Financial returns and price determinants in the Australian art market, 1973-2003

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In this study, 37,605 paintings by sixty well-known Australian artists sold at auction over the period 1973-2003 are used to construct a hedonic price index. The attributes included in the hedonic regression model include the name and living status of the artist, the size and medium of the painting, and the auction house and year in which the painting was sold. The resulting index indicates that returns on Australian fine-art averaged seven percent in nominal terms over the period with a standard deviation of sixteen percent. As a result, the risk-adjusted return of 0.42 in the Australian art market is only slightly less than the risk-adjusted return of 0.44 in the Australian stock market over the same period. The hedonic regression model also captures the willingness to pay for perceived attributes in the artwork, and this shows that works by McCubbin, Gascoigne, Thomas and Preston and other artists deceased at the time of auction, works executed in oils or acrylic, and those auctioned by Sotheby's or Christie's are associated with higher prices.

I Introduction

With the end of the long bull market in equity, and now with falling property values, many international investors are turning to art (paintings, sculpture, ceramics and prints, along with collectibles such as coins, stamps, antiques and furniture) as an alternative investment. Though memories remain strong of the downturn in the art market in the early 1990s, the fine-art resurgence in the final years of the last century, especially of Old Masters and Modern paintings, suggests that global art markets have developed and matured, and now offer more viable investment prospects (Anonymous 2000). With some financial advisors suggesting exposure to the art market up to fifteen percent of personal assets, the periodic revival of interest in art by the corporate world [see, for instance, Curry (1998), Oleck and Dunkin (1999), Peers and Jeffrey (1999) and Reid (2004)], and the widespread availability of market information [see, for example, Art Market Research (2004)], art stands out as an irresistible combination of pleasure and profit in otherwise staid, electronic or paper-strewn portfolios.

In Australia too, there is burgeoning interest in art investment generally, and in the work of Australian artists more particularly. While Australia has a long history of world-renowned artists, including Frederick McCubbin, Arthur Streeton, Tom Roberts and Arthur Boyd, in the

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last few decades painters like Charles Blackman, David Boyd, Ray Crooke and John Olsen have also produced numerous internationally reputable works. And many of these more recent Australian works have also realised high returns. In 2003 David Boyd's brightly coloured *Children Flying Kites* commanded a soaring price of $35,000 when the original estimate was just $12,000 to $18,000 and a large painting by John Olsen bought for $138,000 in 1999 was sold for $245,700 (Ingram 2003). And 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. Fine-art auction houses are struggling to keep up with the increased demand for Australian paintings, especially if the artists are included among the fifty most collectable by the Australian Art Collector magazine. As a consequence, Australia's art auction houses are expected to set a new sales record of $100 million in 2004, up from $92 million in 2003 and more than four times the turnover generated a decade earlier (Maslen 2004).

One patently useful source of information for those collectors, investors, galleries, auction houses and museums interested in Australian art is an index of market price movements. Such indexes allow not only the assessment of general movements in art prices and returns over time, and thereby a means to compare its performance with other assets, but also permit the comparison of returns by individual artists with a market benchmark, and are potentially useful as an input in asset pricing and risk management models. Regrettably, and in sharp contrast to most other artistic collections by school, period or nationality, there is no known price index of Australian work. This is a clear omission in the economics of art literature. 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, while Mok et al. (1993), Candela and Scorcu (1997) and Rennboog and Van Houtte (2002) produced price indices for Chinese, Italian and Belgian artistic works, respectively.

The purpose of this paper is to fill this gap in the literature by investigating the price determinants and investment returns for works by creating an Australian art market index. The index is derived from a hedonic pricing equation capturing the characteristics of artwork by sixty well-known Australian artists auctioned over the period 1973 to 2003. The paper itself is organised as follows. Section II briefly surveys the literature concerning art as an investment. Section III outlines the empirical methodology, while Section IV provides a

description of the data employed. The empirical results are dealt with in Section V. The paper ends with some concluding remarks in the final section.

II Art as an Investment

It goes without saying that art markets differ from financial markets. 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 substantial knowledge of art and the art world, and a large amount of capital to acquire the work of well-known artists. The market is also highly segmented and dominated by a few large auction houses, and risk is pervasive, deriving from both the physical risks of fire and theft and the possibility of reattribution to a different artist. 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.

In sharp contrast, most financial assets are almost always liquid, readily diversifiable and can be selected on the basis of a relatively small set of objective criteria. Such markets are characterised by a large number of buyers and sellers, transaction costs are low, and trades in near identical assets are repeated millions of times daily in hundreds of competing markets and exchanges. Nevertheless, art has been traded on organised markets for some time, with the organisation of the global art market much the same as it was in the 17th Century, and the place attributed to an artist by aesthetic judgement depends more or less upon the prices set in these markets (Gérard-Varet, 1995). While this implies that at least some tools of orthodox financial analysis can, and frequently have, been applied to art markets, there is also the necessity to clearly identify the distinguishing characteristics of these markets so that their findings can be examined in an appropriate context.

One major distinguishing feature of art markets is that the art objects themselves are created by individuals, and are for the most part produced as differentiated objects. Accordingly, and in principle, there is only one unique piece of original work: an extreme case of a heterogeneous commodity. However, heterogeneity does not imply singularity (Chanel et al. 1994) since some substitutability remains among the work of a single artist, or among the works of artists within and across schools. Worthington and Higgs (2003), for example, have examined the short and long-run interrelationships between major painting markets, including Contemporary Masters, French Impressionists, Modern European, Old Masters and Surrealists. Likewise, there are thought to be strong relationships between art

markets and financial markets (including stocks, bonds and property), with Chanel (1995), Ginsburgh and Jeanfils (1995) and Czujack et al. (1996) using cointegration techniques to explore this dimension of art research. Nonetheless, as the creative outpouring of a single artist (or group of artists), the supply of artwork is nonaugmentable, comprised as it is of the works of deceased artists or outmoded or outdated schools.

These particular characteristics manifest themselves most abundantly in the risks associated with art investment. Attribution remains a perennial challenge, as does the problem with fakes and forgeries. An example in the first instance is Rubens' *Daniel in the Lion's Den*. Auctioned in 1882 for £1,680 by Christie's London it was resold in 1885 for £2,520. However in 1963, having been attributed in the meantime to fellow Flemish Baroque Era painter Jordaens, it was auctioned for a mere £500, but in 1965, now acknowledged as a school piece by Rubens, it was acquired by the Metropolitan Museum of Art in New York for £178,600 (Frey and Pommerehne, 1989). In the second instance it has, for example, been claimed there are 8,000 paintings by the French Realist Corot in the United States alone: an astonishing number considering there are only 2,000 authenticated works by that master. The number of marketed works by van Dyck and Utrillo is also thought to greatly exceed those certificated (Frey and Pommerehne, 1989).

Unfortunately, though the technical means of detecting fakes and forgeries has improved in recent years, transactions involving these works remain in the auction samples most often used to calculate the risk and return of art investment. Moreover, in addition to these financial risks arising from price uncertainty, there are purely material risks associated with the unique physical nature of art works. Paintings may be destroyed by fire, damaged during war, or stolen. Of course, while many material risks can be insured against, insurance costs as a percentage of appraised value are relatively high (up to one percent per annum), and for the most part unknown.

Similarly, substantial costs arise over time with maintenance and the restoration of art works, and these are seldom recognised in return calculations. It is also difficult to take into account the taxes due when transacting and holding an art object, though in many countries investment in art is a means of escaping or lowering the tax burden (Frey and Eichenberger, 1995a; 1995b). Moreover, transaction costs involved in sales through auction houses (fees, handling costs and insurance) vary significantly between countries, periods, auction houses, and individual transactions. Auction fees can range from ten to thirty percent when both buying and selling, and this further complicates analyses of rates of return. Irregardless, a voluminous literature has arisen calculating the returns on art investment. Starting with

Baumol (1986), these include studies by Frey and Pommerehne (1989), Goetzmann (1993), Chanel et al. (1994), Candela and Scorcu (1997), Pesando and Shum (1999) and Worthington and Higgs (2004). But for the most part "his [Baumol's] results are here to stay: the (financial) rate of return on paintings is lower than for investment in financial assets (given higher risks in the former market) because paintings also yield a psychic return from owning and viewing the paintings" (Frey and Eichenberger, 1995b: 529).

Perhaps the main distinguishing feature between art markets and financial markets is then that the expected return from art investment consists not only of price rises but also the aforementioned psychic return of art works: through their aesthetic qualities, possibly through their social characteristics, and in the case of pieces acquired by museums for their cultural significance, even public-good attributes. Changing fashions and tastes can thus explain at least some of the extreme volatility in the prices and returns of art. For instance, at the turn of the 20th Century, Scottish industrialists were prepared to pay considerable sums for works by 19th Century European artists like Israëls or Maris. But tastes changed in just a few decades. As an example, in 1910 Maris' *Entrance to the Zuiderzee* made £3,150 at auction, and £2,887 in 1924, but eight years later it fetched no more than £75 (Fase, 1996).

Likewise, Hals' *Man in Black* was auctioned in 1885 for a little more than £5 at Christie's in London, and in 1913 reached £9,000 at Sotheby's (Frey and Pommerehne, 1989). More recently, Picasso's *La Lecture* was bought in (i.e. failed to sell) at US$4.8 million in 1996 after having sold for US$6.3 million in 1989. Almost without exception, studies of art investment have been unable to quantify these psychic returns associated with art as a consumption good and add them to the understated financial returns from art as an investment good. Recognising art as a consumption good goes far in explaining the segmentation that characterises most art markets, and in part accounts for the presence of behavioural anomalies less well-known in modern financial markets.

For instance, market segmentation, and the concomitant propensity for anomalies, is likely to occur among art investors. Many private collectors are not profit orientated and are particularly prone to the anomalies that arise from 'endowment effects' (an art object owned is valued higher than one that is not), 'opportunity cost effects' (many collectors isolate themselves from considering the returns of alternative uses of funds) and a 'sunk cost effect' (past efforts to build a particular genre or school of art are important) (Frey and Eichenberger, 1995a; 1995b). Private collectors may also be subject to a 'bequest effect' whereby art objects given to their beneficiaries carry a psychic return over and above their notional value. Similarly, Felton (1998: 286) observes that the analysis of auction data is "…complicated by

the fact that both professional and amateur bidders, who may have different risk aversions, [are] involved in the bidding [and] the amount of risk aversion seem[s] to depend on the unit sold and the existence of a penalty, not on the attribute of the subject". These conditions are rarely found in modern financial markets.

At the least, it could be expected that corporate collectors undertake their investments solely on the basis of financial returns. Rarely, however, is the means of collection open to more than a small number of persons within a firm and even then is primarily used for consumption purposes. Lastly, public museums are important buyers of art. Once art works are acquired it is rare for these organisations to be either willing or able to dispose of works in the market, nor to change the speciality of their collection. Many specific art works are also obtained with hypothecated grants from governments or fundraising activities and these cannot usually be used for other purposes. For these reasons it is argued that sellers to museums enjoy systematically higher rates of return. Frey and Eichenberger (1995a: 215) suggest *inter alia* that museums are also likely to be active in particular genres of art that do not attract individual or corporate collectors.

Frey and Eichenberger (1995a; 1995b) used this evidence to argue that the behavioural characteristics of art market participants vary dramatically between 'pure speculators', whose activity in art investment markets in largely associated with changes in financial risk, and 'pure collectors' who are more attune to the psychic returns of art and less-sensitive to notions of financial risk. In the extreme, the more 'pure collectors' there are in a market, the lower is the financial return in equilibrium; the major part of investment return is made up of psychic benefits. An emerging literature has examined this and other efficiency aspects of art markets, including Coffman (1991), Louargand and McDaniel (1991), Pesando (1993) and Goetzmann (1995).

At first impression, art markets appear to have little in common with financial markets. Most art markets are characterised by product heterogeneity, illiquidity, market segmentation, information asymmetries, behavioural abnormalities, and almost monopolistic price setting. And there is no doubting the fact that a substantial component of the return from art investment is derived not from financial returns, rather its intrinsic aesthetic qualities. However, in recent years it has been widely accepted that art markets have moved closer to the ideals set by financial markets. Turnover, for example, has increased dramatically among auction houses and the larger proportions of transactions are pursued in these as against traditional dealers. Likewise, information on alternative art investments is now more accessible through the attention of the media, and the publishing and dissemination of auction

catalogues and price indexes. Finally, it is generally accepted that there are many more buyers and sellers of art active in these markets than in the past.

III Empirical Methodology

Three principal methods have been used for calculating art indices: (i) the naïve art index method; (ii) the repeat-sales index method; and (iii) the hedonic price index method. To start with, the calculation of naïve art indices is comparable to the calculation of a Consumer Price Index since a fixed basket of representative paintings is specified for the base year. Experts revalue the paintings in the basket whenever there is an event – such as an auction, major exhibition or publication – that is likely to have an impact on market prices. Since the quality of the artworks included in the basket remains unchanged, the calculation of a mean or median (being less affected by outliers and infrequent trading) price allows a simple comparison with the base year. This method also permits the creation of new baskets by artist and movement and a variation allows the replacement of works not consistently auctioned with substitutes of similar size and quality by the same artist. A drawback is that prices often reflect the subjective opinion of the experts involved, which may or may not be based on actual sales. Art Market Research (2004) indexes are sophisticated examples of this method.

The second approach used to calculate art price indices is the repeat-sales index method. Here the purchasing and selling prices of individual paintings are used to estimate the changes in the value of a painting over a period of time. That is, sales data are only used if a painting is sold more than once, the focus being on the price movements of this one work. After calculating the return for each pair of sales, regression techniques are then used to estimate the average return across artists, schools and periods. The main benefit of using the repeat-sales index method is that the index is based on the price relatives of the same painting, thereby directly controlling for differences in quality.

The main disadvantage is that the index can only be calculated using multiple sales, and since collector's tastes change slowly, along with the pool of potential collectors, resale of a painting within a short period of time is unlikely. High transaction fees, restrictions on arbitrage (short selling is impossible) and information asymmetry between traders also serve to reduce the number of resales. As an example, in Locatelli Biey and Zanolla's (1999) sample of 200,000 art sales over the period 1987-1995, just 1,669 were re-sales. All the same, Anderson (1974), Goetzmann (1993), Chanel et al. (1994), Gerard-Varet (1995) and Mei and Mosses (2001) have employed this method of calculating art price indexes.

The final approach is the hedonic price index method. In this approach, all sales (including repeat sales) are considered as single sales for which the objective features are recorded (e.g. name of the painter, size of painting, medium of execution, etc.). Combining all sales allows the implicit (or shadow) prices for these characteristics to be estimated separately from a characteristic-free price of paintings including only the effect of time and random error. Put simply, the hedonic regression method 'strips' observable 'qualities' from the prices of paintings to retain an index reflecting the price of some 'standard' painting. A clear advantage is that all auction data is used. The main disadvantage is that often only a few characteristics of each painting are gathered together in any given dataset (usually auction records). Buelens and Ginsburgh (1993), de la Barre *et al*. (1994), Chanel (1995) and Agnello and Pierce (1996) have used the hedonic price index method to estimate art price indices, with Chanel (1995) concluding that while the market wide effect was unbiased in both the repeat-sales and hedonic price index methods, the variance of the coefficient estimates for the latter were much smaller. Moreover, there is no need to undertake the somewhat difficult task of identifying resales in often large datasets.

The approach selected for the current analysis is the hedonic price index method. Assuming the availability of comprehensive data, the hedonic price index method's main strengths are that it estimates values based on actual auction sales, and as a collateral outcome, captures the willingness to pay for perceived differences in the attributes of the artwork included in the index. The hedonic price equation is written as:

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

where $\ln p_{kt}$ is the natural logarithm of the price of painting k ($k = 1,...,K$) sold in year 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 who painted the work, the physical characteristics of the work itself, and characteristics of the auction at which the sale of the work took place. The regression equation is then specified as:

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

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 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 data used comprises 37,605 sales transactions of artworks by sixty leading Australian artists. Information on sales is obtained from Australian Art Auction Records (2003) and spans the period March 1973 to June 2003. The selection of artists to be included in the index is, of course, highly subjective and was arrived at after discussion with various art auctioneers, curators and dealers on those artistic works most sought after and frequently sold at auction in the past thirty years. Its construction is also reflective, in so far is possible, of the widest number of periods, schools and genres in Australian art history and is purposively restricted to artists who lived most of their lifetime in Australia.

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 specified in Australian dollars. In much the same manner as prices in financial markets (stock, bonds, bills, etc.), all prices are nominal and hence the price index calculated is in nominal terms. It is not known whether there is potential systematic upward or downward bias in any price index using this data. Since the price obtained in auctions is the outcome of a competitive process it could be suggested that the prices used are lower than those from expert valuations and those in galleries. On the other hand, auction prices are argued to be artificially high as 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 sources. However, since 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 at all times.

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 who created the work. It is well-recognised that one of the most important intrinsic 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. Artists incorporated cover famous artistic dynasties (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 Howard Arkley being the reference category. A full listing of the artists, their year of birth and death (if applicable) and the number of works included in the sample are given in Table 1. The oldest born artists in the sample are John Glover (1767) and Walter Withers (1854) and the youngest born are Tim Maguire (1958) and John Kelly (1965). The number of works sold range from 47 (Rosalie Gascoigne and John Kelly) to 3,132 (Norman Lindsay). On average, 626 works for each artist are included in the sample.

A second 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). 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 sixty artists, nineteen died prior to the sample period, twenty during this period and twenty-one are still living.

The second 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, (*GOU*), 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 durable and difficult-to-work media, though a variety of other potentially valuable media are found in most fine-art collections. The second group of physical characteristic are 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, the expected sign on the coefficient for *ASQ* is thought to be negative (Agnello and Pierce 1996). Of course, there are any number of other physical characteristics that could be included if data were available. These include the painting's genre, providence 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*), James Lawson (*JAM*), Leonard Joel (*LEO*), and Sotheby's (*SOT*). The reference category is all other auction houses. During the sample period, the largest number of works were 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) and Renneboog and Van Houtte (2002), 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 year when the work is sold. This consists of thirty yearly dummy variables with 1973 as the reference category. Accordingly, 1973 provides the base period for the index.

IV Properties of the Data

Selected descriptive statistics of artwork prices as the dependent variable are provided in Table 1. The first part of the table presents these statistics grouped according to the sixty artists (including the reference artist), the second part grouped according to the ten 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.

Turning first to the prices of artworks by artist, the average price achieved for each artist's work ranges from $796.46 for paintings by Jamie Boyd (*BYJ*) to $55,244.61 for those by Frederick McCubbin (*MCC*). Other artists whose paintings have a high average value are John Peter Russell (*RUS*), William Robinson (*ROB*), Jeffrey Smart (*SMA*) and Rover Thomas (*THO*) with means of $45,167, $39,303, $36,544 and $35,217, respectively. On average, the lowest prices are for works by Pro Hart (*HAR*), George Duncan (*DUN*), Frank Hodgkinson (*HOD*) and Reginald Fizelle (*FIZ*) with average prices of $1,442, $1,468, $1,526 and $1,564, respectively.

The standard deviations of art prices range from $872 to $171,014. On this basis, works by Jamie Boyd (*BYJ*), George Duncan (*DUN*), Frank Hodgkinson (*HOD*), Pro Hart (*HAR*) and David Boyd (*BYD*) are the least volatile with standard deviations of $872, $1,898, $2,509, $2,674 and $2,772, respectively, whereas works by Frederick McCubbin (*MCC*), George

Russell Drysdale (*DRY*), John Peter Russell (*RUS*), Brett Whiteley (*WHI*) and Rover Thomas (*THO*) are the most volatile with standard deviations of $171,014, $115,731, $100,079, $82,465 and $78,966, 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 Sydney Nolan (*NOA*) are some of the most variable, with works by Albert Namatjira (*NAM*) and John Kelly (*KEL*) 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 1.07 (*KEL*) to 18.23 (*HAR*). 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 47, the standard deviation under the null hypothesis of normality is 0.3573. All estimates of skewness are then significant at the 0.05 level of significance or lower, suggesting a long right tail of high prices for work by all sixty artists. The kurtosis, or degree of excess, for all artists is also larger than 3, ranging from 3.23 (*KEL*) to 517.25 (*HAR*), 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 $\sqrt{24/n}$ = 0.7146 (for the smallest sample size of 47), 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 less than the 0.01 level of significance indicating that the prices are not well approximated by a normal distribution.

Table 1 also includes the descriptive measures of art prices categorised according to the ten different types of media. Of these, the prices for oils (*OIL*) and acrylic (*ACR*) are respectively the most expensive, averaging $17,363 and $14,193, and the cheapest are etchings (*ETC*) and crayons (*CRA*), averaging $1,389 and $1,979, respectively. The most volatile prices are also for oils (*OIL*) and acrylic (*ACR*) with standard deviations of $54,202 and $28,925, respectively and the least volatile are etching (*ETC*) and crayon (*CRA*) with standard deviations of $1,943 and $3,101 respectively. The distributional properties of art prices aross 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 $27,412, $21,022 and $18,401, respectively. The most volatile sale prices are those for Deutscher-Menzies (*DEU*) and Christies (*CHR*)

with standard deviations of $70,092 and $55,406, respectively, and the least volatile sales prices are from Australian Art Auctions (*AUS*) with a standard deviation of $3,880 and James Lawson (*JAM*) with a standard deviation of $5,756. As before, the distributional properties of art prices by auction house are positively skewed, leptokurtic and non-normal.

V Empirical Results

The estimated coefficients of the hedonic pricing regression model are presented in Table 2. Because the null hypothesis of no heteroskedasticity in the least squares residuals was initially rejected using White's (1980) test (F-statistic = 125.83, p-value = 0.0000), the standard errors and p-values incorporate 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 elasticity (at the means) for the continuous variables. The estimated model is highly significant, with a likelihood ratio test of the hypotheses that all slope coefficients are zero rejected at the 1 percent level using the likelihood ratio statistic. The adjusted R^2 of 0.6798 is high for cross-sectional data. The estimated parameters also appear sensible in terms of both the precision of the estimates and the signs on the coefficients. In fact, the only insignificant coefficient is *PEN*. 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 non-living artists at the time of the auction (10.8522), Norman Lindsay (10.6805), auction year 2001 (8.1386), auction year 2002 (7.9153) and Charles Blackman (7.7395). The average VIF is just 3.2292. This suggests that multicollinearity, while present, is not too serious a problem.

Turning first to the personal characteristics, significantly higher values are placed on the works by Frederick McCubbin (*MCC*), Rosalie Gascoigne (*GAS*), Rover Thomas (*THO*), Margaret Preston (*PRE*) and Tom Roberts (*RBT*) associated with percentage price increases of 252.3076, 190.2854, 156.6903, 154.5391 and 153.6036 percent over the standard painting, respectively. Conversely, lower values are placed on artworks by George Duncan (*DUN*), Clifford (Possum) Tjapaltjarri (*TJA*), Frank Hodgkinson (*HOD*), Richard Larter (*LAR*) and Jamie Boyd (*BYJ*) with percentage increases over the standard painting of just 11.2269, 9.6602, 9.1616, 7.6688 and 6.7973 percent, respectively. A ranking of all sixty artists relative to the standard painting is presented in Table 3. A deceased artist at the time of auction (*DTH*) is associated with a price increase of 1.1338 percent. However, since thirty-nine of the sixty artists (65 percent) included in the sample are deceased prior to or die during the auction

period, this effect may be less than a smaller sample of contemporary artists restricted to those still living, or those who die during the auction period itself. By way of comparison, Agnello and Pierce (1996: 368) found a 154 percent increase in the auction prices of American art when the artist was still alive, justifying this paradoxical outcome as follows: "…since all of the live artists are contemporary, this effect may have more to do with style than the artist's being alive". There is clear evidence that the artist who completed the auctioned work has a strong influence on price with a redundant variables test of the null hypothesis that the personal characteristics are jointly insignificant rejected at any conventional level (*F*-statistic = 337.73, *p*-value = 0.0000).

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. To start with, and 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 6.1522 and 6.0376 percent, respectively. As justification, oil as a medium is more permanent, is not 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. By comparison, media such as etchings (*ETC*), crayon (*CRA*) and charcoal (*CHA*) are associated with respective percentage increases of just 0.8216, 1.4811 and 1.8378 percent implying these media are generally more affordable, regardless of all other characteristics, while gouache (*GOU*), mixed media (*MIX*) and pastels (*PAS*) have price increases of between 3.0289 and 3.7781 percent. The estimated coefficient for pencil (*PEN*) is not significant, even at the .10 level. Unfortunately, it is difficult to compare these findings because earlier studies are often limited to periods or movements when fewer media are generally known (de la Barre et al. 1994; Renneboog and Van Houtte 2002) or to a single medium (Candela and Scorcu 1997; Pesando and Shum 1999). Nevertheless, Agnello and Pierce (1996) found a 156 percent increase in prices for US oil works as compared to all other media (watercolour, gouache, ink, pencil, pastel, etc.).

The remaining physical characteristics included in the regression model concern 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 (1.2484) and the negative sign of its squared term (-0.0932) 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 sixty Australian artists is 6.70 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. A redundant variables test of the null hypothesis of the joint insignificance of the characteristics of the work is rejected at the .01 level (F-statistic = 2952.33, p-value = 0.0000).

The final set of variables relates to the sale characteristics of the works. The sales characteristics show that auctions at Sotheby's (*SOT*), Christies (*CHR*) and Deutscher-Menzies (*DEU*) increase the standard price by 1.9036, 1.8504 and 1.8006 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. One-tailed tests reject the null hypothesis that the estimated coefficient for Sotheby's is equal to Christies (F-statistic = 2.4204, p-value = 0.0599) or Deutscher-Menzies (F-statistic = 3.9502, p-value = 0.0235) in favour of the alternative hypotheses that the coefficient for Sotherby's is greater than that of Christies and Deutscher-Menzies. However, a similar one-tailed test fails to reject the null for the difference in coefficients between Christies and Deutscher-Menzies (F-statistic = 0.9821, p-value = 0.1629). The null hypothesis that the auction characteristics are jointly insignificant is rejected at the .01 level (F-statistic = 624.91, p-value = 0.0000).

Pesando (1993), de la Barre et al. (1994), Agnello and Pierce (1996) and Renneboog and Van Houtte (2002) also found that "…Sotherby's typically fetches higher prices than Christies, while both experience higher prices than all other houses" (Agnello and Pierce 1996: 366). However, while variation in the prices obtained by the different auction houses are small, and certainly smaller than most other factors included in the model, care should still be taken in interpreting these differences as a violation of the law of one price. As an example, both Sotheby's and Christies usually attract more high valued artistic works and therefore some degree of simultaneity may exist between art price and auction house. Even among works by a single artist, those with anticipated higher values may be directed to the leading auction houses, with lesser work appearing in other venues, including galleries and private dealers. De la Barre et al (1994: 165) likewise discussed this complication with the argument that "…the quality of a painting, not captured by our characteristics is partly picked up by the saleroom coefficients: a 'good' Picasso would go to Christies or Sotheby's New York, a less good one would be sold at Drouot's [a Paris-based auction house]…it is impossible to disentangle the two effects".

Before proceeding with the calculation of the art index itself, a final requirement is to examine the ability of the model to accurately predict prices in the Australian art market. The Theil inequality coefficient for the specified model is 0.0561. Since this always lies between zero and one, with zero indicating a perfect fit, this suggests the model is predicatively quite accurate. The mean squared prediction error is also decomposed yielding the bias proportion (how far the mean of the prediction is from the mean of the actual series), the variance proportion (how far the variation of the prediction is from the variation of the actual series) and the covariance proportion (a measure of the remaining unsystematic prediction errors). The bias proportion of the prediction is less than 0.0001 indicating that the model as specified is able to track mean prices in the Australian art market with great accuracy. However, the variance proportion is 0.0713 and this suggests that the model used has relatively greater difficulty in tracking the variance of prices. The remaining prediction error is appropriately concentrated in the covariance proportion (0.9286).

Figure 1 provides a graphical representation of the nominal Australian art index calculated using the hedonic price index method where the index value for the years 1973-2003 is calculated as $100e^{\beta t}$. As a means of direct comparison with Australian financial assets, the All Ordinaries stock price index (in nominal terms) is also presented and plotted 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 percent of market capitalisation. For both the art and financial indices the yearly returns are calculated and plotted such that the yearly 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}.

As shown, the art index has trended upwards during the period 1973-2003, increasing eightfold from the base year of 272 in 1973 to 2193 in 2003. In general, the art and stock indices tracked each other quite closely until the early 1990s, when the short-lived bear market in art and the long running equity bull market forced the two apart. Only since 2001 has the art index started to rise and the equity index fall to the extent that the difference between the two has become appreciably less. The pattern of returns also suggests a close correspondence between the two markets, with returns rising strongly in the period 1977-1981, falling together in 1982, and rising together until 1989. On the basis of this particular index, the art market appears to be strongly cyclical with peaks in 1980, 1983, 1987, 1992,

1996 and 1999, indicating cycles of between three and four years (with the notable exception of the bear market in 1989/1990).

In terms of returns, the arithmetic mean return for the art index over the sampled period is 6.96 percent as compared to an average stock return of 7.00 percent. Given that when investing in any stock, bond, commodity or collectible the investor hopes to receive returns in excess of the inflation rate, both markets appear sound with the CPI averaging 6.56 percent over the sample period. But contrary to the central predictions of capital asset pricing, the returns on art are more risky than the stock market with a standard deviation of 16.51 percent compared to 16.06 percent. However, calculation of the risk-adjusted returns (return divided by standard deviation) in order to measure return in relation to risk indicates that the stock market is only slightly dominant with a risk-adjusted return of 0.436 over the period as compared to 0.422 in the art market. The returns on the artists included in the sample will vary around the mean market return, and the estimated coefficients in Table 2 are suggestive of relatively high and low yielding artists. However, without estimating indexes for the individual artists it is not possible to make definitive statements on the temporal components of price in each artist's work.

At first impression there also appears to be some direct correlation between the stock and art markets in Australia during this period. On several occasions, peaks in the stock market correspond to peaks in the art market. For example, two of the three highest yearly returns for the art market, 1980 (0.30) and 1987 (0.31), correspond with two of the three highest yearly stock returns, also in 1987 (0.38) and 1980 (0.40). There appears to be a similar correspondence with the one of the three lowest yearly returns in both the art (-0.22) and stock market (-0.26) taking place in 1982. As a simple means of evaluating this hypothesised link, Pearson (product-moment) ($\rho = 0.4900$, p-value = 0.0060) and Spearman (rank) ($\rho = 0.4810$, p-value = 0.0070) correlation coefficients confirm a significant and positive relationship between the Australian art and stock markets over the period in question. Since the correlation of returns is relatively low (or at least less than one), diversifying across these markets may allow investors to reduce portfolio risk while holding expected return constant.

The pattern of Australian art market returns presented in this analysis is generally comparable to other studies in this area. Locatelli Biey and Zannola (1999: 220), for example, observed: "…from 1987 to the first semester 1992, investment in arts performed well if compared with alternative forms of investment, such as US stocks, US 30 year government bonds and gold. By contrast, from the second semester of 1992 to 1995 returns on painting were lower". Similarly, De la Barre et al. (1994) concluded that the nominal returns from

Great Masters from 1962 to 1991 peaked in 1990, while Candela and Scorcu (1997: 190) discerned a "…weak negative correlation between the art market and the other markets emerges, a result that is reversed in the second half of the period [1983-1988]". Of course, the long-run relationships between art and financial markets are beyond the scope of the present paper and readers are directed to Chanel (1995), Ginsburgh and Jeanfils (1995), Czujack et al. (1996), Flores et al. (1999) and Worthington and Higgs (2003) for interesting developments in this area.

As for the returns on Australian art, it would appear that the market has also performed at a similar level to other national markets. Renneboog and Van Houtte (2002), for example, found Belgian nominal average returns of 8.4 percent over the period 1970-1989 with a standard deviation of 19.4 percent, Agnello and Pierce (1996) estimated that the returns on American artists averaged 9.3 percent from 1971-1992, and Mei and Moses (2001) calculated average returns of 5.3 percent with a standard deviation of 9.3 percent, also on American auctions, though over the period 1950-1999. Other mean returns from other art studies include 1.6 percent (Frey and Pommerehne 1989), 6.8 percent (Gerard-Varet 1995) and 5.0 percent (Goetzmann 1996). Of course, the art returns as calculated do not reflect the fact that a substantial component of the return from art investment is derived not from its financial returns, rather from 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.

VI Concluding Remarks

This paper investigates risk and return in the Australia art market during the period 1973 to 2003. The hedonic price method is used to construct a yearly price index using data on 37,605 paintings by sixty well-known artists sold at auction during this time. However, unlike most other work in this area which indicates that the returns to art investment are much less, and the risks much higher, than investment markets, the results show that risk and return in the Australian art market is comparable to the Australian stock market. Of course, the renowned artists used to construct the index inevitably involve bias towards higher-valued works, so the risk and returns may only be truly indicative of masterpieces, rather than artworks more generally. The low correlation found between returns in the art market and those in the stock market are also suggestive of the benefits of portfolio diversification through Australia art investment.

The methodology employed in the paper also identifies factors associated with higher prices in the Australian art market. All other things being equal, 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 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.

There are many interesting opportunities to expand upon this work. One possibility is to extend the hedonic price index method and construct price indices for individual Australian artists and schools. This would allow the comparison of artists or school returns with the market return and permit the development of a capital asset pricing model in art along the lines of Locatelli Biey and Zanola (1999). Another extension would involve gathering additional information to be included in the hedonic pricing regression model. For example, the prices (and hence returns) on artists' work may also depend on the cumulative number of works auctioned, the age of the artist at time of the auction, genres of work, interactions between medium and size and so on. While these impacts are proxied by the artist's name in the current analysis, a more defined specification would identify some determinants potentially obscured. Finally, there may be potential to examine art markets along the lines of the market efficiency literature. One distinct possibility is that auctioned artworks are subject to a 'masterpiece effect' whereby expensive paintings tend to underperform the market, which in turn could be the result of a winner's curse due to excessive bidding at auction. Empirical examination could throw some light on this behavioral abnormality.

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TABLE 1

Selected Descriptive Statistics of Artwork Prices by Artist, Medium and Auction House

Description	Variable	Born	Died	Works sold	Mean	Standard deviation	Coefficient of variation	Skewness	Kurtosis	Jarque-Bera	JB p-value
Arkley, Howard		1951	1999	87	$23,126	$45,798	1.98	4.14	23.44	1.76E+03	0.00
Ashton, John	ASH	1881	1963	970	$2,649	$3,782	1.43	3.64	22.13	1.69E+04	0.00
Beckett, Clarice	BEC	1887	1935	173	$9,579	$13,311	1.39	3.43	17.46	1.85E+03	0.00
Blackman, Charles	BLA	1928	–	2361	$8,006	$20,495	2.56	7.64	92.22	8.06E+05	0.00
Booth, Peter	BOO	1940	–	119	$6,248	$15,966	2.56	6.76	57.67	1.57E+04	0.00
Boyd, Arthur	BYA	1920	1999	1797	$20,426	$57,305	2.81	9.37	121.65	1.08E+06	0.00
Boyd, David	BYD	1924	–	1645	$2,693	$2,772	1.03	8.44	162.12	1.75E+06	0.00
Boyd, Jamie	BYJ	1948	–	178	$796	$872	1.10	1.83	6.18	1.74E+02	0.00
Brack, Cecil John	BRA	1920	1999	293	$35,010	$76,521	2.19	3.41	16.15	2.68E+03	0.00
Bunny, Rupert	BUN	1864	1947	527	$23,837	$75,640	3.17	9.83	139.47	4.17E+05	0.00
Coburn, John	COB	1925	–	652	$3,497	$6,386	1.83	3.58	18.01	7.51E+03	0.00
Crooke, Ray	CRO	1922	–	2020	$4,000	$6,472	1.62	4.45	29.24	6.46E+04	0.00
Dargie, William	DAR	1912	–	176	$1,931	$4,317	2.24	7.06	63.28	2.81E+04	0.00
Dickerson, Robert	DIC	1924	–	1628	$4,326	$8,121	1.88	4.86	34.27	7.27E+04	0.00
Drysdale, George Russell	DRY	1912	1981	612	$32,940	$115,731	3.51	6.24	48.36	5.64E+04	0.00
Duncan, George	DUN	1904	1974	111	$1,468	$1,898	1.29	2.70	10.80	4.16E+02	0.00
Fairweather, Ian	FAI	1891	1974	170	$19,699	$29,316	1.49	3.54	21.11	2.68E+03	0.00
Fizelle, Reginald Cecil	FIZ	1891	1964	136	$1,564	$4,762	3.05	7.68	66.14	2.39E+04	0.00
Fox, Ethel	FOX	1872	1952	334	$10,172	$20,197	1.99	5.67	54.47	3.87E+04	0.00
Friend, Donald	FRI	1915	1989	1647	$4,272	$8,501	1.99	8.75	133.24	1.19E+06	0.00
Fullbrook, Samuel	FUL	1922	–	189	$8,042	$10,575	1.31	2.56	10.78	6.84E+02	0.00
Gascoigne, Rosalie	GAS	1917	1999	47	$34,501	$49,992	1.45	3.14	15.67	3.91E+02	0.00
Gleeson, James Timothy	GLE	1915	–	587	$3,310	$7,225	2.18	5.53	39.09	3.49E+04	0.00
Glover, John	GLO	1767	1849	315	$10,572	$48,580	4.60	11.00	141.55	2.57E+05	0.00
Gruner, Elioth	GRU	1882	1939	386	$11,195	$14,824	1.32	2.68	12.91	2.04E+03	0.00
Hart, Kevin Charles Pro	HAR	1928	–	1922	$1,442	$2,674	1.85	18.23	517.25	2.13E+07	0.00
Hester, Joy	HES	1920	1960	96	$9,785	$24,206	2.47	6.48	51.26	9.99E+03	0.00
Heysen, Hans	HYH	1877	1968	1200	$8,571	$16,653	1.94	8.30	101.33	4.97E+05	0.00
Heysen, Nora	HYN	1911	–	99	$3,158	$5,383	1.70	2.49	8.67	2.35E+02	0.00
Hodgkinson, Frank	HOD	1919	2001	178	$1,526	$2,509	1.64	3.80	22.50	3.25E+03	0.00
Jackson, James Ranalph	JAC	1882	1975	693	$5,894	$9,662	1.64	7.82	92.68	2.39E+05	0.00
Kelly, John	KEL	1965	–	47	$34,045	$30,328	0.89	1.07	3.23	9.10E+00	0.01
Klippel, Robert	KLI	1920	2001	96	$5,158	$12,028	2.33	3.75	17.63	1.08E+03	0.00
Larter, Richard	LAR	1929	–	109	$4,193	$3,861	0.92	1.36	4.69	4.67E+01	0.00
Lindsay, Norman	LIN	1879	1969	3132	$5,822	$13,657	2.35	8.16	109.35	1.51E+06	0.00
Long, Sydney	LON	1871	1955	873	$4,073	$8,702	2.14	9.33	146.12	7.58E+05	0.00
Maguire, Tim	MAG	1958	–	79	$9,761	$19,207	1.97	2.93	11.57	3.55E+02	0.00

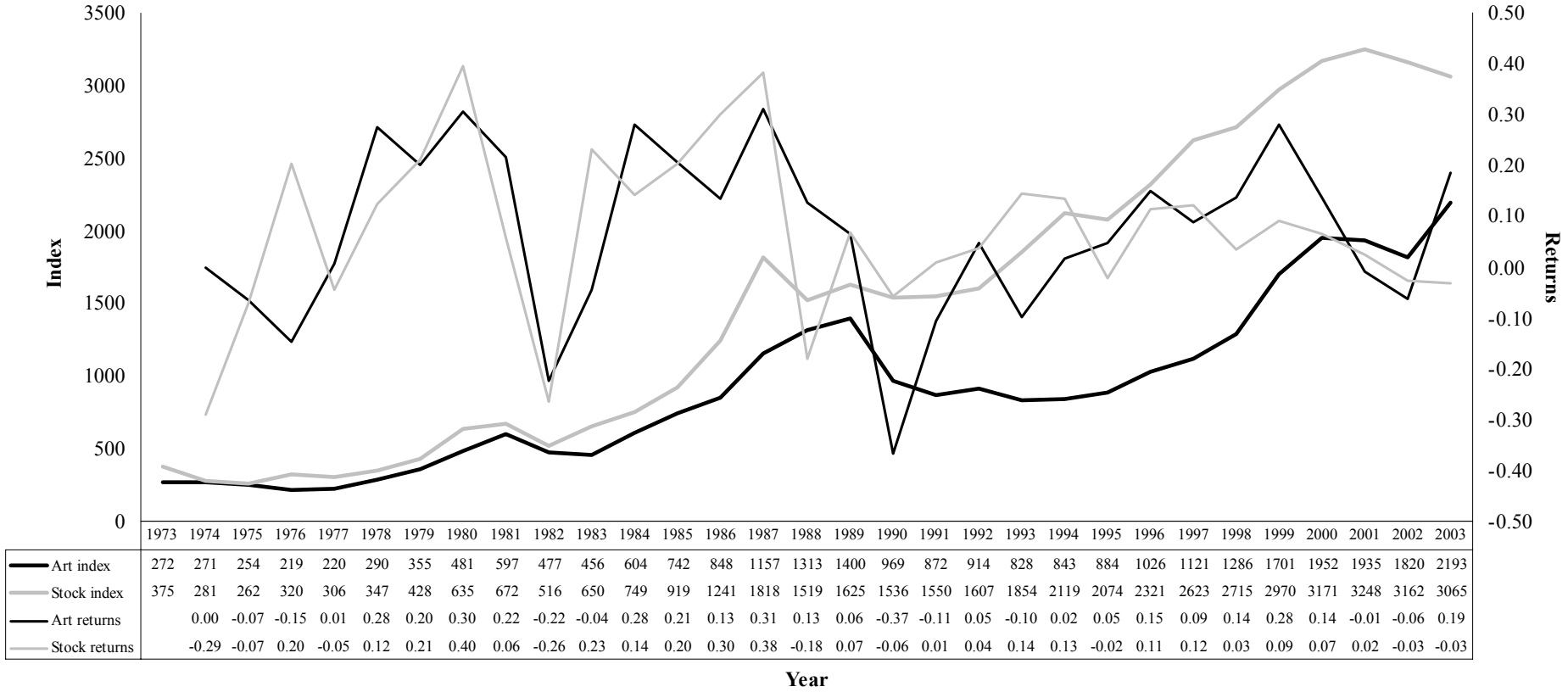
Description	Variable	Born	Died	Works sold	Mean	Standard deviation	Coefficient of variation	Skewness	Kurtosis	Jarque-Bera	JB p-value
McCubbin, Frederick	MCC	1855	1917	269	$55,245	$171,014	3.10	7.77	82.03	7.27E+04	0.00
Namatjira, Albert	NAM	1902	1959	593	$7,339	$6,132	0.84	1.25	5.05	2.57E+02	0.00
Nolan, Sydney	NOL	1917	1992	2405	$11,182	$42,852	3.83	15.23	335.45	1.12E+07	0.00
Olley, Margaret	OLL	1923	–	278	$12,529	$15,930	1.27	1.76	5.82	2.36E+02	0.00
Olsen, John	OLS	1928	–	1145	$9,118	$24,821	2.72	10.35	155.72	1.13E+06	0.00
Perceval, John	PER	1923	2000	679	$14,133	$38,256	2.71	8.17	91.01	2.27E+05	0.00
Preston, Margaret	PRE	1875	1963	380	$12,470	$26,244	2.10	6.59	69.81	7.34E+04	0.00
Proctor, Althea	PRO	1879	1966	340	$1,867	$3,072	1.65	4.10	28.21	9.96E+03	0.00
Rees, Lloyd	REE	1895	1988	997	$9,617	$20,669	2.15	4.25	25.15	2.34E+04	0.00
Roberts, Thomas	RBT	1856	1931	253	$24,168	$48,848	2.02	4.37	25.52	6.15E+03	0.00
Robinson, William	ROB	1936	–	80	$39,303	$52,664	1.34	2.00	7.09	1.09E+02	0.00
Russell, John Peter	RUS	1859	1930	126	$45,167	$100,079	2.22	3.86	20.57	1.93E+03	0.00
Shead, Garry	SHE	1942	–	240	$9,025	$16,783	1.86	2.65	10.87	8.99E+02	0.00
Smart, Frank Jeffrey	SMA	1921	–	295	$36,544	$51,774	1.42	2.29	8.75	6.64E+02	0.00
Smith, Grace Cossington	SMI	1892	1984	257	$17,204	$30,323	1.76	5.06	37.46	1.38E+04	0.00
Storrier, Tim	STO	1949	–	351	$10,140	$19,690	1.94	3.86	25.61	8.35E+03	0.00
Streeton, Arthur	STR	1867	1943	790	$31,800	$61,587	1.94	6.13	59.44	1.10E+05	0.00
Thomas, Rover	THO	1926	1998	84	$35,217	$78,966	2.24	7.28	61.32	1.26E+04	0.00
Tjapaltjarri, Clifford	TJA	1934	2003	80	$7,160	$15,670	2.19	5.38	36.16	4.05E+03	0.00
Tucker, Albert	TUC	1914	1999	310	$14,764	$38,791	2.63	11.68	170.20	3.68E+05	0.00
Whiteley, Brett	WHI	1939	1992	1000	$23,927	$82,465	3.45	12.22	228.22	2.14E+06	0.00
Williams, Frederick	WIL	1927	1982	602	$21,305	$49,779	2.34	5.34	41.10	3.93E+04	0.00
Withers, Walter	WTH	1854	1914	368	$12,097	$30,502	2.52	6.96	68.10	6.80E+04	0.00
Acrylic	ACR	–	–	717	$14,193	$28,925	2.04	4.85	35.63	3.46E+04	0.00
Chacoal	CHA	–	–	995	$3,424	$9,133	2.67	17.50	421.77	7.32E+06	0.00
Crayon	CRA	–	–	254	$1,979	$3,101	1.57	3.39	16.95	2.55E+03	0.00
Etching	ETC	–	–	3113	$1,389	$1,943	1.40	6.21	71.65	6.31E+05	0.00
Gouache	GOU	–	–	635	$9,044	$13,034	1.44	2.97	16.90	6.05E+03	0.00
Mixed media	MIX	–	–	891	$5,957	$15,762	2.65	18.47	444.44	7.29E+06	0.00
Oil	OIL	–	–	1644	$17,363	$54,202	3.12	13.18	307.83	6.42E+07	0.00
Pastel	PAS	–	–	1010	$4,682	$7,268	1.55	5.65	58.65	1.36E+05	0.00
Pencil	PEN	–	–	1459	$2,196	$3,531	1.61	4.37	29.99	4.89E+04	0.00
Watercolour	WCO	–	–	4164	$7,176	$9,685	1.35	4.43	42.10	2.79E+05	0.00
All other medias		–	–	7919	$5,124	$26,503	5.17	23.09	781.43	2.01E+08	0.00
Australian Art Auctions	AUS	–	–	2900	$2,156	$3,880	1.80	7.39	91.70	9.77E+05	0.00
Christies	CHR	–	–	6012	$18,401	$55,406	3.01	13.22	290.36	2.09E+07	0.00
Deutscher-Menzies	DEU	–	–	1886	$27,412	$70,092	2.56	6.80	66.26	3.29E+05	0.00
James Lawson	JAM	–	–	4330	$2,748	$5,756	2.09	7.21	83.97	1.22E+06	0.00
Leonard Joel	LEO	–	–	8720	$4,283	$20,199	4.72	37.87	2001.32	1.45E+09	0.00
Sotheby's	SOT	–	–	6039	$21,022	$48,016	2.28	9.27	137.30	4.63E+06	0.00
All other auction houses		–	–	7718	$6,305	$34,171	5.42	35.69	1914.95	1.18E+09	0.00

TABLE 2

Estimated Coefficients, Standard Errors and Percentage Changes in Price for the Hedonic Pricing 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
ASH	3.1686	0.0978	0.0000	23.7738	MCC	5.5306	0.1089	0.0000	252.3076	AUS	-0.4693	0.0187	0.0000	0.6254
BEC	3.6994	0.1093	0.0000	40.4230	NAM	4.5608	0.1003	0.0000	95.6608	CHR	0.6154	0.0179	0.0000	1.8504
BLA	3.5336	0.0915	0.0000	34.2476	NOL	3.7521	0.0950	0.0000	42.6123	DEU	0.5881	0.0275	0.0000	1.8006
BOO	3.1215	0.1110	0.0000	22.6798	OLL	3.6629	0.1045	0.0000	38.9742	JAM	-0.1376	0.0168	0.0000	0.8715
BYA	4.0767	0.0933	0.0000	58.9501	OLS	3.8074	0.0942	0.0000	45.0312	LEO	-0.0677	0.0145	0.0000	0.9345
BYD	3.2169	0.0906	0.0000	24.9510	PER	4.2980	0.0979	0.0000	73.5545	SOT	0.6437	0.0183	0.0000	1.9036
BYJ	1.9165	0.1081	0.0000	6.7973	PRE	5.0404	0.1046	0.0000	154.5391	1974	0.9978	0.0931	0.0000	2.7124
BRA	4.6074	0.1065	0.0000	100.2271	PRO	3.9059	0.1038	0.0000	49.6965	1975	0.9325	0.0932	0.0000	2.5408
BUN	4.2456	0.1044	0.0000	69.8000	REE	4.5423	0.0958	0.0000	93.9021	1976	0.7841	0.0912	0.0000	2.1905
COB	2.9454	0.0964	0.0000	19.0179	RBT	5.0344	0.1120	0.0000	153.6036	1977	0.7902	0.0952	0.0000	2.2038
CRO	3.2710	0.0912	0.0000	26.3366	ROB	4.1269	0.1400	0.0000	61.9852	1978	1.0652	0.0937	0.0000	2.9015
DAR	2.8086	0.1073	0.0000	16.5867	RUS	4.8441	0.1404	0.0000	126.9939	1979	1.2671	0.0891	0.0000	3.5506
DIC	3.6100	0.0933	0.0000	36.9674	SHE	3.2600	0.1081	0.0000	26.0491	1980	1.5716	0.0899	0.0000	4.8144
DRY	4.9792	0.1003	0.0000	145.3533	SMA	4.7980	0.1024	0.0000	121.2662	1981	1.7867	0.0899	0.0000	5.9698
DUN	2.4183	0.1172	0.0000	11.2269	SMI	4.3760	0.1060	0.0000	79.5211	1982	1.5618	0.0907	0.0000	4.7673
FAI	4.7196	0.1136	0.0000	112.1251	STO	3.1119	0.1048	0.0000	22.4630	1983	1.5179	0.0910	0.0000	4.5626
FIZ	2.9653	0.1212	0.0000	19.4015	STR	4.9411	0.1004	0.0000	139.9214	1984	1.7992	0.0902	0.0000	6.0447
FOX	3.7055	0.1117	0.0000	40.6723	THO	5.0543	0.1520	0.0000	156.6903	1985	2.0042	0.0906	0.0000	7.4202
FRI	3.9835	0.0940	0.0000	53.7063	TJA	2.2680	0.1715	0.0000	9.6602	1986	2.1372	0.0896	0.0000	8.4757
FUL	3.7650	0.1041	0.0000	43.1632	TUC	4.2320	0.0993	0.0000	68.8544	1987	2.4483	0.0891	0.0000	11.5684
GAS	5.2485	0.1848	0.0000	190.2854	WHI	4.6711	0.0961	0.0000	106.8190	1988	2.5749	0.0877	0.0000	13.1296
GLE	3.0428	0.0950	0.0000	20.9635	WIL	4.4182	0.0985	0.0000	82.9504	1989	2.6390	0.0880	0.0000	13.9988
GLO	4.0201	0.1108	0.0000	55.7042	WTH	4.4360	0.1069	0.0000	84.4359	1990	2.2716	0.0877	0.0000	9.6947
GRU	4.4129	0.1034	0.0000	82.5045	DTH	0.1256	0.0240	0.0000	1.1338	1991	2.1660	0.0874	0.0000	8.7232
HAR	2.5879	0.0912	0.0000	13.3021	ACR	1.8168	0.0546	0.0000	6.1522	1992	2.2130	0.0877	0.0000	9.1432
HES	4.5190	0.1415	0.0000	91.7424	CHA	0.6086	0.0334	0.0000	1.8378	1993	2.1143	0.0876	0.0000	8.2834
HYH	4.7219	0.0978	0.0000	112.3773	CRA	0.3928	0.0521	0.0000	1.4811	1994	2.1321	0.0867	0.0000	8.4323
HYN	3.2503	0.1372	0.0000	25.7987	ETC	-0.1965	0.0199	0.0000	0.8216	1995	2.1789	0.0879	0.0000	8.8363
HOD	2.2150	0.1070	0.0000	9.1616	GOU	1.3292	0.0351	0.0000	3.7781	1996	2.3280	0.0867	0.0000	10.2577
JAC	3.7287	0.0991	0.0000	41.6243	MIX	1.1082	0.0317	0.0000	3.0289	1997	2.4172	0.0872	0.0000	11.2145
KEL	3.7762	0.1788	0.0000	43.6495	OIL	1.7980	0.0204	0.0000	6.0376	1998	2.5539	0.0864	0.0000	12.8577
KLI	3.7179	0.1726	0.0000	41.1767	PAS	1.1314	0.0336	0.0000	3.0999	1999	2.8340	0.0862	0.0000	17.0137
LAR	2.0372	0.1375	0.0000	7.6688	PEN	-0.0133	0.0283	0.6377	0.9868	2000	2.9713	0.0896	0.0000	19.5174
LIN	4.8028	0.0946	0.0000	121.8452	WCO	1.1281	0.0215	0.0000	3.0899	2001	2.9629	0.0868	0.0000	19.3541
LON	4.0749	0.0978	0.0000	58.8468	ARE	1.2484	0.0148	0.4095	3.4847	2002	2.9013	0.0879	0.0000	18.1978
MAG	2.8178	0.1517	0.0000	16.7402	ASQ	-0.0932	0.0021	-0.0365	0.4053	2003	3.0879	0.0890	0.0000	21.9299

FIGURE 1
Australian Stock and Art Indices and Index Returns



	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Art index	272	271	254	219	220	290	355	481	597	477	456	604	742	848	1157	1313	1400	969	872	914	828	843	884	1026	1121	1286	1701	1952	1935	1820	2193
Stock index	375	281	262	320	306	347	428	635	672	516	650	749	919	1241	1818	1519	1625	1536	1550	1607	1854	2119	2074	2321	2623	2715	2970	3171	3248	3162	3065
Art returns		0.00	-0.07	-0.15	0.01	0.28	0.20	0.30	0.22	-0.22	-0.04	0.28	0.21	0.13	0.31	0.13	0.06	-0.37	-0.11	0.05	-0.10	0.02	0.05	0.15	0.09	0.14	0.28	0.14	-0.01	-0.06	0.19
Stock returns		-0.29	-0.07	0.20	-0.05	0.12	0.21	0.40	0.06	-0.26	0.23	0.14	0.20	0.30	0.38	-0.18	0.07	-0.06	0.01	0.04	0.14	0.13	-0.02	0.11	0.12	0.03	0.09	0.07	0.02	-0.03	-0.03

Year

TABLE 3
Ranking of Artists Relative to the Standard, 1973-2003

Artist	Rank	Artist	Rank
McCubbin, Frederick	1	Olsen, John	31
Gascoigne, Rosalie	2	Kelly, John	32
Thomas, Rover	3	Fullbrook, Samuel	33
Preston, Margaret	4	Nolan, Sydney	34
Roberts, Thomas William	5	Jackson, James Ranalph	35
Drysdale, George Russell	6	Klippel, Robert	36
Streeton, Arthur	7	Fox, Ethel	37
Russell, John Peter	8	Beckett, Clarice	38
Lindsay, Norman	9	Olley, Margaret	39
Smart, Frank Jeffrey	10	Dickerson, Robert	40
Heysen, Hans	11	Blackman, Charles	41
Fairweather, Ian	12	Crooke, Ray	42
Whiteley, Brett	13	Shead, Garry	43
Brack, Cecil John	14	Heysen, Nora	44
Namatjira, Albert	15	Boyd, David	45
Rees, Lloyd	16	Ashton, John	46
Hester, Joy	17	Booth, Peter	47
Withers, Walter	18	Storrier, Tim	48
Williams, Frederick	19	Gleeson, James Timothy	49
Gruner, Elioth	20	Fizelle, Reginald Cecil	50
Smith, Grace Cossington	21	Coburn, John	51
Perceval, John	22	Maguire, Tim	52
Bunny, Rupert	23	Dargie, William	53
Tucker, Albert	24	Hart, Kevin Charles Pro	54
Robinson, William	25	Duncan, George	55
Boyd, Arthur	26	Tjapaltjarri, Clifford	56
Long, Sydney	27	Hodgkinson, Frank	57
Glover, John	28	Larter, Richard	58
Friend, Donald	29	Boyd, Jamie	59
Proctor, Althea	30	Arkley, Howard	60

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