1635 to 1987 obtained an average return of 1.5 percent with a standard deviation of 5 percent.

Based on the returns of the three markets over the entire period, the simple pairwise correlation of the return to art and with the returns to stock and housing are respectively 0.0737 and 0.0979. As the correlation of returns is relatively low and not significantly different from zero, diversifying across these markets may allow investors to reduce portfolio risk.

V Concluding Remarks

This study constructs a *quarterly* Australian art price index for the period 1986 to 2009, which allows a comparison of the short-term performance of the art market as a form of investment relative to the stock and housing markets. This study extends this area by estimating a quarterly art price index, whereas previous studies all produced semi-annual or annual art indices, which are inadequate to examine the intense price movements of the art, stock and housing markets over the short period of the GFC from 2008 to 2009.

The hedonic price method is used to build this index, using data on 64,203 artworks by seventy-one well-known artists sold at auctions during this time. From the hedonic price equation, works by McCubbin, Gascoigne, Thomas and Preston and artists deceased at the time of auction, larger sized works and those executed in oils or acrylic, and those auctioned by Sotheby's, Deutscher-Menzies or Christies are associated with higher prices. Conversely, works by Arkley, Boyd (Jamie), Larter and Hodgkinson and artists living at the time of the auction, smaller works, etchings, crayon or charcoal works, along with those auctioned by Australian Art Auctions, James Lawson and Leonard Joel are associated with systematically lower prices.

The movement of the art price index tracked closely to that of the stock market with peaks in the late 1980s and in 2007 and dramatic downturns in the middle of 2008 during the GFC. By contrast, the housing market remained relatively unscathed during the GFC. Over the entire sample period, returns on art are *not significantly* lower but risks are significantly higher than in the stock and housing investment markets. Over the GFC, the average return on art is *significantly* lower and risk significantly higher than the stock and housing markets. During the GFC the Australian art market followed a similar fate to that of the global art markets, which also coincided with the downturn of stock markets nationally and internationally.

These results are of interest to portfolio managers. There are substantial drawbacks to art investment with the art market being less liquid and returns being further reduced by high transaction costs; however one must not overlook the aesthetic qualities of art investment. Investment in the art market could be encouraged because of the relatively low correlations with the stock and housing markets, and are suggestive of the benefits of portfolio diversification.

These findings made a contribution in tracking the movement of the art, stock and housing markets that has not been previously explored in the Australian context especially over the uncertain period of the GFC. The assessment of the risk and returns of these markets allows for better understanding of investment diversification by investors. These findings are of special interest given the recent Henry tax reform which proposes to disallow the use of artworks as investments in self managed super funds.

A limitation in this model is that works from well-established artists are used to estimate the index which inevitably involves bias towards higher-valued works, so the risk and returns may only be truly indicative of masterpieces, rather than artworks more generally. The advantage of this is that it reduces the impact of the gallery sales market for unknown and

new artists. This is comparable to the stock market which includes only the top 500 shares. By contrast, the housing index is the weighted index employing the median house prices sold in the eight capital cities and the median prices ignore both higher and lower priced houses resulting in a smoother series.

There are many interesting opportunities to expand upon this work. One possibility is to extend the hedonic price index method and construct a monthly price index. This would allow further analyses into the inter-relationship between these three markets using capital asset pricing models (Locatelli Biey and Zanola, 1999), cointegration and error correction models (Czujack *et al*, 1996; Flores, Ginsburgh and Jeanfils, 1999; Worthington and Higgs, 2003) and more sophisticated time-series techniques. In addition, it would be of interest to extend the art price index to take account of the future impact of the Henry tax reform whereby self managed super funds are no longer allowed to own artworks as part of their portfolio and how this change will affect the art price index at the time of the announcement and when the legislation becomes effective.

REFERENCES

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

Art Market Insight (2010), <http://www.artmarketresearch.com/> Accessed February 2010.

Australian Art Sales Digest (2010), <http://www.aasd.com.au/> Accessed November 2009.

Australian Art Collector Magazine (2010) <http://www.artcollector.net.au/> Accessed February 2010.

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

Buelens, N. and Ginsburgh, V. (1993), Revisiting Baumol's 'Art as a floating crap game', *European Economic Review* **37**, 1351-1371.

Candela, G. and Scorcu, A.E. (1997), 'A price index for art market auctions', *Journal of Cultural Economics* **21**, 175-196.

Chanel, O. (1995), 'Is Art Market Behaviour Predictable?', *European Economic Review* **39**, 519-527.

Czujack, C., R. Flores, and V. Ginsburgh, (1996), On long-run price comovements between paintings and prints, in: V.A. Ginsburgh and P.M. Menger, eds., *Economics of the Arts: Selected Essays* (Elsevier North-Holland, Amsterdam) 85–112.

de la Barre. M., Docclo, S. and Ginsburgh, V. (1994), 'Returns of Impressionist, Modern and Contemporary European Paintings 1962-1991', *Annales d'Economie et de Statistique* **35**, 143-181.

Flores, R.G., Ginsburgh, V. and Jeanfils, P. (1999), 'Long and Short Term Portfolio Choices of Paintings', *Journal of Cultural Economics* **23**, 193-201.

Frey, B. and Pommerehne, W. (1989), 'Art Investment: An Empirical Inquiry, *Southern Economic Journal* **56**, 396-407.

Frey, B.S. and Eichenberger, R. (1995a), 'On the Return of Art Investment Return Analyses', *Journal of Cultural Economics* **19**, 207-220.

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

Gerard-Varet, L.A. (1995), 'On Pricing the Priceless: Comments on the Economics of the Visual Art Market', *European Economic Review* **39**, 509-518.

Ginsburgh, V. and Jeanfils, P. (1995), 'Long Term Comovements in International Markets for Paintings', *European Economic Review* **39**, 538-548.

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

Goetzmann, W.N. (1995), 'The Informational Efficiency of the Art Market', *Managerial Finance* **21**, 25-34.

Goetzmann, W.N. (1996), 'How Costly is the Fall from Fashion? Survivorship Bias in the Painting Market','in: V.A. Ginsburgh and P.M. Menger, eds., *Economics of the Arts: Selected Essays* (Elsevier North-Holland, Amsterdam) 71-84.

Guerzoni, G. (1995), 'Reflections on Historical Series of Art Prices: Reitlinger's Data Revisited', *Journal of Cultural Economics* **19**, 251-260.

Higgs, H. and Worthington, A.C. (2005), 'Financial Returns and Price Determinants in the Australian Art Market, 1973-2003, *The Economic Record*, **81**(253), 113-123.

Locatelli Biey, M. and Zanola, R. (1999), 'Investment in Paintings: A Short-Run Price Index, *Journal of Cultural Economics* **23**, 211-222.

Mei, J. and Moses, M. (2002), 'Art as an investment and the underperformance of masterpieces', The American Economic Review, **92**, 1165-1668.

Mok, H.M.K., Ko, V.W.K., Woo, S.S.M. and Kwok, K.Y.S. (1993), 'Modern Chinese Paintings: An Investment Alternative', *Southern Economic Journal* **59**, 808-816.

Passmore, D. (2010), 'Rocket to recovery: Rich get richer as shares surge', *The Sunday Mail*, 24 January.

Pesando, J.E. (1993), 'Arts as An Investment: The Market for Modern Prints', *American Economic Review* **83**, 1075-1089.

Pesando, J.E. and Shum, P.M. (1999), 'The Returns to Picasso's Prints and to Traditional Financial Assets, 1977 to 1996', *Journal of Cultural Economics* **23**, 183-192.

Renneboog, L. and Van Houtte, T. (2002), 'The Monetary Appreciation of Paintings: from Realism to Magritte', *Cambridge Journal of Economics* **26**, 331-357.

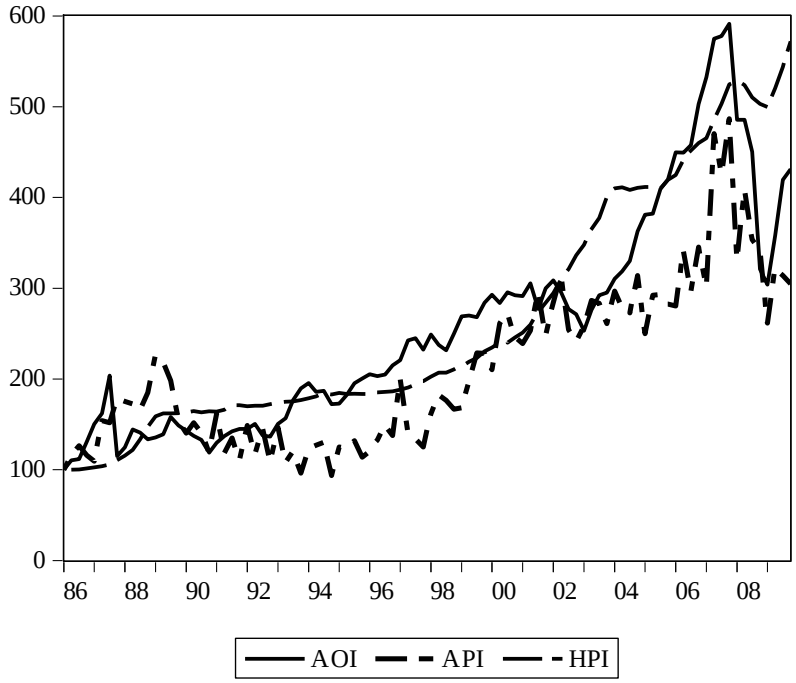
White, H. (1980), 'A Heteroscedastistic Consistent Covariance Matrix Estimator and A Direct Test for Heteroscedasticity, *Econometrica* **50**, 1-25.

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

Worthington, A.C. and Higgs, H. (2004), 'Art as an Investment: Risk, Return and Portfolio Diversification in Major Painting Markets', *Accounting and Finance* **44**, 257-272.

Figure 1

Graph of All Ordinary, Art Price and Housing Price Indices from 1986 Quarter One to 2009 Quarter Four



Notes: AOI, All Ordinary Index; API, Art Price Index; HPI, Housing Price Index

Table 1

Descriptive Statistics of Artworks by Artists, Medium and Auction House

Description	Variable	Born	Died	Work Sold	Mean	Standard deviation	Coefficient of Variation	Skewness	Kurtosis	Jarque-Bera	J-B p-value
Arkley, Howard	ARK	1951	1999	147	$56450	$84902	1.50	2.23	7.51	247.10	0.00
Ashton, John	ASH	1881	1963	1084	$3323	$5628	1.69	7.36	98.36	420555.50	0.00
Beckett, Clarice	BEC	1887	1935	215	$13951	$17130	1.23	2.51	10.52	732.40	0.00
Blackman, Charles	BLA	1928	–	3650	$12200	$42467	3.48	11.58	195.31	5705786.00	0.00
Booth, Peter	BOO	1940	–	228	$11263	$23878	2.12	4.16	23.70	4729.27	0.00
Boyd, Arthur	BYA	1920	1999	2609	$26279	$71781	2.73	7.86	86.83	790887.40	0.00
Boyd, David	BYD	1924	–	2332	$6552	$10345	1.58	6.51	91.27	773599.90	0.00
Boyd, Jamie	BYJ	1948	–	229	$1293	$1493	1.15	1.82	6.18	223.56	0.00
Boyd, Theodore Penleigh	BYT	1890	1923	351	$12314	$30504	2.48	5.68	41.21	23233.27	0.00
Brack, Cecil John	BRA	1920	1999	441	$77187	$280600	3.64	8.30	84.27	126440.60	0.00
Buckmaster, Ernest	BUC	1897	1968	951	$4810	$3290	0.68	1.56	7.79	1295.39	0.00
Bunny, Rupert	BUN	1864	1947	588	$34729	$88696	2.55	6.59	69.71	113297.40	0.00
Coburn, John	COB	1925	2006	1206	$6298	$14391	2.29	5.99	54.54	140693.50	0.00
Coleman, William	COL	1922	1993	959	$1649	$2211	1.34	3.97	29.26	30069.68	0.00
Crooke, Ray	CRO	1922	–	2137	$6408	$9428	1.47	3.01	14.23	14446.30	0.00
Dargie, William	DAR	1912	2003	231	$3452	$11788	3.41	8.99	96.95	88069.68	0.00
Dickerson, Robert	DIC	1924	–	2035	$6797	$10639	1.57	4.30	28.85	62936.05	0.00
Dobell, William	DOB	1899	1970	905	$15320	$48138	3.14	9.00	114.61	481992.50	0.00
Drysdale, George Russell	DRY	1912	1981	785	$49722	$170924	3.44	5.82	44.54	60867.06	0.00
Duncan, George	DUN	1904	1974	115	$2080	$3162	1.52	3.92	23.34	2277.41	0.00
Fairweather, Ian	FAI	1891	1974	204	$52733	$113639	2.15	5.30	36.43	10453.09	0.00
Fizelle, Reginald Cecil	FIZ	1891	1964	140	$2488	$9287	3.73	8.03	72.24	29470.10	0.00
Fox, Ethel	FOX	1872	1952	379	$19603	$68532	3.50	10.10	128.10	253588.30	0.00
Friend, Donald	FRI	1915	1989	1913	$5249	$10117	1.93	7.80	104.59	841999.20	0.00
Fullbrook, Samuel	FUL	1922	2004	214	$11148	$12736	1.14	1.93	6.73	257.45	0.00
Garrett, Thomas	GAR	1879	1952	1073	$2235	$1676	0.75	5.46	82.91	290853.30	0.00
Gascoigne, Rosalie	GAS	1917	1999	34	$37954	$63288	1.67	3.32	15.71	291.19	0.00
Gleeson, James Timothy	GLE	1915	2008	867	$7241	$17086	2.36	8.50	108.18	410063.40	0.00
Glover, John	GLO	1767	1849	336	$29111	$164874	5.66	9.20	91.00	113171.60	0.00
Gould, John	GOU	1804	1881	2640	$1272	$5320	4.18	25.12	774.56	65760979.00	0.00

Description	Variable	Born	Died	Work Sold	Mean	Standard deviation	Coefficient of Variation	Skewness	Kurtosis	Jarque-Bera	J-B p-value
Gruner, Elioth	GRU	1882	1939	441	$16669	$21566	1.29	2.36	9.99	1307.51	0.00
Hart, Kevin Charles Pro	HAR	1928	2006	3428	$3705	$5325	1.44	4.68	47.48	295068.60	0.00
Hester, Joy	HES	1920	1960	111	$13273	$30023	2.26	5.23	34.09	4976.12	0.00
Heysen, Hans	HYH	1877	1968	1661	$9414	$18921	2.01	8.22	98.54	650385.40	0.00
Heysen, Nora	HYN	1911	2003	166	$6410	$8778	1.37	1.62	4.54	89.16	0.00
Hodgkinson, Frank	HOD	1919	2001	354	$1507	$2528	1.68	3.88	24.56	7742.14	0.00
Jackson, James Ranalph	JAC	1882	1975	708	$6631	$10214	1.54	7.46	87.74	218386.50	0.00
Kelly, John	KEL	1965	–	181	$32042	$34589	1.08	2.26	10.24	550.56	0.00
Klippel, Robert	KLI	1920	2001	269	$17406	$45640	2.62	6.81	61.17	40012.09	0.00
Kngwarreye, Emily	KNG	1910	1996	460	$36240	$68525	1.89	8.61	113.55	239905.80	0.00
Larter, Richard	LAR	1929	–	169	$5566	$7382	1.33	5.39	47.11	14517.49	0.00
Lindsay, Lionel	LNL	1874	1961	2512	$570	$943	1.66	18.27	534.54	29711633.00	0.00
Lindsay, Norman	LNN	1879	1969	4419	$6956	$18073	2.60	8.39	107.34	2056211.00	0.00
Long, Sydney	LON	1871	1955	851	$5521	$12568	2.28	8.75	113.34	442526.00	0.00
Maguire, Tim	MAG	1958	–	211	$25002	$55577	2.22	3.98	22.20	3797.30	0.00
McCubbin, Frederick	MCC	1855	1917	337	$87997	$248945	2.83	5.48	38.33	19208.89	0.00
Namatjira, Albert	NAM	1902	1959	741	$12093	$10784	0.89	1.96	10.04	2002.79	0.00
Nolan, Sidney	NOL	1917	1992	3527	$15788	$58711	3.72	12.66	230.43	7695649.00	0.00
Olley, Margaret	OLL	1923	–	355	$22248	$22927	1.03	1.05	3.04	64.98	0.00
Olsen, John	OLS	1928	–	1818	$15679	$48269	3.08	10.31	166.63	2060412.00	0.00
Perceval, John	PER	1923	2000	944	$20145	$47474	2.36	6.78	64.95	158198.80	0.00
Preston, Margaret	PRE	1875	1963	383	$18965	$34554	1.82	4.59	35.62	18332.04	0.00
Proctor, Althea	PRO	1879	1966	331	$2750	$3883	1.41	3.52	22.32	5834.11	0.00
Pugh, Clifton	PUG	1924	1990	978	$5341	$9723	1.82	4.43	31.98	37427.94	0.00
Rankin, David	RAN	1946	–	517	$2995	$3802	1.27	1.85	7.10	656.25	0.00
Rees, Lloyd	REE	1895	1988	1184	$13389	$35325	2.64	6.90	70.71	235594.60	0.00
Roberts, Thomas William	RBT	1856	1931	321	$27155	$54607	2.01	4.24	24.55	7171.10	0.00
Robinson, William	ROB	1936	–	170	$62977	$95101	1.51	2.90	15.04	1266.45	0.00
Russell, John Peter	RUS	1859	1930	199	$75158	$202359	2.69	5.80	43.53	14735.85	0.00
Sawrey, Hugh	SAW	1923	1999	835	$7250	$8219	1.13	4.20	37.55	43983.93	0.00
Shead, Garry	SHE	1942	–	499	$16855	$37743	2.24	4.69	37.37	26389.59	0.00
Smart, Frank Jeffrey	SMA	1921	–	433	$65454	$106364	1.63	3.58	21.47	7078.30	0.00
Smith, Grace Cossington	SMI	1892	1984	280	$24175	$37379	1.55	4.20	27.41	7771.84	0.00

Description	Variable	Born	Died	Work Sold	Mean	Standard deviation	Coefficient of Variation	Skewness	Kurtosis	Jarque-Bera	J-B p-value
Storrier, Tim	STO	1949	–	662	$17112	$30347	1.77	2.89	12.97	3662.94	0.00
Streeton, Arthur	STR	1867	1943	1102	$36102	$91784	2.54	10.30	166.41	1245578.00	0.00
Thomas, Rover	THO	1926	1998	249	$64221	$109336	1.70	3.40	16.53	2380.20	0.00
Tjapaltjarri, Clifford	TJA	1932	2002	243	$32234	$159392	4.94	13.70	202.34	409918.00	0.00
Tucker, Albert	TUC	1914	1999	385	$33868	$85396	2.52	6.50	53.45	43541.56	0.00
Whiteley, Brett	WHI	1939	1992	1497	$49487	$193201	3.90	9.78	128.69	1009319.00	0.00
Williams, Frederick	WIL	1927	1982	841	$51167	$158308	3.09	7.50	73.17	180421.70	0.00
Withers, Walter	WTH	1854	1914	433	$13816	$34473	2.50	6.20	55.41	52340.81	0.00
Acrylic	ACR	–	–	1443	$27417	$88433	3.23	15.89	378.01	8516198.00	0.00
Charcoal	CHA	–	–	1341	$4947	$10556	2.13	14.72	331.91	6093174.00	0.00
Crayon	CRA	–	–	330	$3670	$6062	1.65	3.99	24.18	7042.84	0.00
Etching	ETC	–	–	6059	$1507	$2394	1.59	5.05	45.20	475269.40	0.00
Gouache	GCH	–	–	1220	$11432	$18371	1.61	3.04	15.75	10143.23	0.00
Lithograph	LTH	–	–	6401	$1540	$3337	2.17	15.25	504.24	67256741.00	0.00
Mixed media	MIX	–	–	1285	$8287	$19241	2.32	15.34	356.36	6735925.00	0.00
Oil	OIL	–	–	24465	$27579	$99225	3.60	14.09	305.80	94273506.00	0.00
Pastel	PAS	–	–	1427	$6769	$8584	1.27	4.15	34.13	61699.50	0.00
Pencil	PEN	–	–	3059	$4309	$12747	2.96	16.73	405.32	20773495.00	0.00
Watercolour	WCO	–	–	6610	$8670	$12773	1.47	4.22	35.13	303974.30	0.00
All other media	–	–	–	10563	$9236	$41763	4.52	13.85	279.99	34105690.00	0.00
Australian Art Auctions	AUS	–	–	1889	$2424	$4125	1.70	6.56	70.15	368501.70	0.00
Christies	CHR	–	–	10345	$18063	$67393	3.73	16.00	387.00	64002036.00	0.00
Deutscher-Menzies	DEU	–	–	5484	$37947	$125480	3.31	10.83	182.54	7472887.00	0.00
Lawson Menzies	LAW	–	–	2738	$14202	$44810	3.16	10.62	174.13	3392494.00	0.00
Leonard Joel	LEO	–	–	14979	$3749	$16473	4.39	42.27	2676.79	4470000000.00	0.00
Sotheby's	SOT	–	–	8724	$33379	$108913	3.26	14.86	327.87	38685639.00	0.00
All other auction houses	–	–	–	20044	$7865	$35698	4.54	22.24	734.39	448000000.00	0.00

Table 2

Estimated Coefficients, Standard Errors and Percentage Change in Prices for the Hedonic Price Equation

Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change	Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change	Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change
C	3.1703	0.0352	0.0000	23.8139	SMI	2.1675	0.0604	0.0000	8.7366	1994Q3	1.2634	0.0333	0.0000	3.5373
ARK	2.1958	0.0924	0.0000	8.9872	STO	1.9234	0.0603	0.0000	6.8444	1994Q4	0.9341	0.0340	0.0000	2.5450
ASH	0.8771	0.0372	0.0000	2.4039	STR	2.5351	0.0436	0.0000	12.6180	1995Q1	1.2235	0.0483	0.0000	3.3990
BEC	1.5687	0.0583	0.0000	4.8006	THO	3.5662	0.0876	0.0000	35.3815	1995Q2	1.2106	0.0494	0.0000	3.3554
BLA	1.7558	0.0383	0.0000	5.7882	TJA	1.9972	0.1004	0.0000	7.3682	1995Q3	1.2782	0.0377	0.0000	3.5902
BOO	1.4039	0.0619	0.0000	4.0708	TUC	2.4042	0.0530	0.0000	11.0692	1995Q4	1.1296	0.0393	0.0000	3.0944
BRA	2.9329	0.0567	0.0000	18.7817	WHI	2.9585	0.0437	0.0000	19.2688	1996Q1	1.1846	0.0943	0.0000	3.2692
BUC	1.2367	0.0366	0.0000	3.4441	WIL	2.6487	0.0434	0.0000	14.1363	1996Q2	1.2817	0.0365	0.0000	3.6028
BUN	1.9840	0.0555	0.0000	7.2717	WTH	2.0007	0.0575	0.0000	7.3944	1996Q3	1.4021	0.0389	0.0000	4.0637
BYA	2.0907	0.0367	0.0000	8.0904	DTH	0.2230	0.0161	0.0000	1.2498	1996Q4	1.3186	0.0355	0.0000	3.7381
BYD	1.4033	0.0321	0.0000	4.0686	ACR	1.1090	0.0342	0.0000	3.0312	1997Q1	1.6924	0.0786	0.0000	5.4324
BYJ	0.1178	0.0657	0.0731	1.1251	CHA	0.5396	0.0290	0.0000	1.7153	1997Q2	1.3357	0.0397	0.0000	3.8025
BYT	1.7702	0.0599	0.0000	5.8721	CRA	0.3495	0.0462	0.0000	1.4184	1997Q3	1.2883	0.0303	0.0000	3.6266
COB	1.3638	0.0404	0.0000	3.9109	ETC	-0.4439	0.0178	0.0000	0.6415	1997Q4	1.2242	0.0374	0.0000	3.4014
CRO	1.1951	0.0337	0.0000	3.3039	GCH	1.0872	0.0291	0.0000	2.9661	1998Q1	1.4801	0.0658	0.0000	4.3932
DAR	0.5062	0.0711	0.0000	1.6590	LTH	-0.7044	0.0192	0.0000	0.4944	1998Q2	1.6014	0.0345	0.0000	4.9598
DIC	1.9058	0.0413	0.0000	6.7250	MIX	1.0175	0.0286	0.0000	2.7664	1998Q3	1.5676	0.0376	0.0000	4.7953
DOB	2.2331	0.0441	0.0000	9.3283	OIL	1.8693	0.0197	0.0000	6.4840	1998Q4	1.5120	0.0353	0.0000	4.5359
DRY	2.6403	0.0490	0.0000	14.0177	PAS	0.9906	0.0301	0.0000	2.6927	1999Q1	1.5206	0.0869	0.0000	4.5752
DUN	0.1530	0.0826	0.0640	1.1653	PEN	0.1176	0.0218	0.0000	1.1248	1999Q2	1.6798	0.0333	0.0000	5.3645
FAI	3.0431	0.0767	0.0000	20.9691	WCO	1.0354	0.0181	0.0000	2.8163	1999Q3	1.8279	0.0339	0.0000	6.2209
FIZ	0.7782	0.0830	0.0000	2.1776	ARE	0.6598	0.0077	0.0000	1.9343	1999Q4	1.8253	0.0318	0.0000	6.2048
FOX	1.5736	0.0634	0.0000	4.8240	ASQ	-0.0628	0.0061	0.0000	0.9391	2000Q1	1.7437	0.1123	0.0000	5.7185
FRI	1.6873	0.0358	0.0000	5.4051	AUS	-0.2168	0.0215	0.0000	0.8051	2000Q2	1.9609	0.0316	0.0000	7.1059
FUL	1.5724	0.0657	0.0000	4.8182	CHR	0.5810	0.0142	0.0000	1.7879	2000Q3	2.0021	0.0403	0.0000	7.4048

Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change	Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change	Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change
GAR	2.1747	0.0424	0.0000	8.7999	DEU	0.6323	0.0159	0.0000	1.8819	2000Q4	1.8999	0.0346	0.0000	6.6852
GAS	3.4302	0.1645	0.0000	30.8833	LAW	0.1558	0.0197	0.0000	1.1686	2001Q1	1.8717	0.0864	0.0000	6.4990
GLE	1.1365	0.0389	0.0000	3.1159	LEO	0.1308	0.0118	0.0000	1.1398	2001Q2	1.9298	0.0343	0.0000	6.8881
GLO	2.0105	0.0715	0.0000	7.4667	SOT	0.7991	0.0158	0.0000	2.2235	2001Q3	2.0840	0.0336	0.0000	8.0369
GOU	1.6569	0.0381	0.0000	5.2428	1986Q2	1.1439	0.0568	0.0000	3.1390	2001Q4	1.9077	0.0335	0.0000	6.7379
GRU	2.1308	0.0494	0.0000	8.4212	1986Q3	1.2346	0.0717	0.0000	3.4369	2002Q1	2.0445	0.0597	0.0000	7.7250
HAR	0.6480	0.0299	0.0000	1.9116	1986Q4	1.1472	0.0604	0.0000	3.1492	2002Q2	2.1443	0.0392	0.0000	8.5362
HES	2.3656	0.1002	0.0000	10.6501	1987Q1	1.0890	0.0927	0.0000	2.9714	2002Q3	1.9334	0.0345	0.0000	6.9129
HOD	0.1341	0.0572	0.0190	1.1435	1987Q2	1.4328	0.0561	0.0000	4.1904	2002Q4	1.8829	0.0326	0.0000	6.5724
HYH	2.4024	0.0373	0.0000	11.0492	1987Q3	1.4171	0.0546	0.0000	4.1253	2003Q1	1.9460	0.0548	0.0000	7.0009
HYN	1.1389	0.0811	0.0000	3.1234	1987Q4	1.5777	0.0455	0.0000	4.8440	2003Q2	2.0530	0.0328	0.0000	7.7909
JAC	1.3129	0.0436	0.0000	3.7169	1988Q1	1.5620	0.0731	0.0000	4.7681	2003Q3	2.0412	0.0348	0.0000	7.6998
KEL	2.2450	0.0836	0.0000	9.4406	1988Q2	1.5437	0.0501	0.0000	4.6819	2003Q4	1.9601	0.0334	0.0000	7.0999
KLI	2.5856	0.0998	0.0000	13.2714	1988Q3	1.5040	0.0383	0.0000	4.4998	2004Q1	2.0882	0.0402	0.0000	8.0705
KNG	2.5478	0.0744	0.0000	12.7789	1988Q4	1.6145	0.0370	0.0000	5.0253	2004Q2	2.0255	0.0333	0.0000	7.5795
LAR	0.8371	0.0879	0.0000	2.3096	1989Q1	1.8162	0.0684	0.0000	6.1486	2004Q3	2.0033	0.0356	0.0000	7.4136
LNL	0.9906	0.0326	0.0000	2.6929	1989Q2	1.7795	0.0440	0.0000	5.9270	2004Q4	2.1439	0.0269	0.0000	8.5324
LNN	2.3782	0.0326	0.0000	10.7859	1989Q3	1.6841	0.0396	0.0000	5.3874	2005Q1	1.9164	0.0420	0.0000	6.7965
LON	1.5821	0.0439	0.0000	4.8649	1989Q4	1.4394	0.0422	0.0000	4.2182	2005Q2	2.0723	0.0328	0.0000	7.9430
MAG	1.5103	0.0919	0.0000	4.5279	1990Q1	1.3380	0.1099	0.0000	3.8115	2005Q3	2.0755	0.0401	0.0000	7.9687
MCC	2.9873	0.0633	0.0000	19.8322	1990Q2	1.4165	0.0449	0.0000	4.1225	2005Q4	2.0381	0.0348	0.0000	7.6762
NAM	2.5642	0.0423	0.0000	12.9907	1990Q3	1.3469	0.0396	0.0000	3.8453	2006Q1	2.0312	0.0385	0.0000	7.6235
NOL	1.8653	0.0357	0.0000	6.4581	1990Q4	1.1766	0.0425	0.0000	3.2434	2006Q2	2.2295	0.0339	0.0000	9.2951
OLL	2.0148	0.0590	0.0000	7.4992	1991Q1	1.4814	0.1067	0.0000	4.3992	2006Q3	2.0867	0.0384	0.0000	8.0579
OLS	2.2226	0.0430	0.0000	9.2317	1991Q2	1.1701	0.0387	0.0000	3.2222	2006Q4	2.2392	0.0348	0.0000	9.3861
PER	2.1679	0.0454	0.0000	8.7399	1991Q3	1.3006	0.0369	0.0000	3.6715	2007Q1	2.1027	0.0524	0.0000	8.1883
PRE	2.8625	0.0618	0.0000	17.5059	1991Q4	1.1024	0.0439	0.0000	3.0114	2007Q2	2.5480	0.0402	0.0000	12.7820
PRO	1.6472	0.0650	0.0000	5.1923	1992Q1	1.3966	0.1024	0.0000	4.0416	2007Q3	2.4483	0.0313	0.0000	11.5683

Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change	Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change	Variable	Estimated Coefficient	Standard Error	p-value	Percentage Change
PUG	1.0251	0.0406	0.0000	2.7873	1992Q2	1.1570	0.0409	0.0000	3.1804	2007Q4	2.5828	0.0391	0.0000	13.2343
RAN	0.1851	0.0627	0.0032	1.2033	1992Q3	1.3717	0.0484	0.0000	3.9420	2008Q1	2.1974	0.0506	0.0000	9.0013
RBT	2.4678	0.0690	0.0000	11.7963	1992Q4	1.0829	0.0437	0.0000	2.9532	2008Q2	2.4084	0.0372	0.0000	11.1158
REE	2.3399	0.0388	0.0000	10.3797	1993Q1	1.3832	0.1190	0.0000	3.9877	2008Q3	2.2630	0.0425	0.0000	9.6116
ROB	2.7078	0.0769	0.0000	14.9960	1993Q2	1.0762	0.0454	0.0000	2.9336	2008Q4	2.2296	0.0435	0.0000	9.2963
RUS	2.7744	0.0929	0.0000	16.0287	1993Q3	1.1824	0.0424	0.0000	3.2623	2009Q1	1.9624	0.0496	0.0000	7.1161
SAW	1.2511	0.0390	0.0000	3.4943	1993Q4	0.9625	0.0388	0.0000	2.6182	2009Q2	2.1717	0.0439	0.0000	8.7736
SHE	1.6146	0.0550	0.0000	5.0258	1994Q1	1.2017	0.0499	0.0000	3.3258	2009Q3	2.1444	0.0465	0.0000	8.5368
SMA	3.0886	0.0565	0.0000	21.9457	1994Q2	1.2387	0.0464	0.0000	3.4512	2009Q4	2.1144	0.0416	0.0000	8.2848

Table 3

Art, All Ordinary and Housing Price Indices and Returns

Year Quarter	API	APR	AOI	AOR	HPI	HPR	Year Quarter	API	APR	AOI	AOR	HPI	HPR
1986Q1	100.00		100.00				1998Q1	161.62	25.59	248.98	7.01	202.61	2.45
1986Q2	115.48	14.39	110.27	9.78	100.00		1998Q2	182.46	12.13	237.54	-4.70	207.01	2.15
1986Q3	126.44	9.07	111.93	1.49	100.33	0.33	1998Q3	176.41	-3.37	231.59	-2.54	207.01	0.00
1986Q4	115.85	-8.74	130.98	15.72	101.47	1.13	1998Q4	166.87	-5.56	250.03	7.66	210.44	1.64
1987Q1	109.31	-5.81	150.26	13.73	102.61	1.12	1999Q1	168.31	0.86	269.05	7.33	214.19	1.77
1987Q2	154.16	34.38	162.03	7.54	103.75	1.11	1999Q2	197.35	15.92	269.85	0.30	219.09	2.26
1987Q3	151.76	-1.57	203.89	22.98	105.55	1.71	1999Q3	228.86	14.81	268.25	-0.60	223.16	1.84
1987Q4	178.20	16.06	115.09	-57.19	110.60	4.68	1999Q4	228.26	-0.26	283.87	5.66	230.51	3.24
1988Q1	175.41	-1.58	124.68	8.00	115.50	4.33	2000Q1	210.37	-8.16	292.70	3.06	234.75	1.82
1988Q2	172.24	-1.82	144.38	14.67	121.70	5.23	2000Q2	261.41	21.72	283.78	-3.10	240.29	2.34
1988Q3	165.54	-3.97	141.01	-2.36	133.61	9.34	2000Q3	272.41	4.12	295.49	4.04	239.97	-0.14
1988Q4	184.87	11.04	133.65	-5.36	146.98	9.54	2000Q4	245.93	-10.22	292.20	-1.12	245.68	2.35
1989Q1	226.19	20.17	135.71	1.53	158.89	7.79	2001Q1	239.09	-2.82	291.47	-0.25	251.06	2.17
1989Q2	218.04	-3.67	139.13	2.49	161.99	1.93	2001Q2	253.40	5.81	305.32	4.64	260.03	3.51
1989Q3	198.19	-9.55	158.21	12.85	161.99	0.00	2001Q3	295.66	15.43	277.10	-9.70	273.57	5.08
1989Q4	155.18	-24.46	148.71	-6.20	162.48	0.30	2001Q4	247.87	-17.63	299.89	7.90	283.85	3.69
1990Q1	140.22	-10.14	143.08	-3.86	163.30	0.50	2002Q1	284.19	13.67	308.62	2.87	294.62	3.72
1990Q2	151.66	7.84	137.41	-4.04	164.76	0.90	2002Q2	314.03	9.98	295.46	-4.36	309.14	4.81
1990Q3	141.46	-6.96	132.89	-3.35	163.30	-0.90	2002Q3	254.31	-21.09	276.83	-6.51	320.88	3.73
1990Q4	119.32	-17.02	118.75	-11.25	164.27	0.60	2002Q4	241.79	-5.05	271.36	-2.00	336.22	4.67
1991Q1	161.84	30.48	129.82	8.91	164.11	-0.10	2003Q1	257.55	6.32	253.09	-6.97	347.63	3.34
1991Q2	118.54	-31.14	137.06	5.43	166.07	1.19	2003Q2	286.61	10.69	276.07	8.69	365.09	4.90
1991Q3	135.07	13.05	142.22	3.70	171.13	3.00	2003Q3	283.26	-1.18	292.08	5.63	377.32	3.30
1991Q4	110.78	-19.82	145.09	2.00	171.13	0.00	2003Q4	261.19	-8.11	295.15	1.05	399.84	5.80
1992Q1	148.68	29.42	144.95	-0.10	169.98	-0.67	2004Q1	296.90	12.81	310.53	5.08	409.95	2.50
1992Q2	117.00	-23.96	150.52	3.77	170.47	0.29	2004Q2	278.83	-6.28	318.52	2.54	411.26	0.32

Year Quarter	API	APR	AOI	AOR	HPI	HPR	Year Quarter	API	APR	AOI	AOR	HPI	HPR
1992Q3	145.02	21.47	137.63	-8.95	170.64	0.10	2004Q3	272.73	-2.21	330.07	3.56	408.32	-0.72
1992Q4	108.64	-28.88	136.35	-0.94	172.27	0.95	2004Q4	313.89	14.06	362.77	9.45	410.60	0.56
1993Q1	146.70	30.03	150.56	9.91	173.90	0.94	2005Q1	250.03	-22.75	380.97	4.90	411.42	0.20
1993Q2	107.92	-30.70	156.89	4.12	175.04	0.65	2005Q2	292.20	15.59	382.21	0.32	410.93	-0.12
1993Q3	120.01	10.62	176.64	11.86	175.20	0.09	2005Q3	293.15	0.32	409.34	6.86	410.12	-0.20
1993Q4	96.32	-22.00	189.61	7.09	176.84	0.93	2005Q4	282.39	-3.74	419.74	2.51	419.40	2.24
1994Q1	122.35	23.92	195.48	3.05	178.79	1.10	2006Q1	280.45	-0.69	449.66	6.89	424.64	1.24
1994Q2	126.96	3.70	185.81	-5.07	180.91	1.18	2006Q2	341.95	19.83	449.29	-0.08	440.77	3.73
1994Q3	130.13	2.47	187.14	0.71	183.69	1.52	2006Q3	296.43	-14.28	457.50	1.81	451.66	2.44
1994Q4	93.63	-32.92	172.21	-8.31	182.87	-0.45	2006Q4	345.29	15.26	502.83	9.45	460.13	1.86
1995Q1	125.04	28.93	172.82	0.35	184.67	0.98	2007Q1	301.23	-13.65	532.53	5.74	465.37	1.13
1995Q2	123.44	-1.29	182.22	5.30	183.36	-0.71	2007Q2	470.22	44.53	574.74	7.63	485.13	4.16
1995Q3	132.08	6.76	195.14	6.85	183.69	0.18	2007Q3	425.57	-9.98	577.68	0.51	503.28	3.67
1995Q4	113.84	-14.86	200.58	2.75	183.36	-0.18	2007Q4	486.86	13.45	591.29	2.33	524.65	4.16
1996Q1	120.27	5.50	205.31	2.33	183.03	-0.18	2008Q1	331.14	-38.54	485.42	-19.73	528.28	0.69
1996Q2	132.54	9.71	203.25	-1.01	185.32	1.24	2008Q2	408.93	21.10	485.69	0.06	523.84	-0.84
1996Q3	149.50	12.04	205.08	0.90	185.97	0.35	2008Q3	353.59	-14.54	450.42	-7.54	510.13	-2.65
1996Q4	137.52	-8.35	215.05	4.75	186.46	0.26	2008Q4	341.99	-3.34	320.90	-33.90	503.28	-1.35
1997Q1	199.85	37.38	220.78	2.63	188.09	0.87	2009Q1	261.79	-26.73	304.04	-5.40	499.25	-0.80
1997Q2	139.89	-35.67	242.50	9.38	190.54	1.29	2009Q2	322.76	20.94	358.24	16.40	520.62	4.19
1997Q3	133.41	-4.74	244.90	0.98	193.96	1.78	2009Q3	314.05	-2.74	419.51	15.79	543.60	4.32
1997Q4	125.13	-6.41	232.13	-5.35	197.72	1.92	2009Q4	304.78	-3.00	431.06	2.72	571.83	5.06

Table 4

Summary of Statistics of Art, All Ords and Housing Returns

	Art Return	All Ords Return	Housing Return
Period		Entire Period	
Mean	1.1731	1.5380	1.8550
Standard Deviation	17.3477	9.7820	2.1886
Minimum	-38.5436	-57.1851	-2.6523
Maximum	44.5334	22.9788	9.5421
Correlation	Art Return	0.0737	0.0979
t Statistic		0.7126	0.9491
p-value		0.4779	0.3450
Count	95	95	94
Period		Up to 2007 Q4	
Mean	1.8193	2.0427	1.9274
Standard Deviation	16.9846	8.8303	2.1056
Minimum	-35.6721	-57.1851	-0.8951
Maximum	44.5334	22.9788	9.5421
Count	87	87	86
Period		GFC - 2008Q1 to 2009Q4	
Mean	-5.8548	-3.9509	1.0764
Standard Deviation	20.8675	17.0108	3.0071
Minimum	-38.5436	-33.9043	-2.6523
Maximum	21.0993	16.4038	5.0625
Count	8	8	8