

Dynamic Price Dependence of Canadian and World Art Markets: An Empirical Analysis

Douglas J. Hodgson

UQAM, Université du Québec à Montréal
Department of economics
P.O. Box 8888,
Downtown Station
Montreal (Quebec) H3C 3P8, CANADA
E-mail: hodgson.douglas@uqam.ca

Aylin Seçkin

Istanbul Bilgi University
Department of Economics
Kurtulus Deresi Cad. No:47 Dolapdere
Istanbul TURKEY
E-mail: aseckin@bilgi.edu.tr

Abstract:

Although the market for Canadian paintings is now of substantial magnitude, with several works having recently sold for well over a million dollars, it remains true that with very few exceptions, the works of Canadian painters are bought and sold only in Canada and held only by Canadian collectors. This market can thus be viewed as almost exclusively local, and it is therefore not clear that there should be any linkage between price movements for Canadian art and those for the mainstream global market in old master, impressionist, and modern art. This paper investigates the presence and nature of such time series dependence econometrically, both in terms of long term trends as reflected in the co-integrating relationship between Canadian and the global market, and in terms of short-run comovements as represented in correlations. The possibility that the local market "follows" the global one is also considered through an analysis of Granger-Causality. For Canadian art prices we use a new hedonic index that has been computed using an updated version of the data set of Hodgson and Vorkink (2004), while for the international prices, we use an index provided by Mei and Moses.

Key words: *Alternative investments; Economics of art markets; Market for paintings; Time series analysis; CAPM.*

JEL Classification: *Z11, G11*

1. Introduction

The continuous growth of world output and closer integration of economies has promoted the development of alternative investment markets such as art. The increased media attention for auction prices of famous impressionists and contemporary painters has attracted financial economists' interests to this niche market. The phenomenon of ever expanding art prices is a popular story in the mass media after each record price sale of a painting at auction. Hence, a series of articles in the financial economics literature has emerged trying to gauge the price behavior of art markets, paintings in particular.¹ The key issue in this literature has been the risk – return comparison of the returns of art objects and collectibles relative to conventional investments, such as stocks and bonds. The idea has been to test whether including paintings could diversify financial portfolios.

Various economic studies have empirically confirmed that art investments produce lower returns than other financial investment alternatives. It is possible that investing in a particular painter or genre may generate higher earnings than those of stocks and bonds. There is also some evidence that the art market returns are uncorrelated with the returns on other financial investments. Using the framework of the capital asset pricing model (CAPM) several studies have shown that art market investments have low beta values with respect to stock market portfolios. Therefore, buying paintings and other collectibles may diversify an investment portfolio despite the somewhat lower expected returns and higher volatility inherent to these markets.

Furthermore, art markets are highly segmented by genre and distance so that each of them follows its own internal dynamics, somehow in isolation, which, as a consequence, may yield different returns (Worthington and Higgs, 2003). This

¹ Frey and Eichenberger (1995), Burton and Jacobsen (1999), and Ashenfelter and Graddy (2003) extensively discuss the main issues in the economics of arts and review the literature on the returns to investing in art objects and collectibles.

particular point implies the possibility of risk diversification of an art market portfolio. Hence, designing an optimal art portfolio including several genres, categories and artists from different countries is an interesting possibility.² Although the art markets are segmented there may be some co-movements in the price dynamics between different styles, artists, auction houses or even between local and international markets. In this context, Atukeren and Seckin (forthcoming) examine the correlation and price dependence of Turkish and international art markets for the period 1990-2005. They find that the prices in the Turkish paintings auctions and the international art market prices are co-integrated. This implies that, despite any short-term fluctuations, price developments in the Turkish and international art markets should move together in the long-run.

In this paper, we investigate the price dynamics between the Canadian and the global art markets. We first calculate the Canadian semi annual art price index for the period 1968-2008. Then we test whether the prices of Canadian paintings move in line with or independently of the prices in the international art markets by means of co-integration and Granger-causality tests.

Although the market for Canadian paintings is now of substantial magnitude, with several works having recently sold for well over a million dollars, it remains true that with very few exceptions, the works of Canadian painters are bought and sold only in Canada and held only by Canadian collectors. This market can thus be viewed as almost exclusively local, and it is therefore not clear that there should be

² There are a number of studies that examine the returns to investing in the works of painters from particular countries. See, for example, Arvin and Scigliano (2004), Hodgson and Vorkink (2004), and Hodgson (in press) for returns to Canadian painters' works; Higgs and Worthington (2005) for Australian painters' works; Agnello and Pierce (1996) on genre effects on American art investments; Edwards (2004) on Latin American paintings, and Mok, et al (1993) for returns on modern Chinese paintings.

any linkage between price movements for Canadian art and those for the mainstream global market in old master, impressionist, and modern art.

This paper investigates the presence and nature of such time series dependence econometrically, both in terms of long term trends as reflected in the presence or absence of a co-integrating relationship between the Canadian and global markets, and in terms of short-run co-movements as represented in correlations. The possibility that the local market "follows" the global one is also considered through an analysis of the possible presence of Granger-Causality. The possibility that common economic fundamentals (or lack thereof) may account for common price movements is also investigated through the estimation of relationships between art prices and such fundamentals as general asset price indices and indices of real economic activity. For Canadian art prices we use a new hedonic index that has been computed using an updated version of the data set of Hodgson and Vorkink (2004), while for the international prices, we use an index provided by Mei and Moses.

The rest of the paper is organized as follows. In section 2, we provide a brief review of the results in the literature on art investment. In section 3, we review the main results of the previous studies on the financial returns in the Canadian art market. Then, we test for the time series properties of the Canadian paintings market price index and the Mei Moses Fine Art Prices index, calculated by Jienpeng Mei and Michael Moses, of Beautiful Asset Corporation, the semi-annual index available upon purchase at www.artasasset.com. Based on the unit root test results, we investigate whether the Canadian and world art market indices are co-integrated and the direction of Granger-causality (or lack thereof) between them. Section 4 considers the influence on the relative art price dynamics of aggregate indices of financial markets and general economic activity, and Section 5 concludes.

2. A Brief Review of the Financial Economics of Art Markets

The analysis of art prices within the context of asset pricing theory has focused on the statistical properties of time series of art returns. A time series index of prices and returns based on category, genre, technique and medium is estimated using either a hedonic regression or a repeat-sales method.

One of the first art price indices was constructed by Stein (1977) under the title “The Monetary Appreciation of Paintings”. Stein (1977) used US and UK auction prices over the period 1946-1968 and found an annual compounded nominal rate of return to paintings of 10.5 per cent while the annual compounded nominal rate of return of stocks was 14.3 per cent.

Using Reitlenger’s (1961) extensive data set on art works, Baumol (1986) studied the period between the years 1652 and 1961 for 640 transactions of multiple sales and found 0.55 per cent as the annual compounded real rate of return on paintings, implying a significant loss when compared with the average rate of return of 2.5 per cent of the British government bonds. Furthermore, investment in paintings performed even worse when compared with the stock market. Baumol also emphasized the importance of the aesthetic return of art investment to painting holders even though it underperforms financially.

Frey and Pommerehne (1989) undertook a similar investigation. The high prices paid for French impressionists and old master paintings led to a widespread belief that investing in art is a financially rewarding activity. Their calculations resulted in a real rate of return on paintings of 1.5 per cent per year whereas the long term real rate of return on financial investment was three per cent per year. As with

Baumol, they argue that investing in art is attractive due to both financial and “psychic” returns, as the enjoyment of owning the work of art and viewing it provides additional benefits to collectors. Atukeren and Seckin (2007) estimate the psychic returns in the Turkish art market using the CAPM.

In an influential study, Mei and Moses (2002) argue that there are two major difficulties attached to art markets: heterogeneity of art objects and the non-existence of continuous trade. They overcome these problems by constructing a new repeat-sales data set based on art auctions and obtain 4896 price pairs covering the period 1875-2000. Their index implies less volatility and much less correlation with other financial assets. As a result, they argue that a diversified portfolio of art objects may be a good way to disperse risk for long-term investors. The sub-categories of impressionist and old master paintings were found to yield 10.7 and 10.0 per cent per annum, respectively. These figures are still below the return on S&P 500, which yielded 10.9 per cent, but clearly above the 10 year US government bonds (6.6 per cent) and short-term treasury bills (5.4 per cent).³

Overall, the future price of a painting depends on fashion, tastes, stylistic trends, and other non-economic factors which are difficult to predict ex-ante. Goetzmann (1993) argues that art prices mimic stock prices with a considerable lag and the increase in the wealth of consumers pushes further up the demand for art. Globalization of aesthetic values will increase the demand for similar art objects, thus leading to ever higher prices and Goetzmann (1993) gives the example of the increased universal passion for the French impressionists and the higher auction prices for their works.

³ The 2006 update of the Mei & Moses fine art index shows that the annual return on paintings in the last 50 years is 10.5 per cent.

3. A Time-series Analysis of the Relationships between Canadian and International Art Markets

3.1 Data Description and Canadian Art Market

Records of sales of Canadian paintings at auction from 1968 to 2008 were collected from Campbell (1970-75, 1980), Sotheby's (1975, 1980) and Westbridge (1981-2008). Our data set includes results on sales for painters judged to be of significant interest from the standpoint of Canadian art history, this criterion being satisfied if a painter is mentioned in one of the major histories of Canadian art written by Harper (1977) or Reid (1973, 1988). We consider only oil and acrylic paintings, and only sales for which the auction house provides a secure attribution. For each painting, we recorded, in addition to the identity of the artist, the height and width, the medium and support, the auction house, the date of sale, the genre of the picture, and, when available, the date of execution of the painting. The prices we use are hammer prices as reported in the aforementioned publications. The resulting data set, an expanded version of that used by Hodgson and Vorkink (2004), contains 25,003 observations on final sales of 43 auction houses, covering the period 1968-2008, for 275 painters.

Painting in Canada has a long history, extending back to the seventeenth century (Reid (1973)), and most Canadians are familiar with the names of several Canadian painters from a variety of historical periods and regions. There are many museums of Canadian art across the country, and major sales of art works (often in seven-digit figures) sometimes make headlines. Canadian art can be classified under three categories, namely, the colonial and early confederation period, the interwar nationalist period, and, thirdly, the post-war "International Contemporary" period. In addition, there are several First Nations artists included in our sample, and this

category of art is an important and valuable (both financially and historically) component of Canadian art history and of the contemporary market.⁴

Landscape and portraiture formed the backbone of Canadian art prior to the 1867 Confederation. Much of this work was produced to the demand of a small colonial elite of businessmen, officials and military officers by journeymen whose training would have seemed rudimentary by the standards of the leading European academicians of the day.

By the time of Confederation, sufficient demand had developed to provide employment for full-time, well-trained professional artists. Although imported art styles, especially from Paris, were influential, Canadian landscape painting (and photography) developed in the nineteenth century into a national art, largely patronized by eastern business leaders who were interested in the development of the new national territories (Reid 1979). The art of the early Confederation period is characterized by painters generally working in styles heavily influenced by European academicism, old-fashioned by the standards of contemporary European advanced painting.

World War I helped Canada to strengthen its national identity and confidence. The growing development of a nationalistic Canadian consciousness during the 1910-20 period and after can be associated with a generation of Canadian painters who were consciously trying to create a distinctively indigenous idiom of painting, directly influenced by the Canadian landscape and not dependent on European styles. This outlook is most closely associated with the Group of Seven, who started painting together shortly before the war, in which many served as war artists, and who had their first formal group exhibition in 1920. During and after World War

⁴ Also of historical importance is the work of the early European cartographers who traversed and mapped the territories.

Two, the development of the most advanced Canadian artists came to parallel that of their American counterparts. In Montreal, a group of young artists influenced by European modernism, especially surrealism, were developing a form of abstract art not dissimilar from American abstract expressionism.

The loosening of British ties led Canada to develop stronger economic, social and cultural relationship with its rich southern neighbor. The post-war development of the New York art world, with its associated critics and periodicals, had a rapid impact in Canada, in Montreal in particular.

The market for the works of Canadian artists is, with a handful of exceptions, primarily limited to Canada. The aim of this paper is to further investigate the characteristics of this market and its links with the wider global art market using econometric analysis.

3.2 The Econometric Model

The evolution of the Canadian auction market has been studied in a number of previous papers. While Hodgson and Vorkink (2004) estimate a price index for the art market in Canada for the period 1968-2001, Arvin and Scigliano (2004) consider only the paintings of Group of Seven sold at auctions. Valsan (2002) compares the price dynamics of paintings of several Canadian and American artists for the period 1987-1996 using non-parametric tests and the hedonic regression method.

This paper extends the hedonic price index for Canada presented in Hodgson and Vorkink (2004) by updating the data set until the first half of 2008. The hedonic regression helps address the question of regularities in art prices by providing a functional form of various characteristics (the genre, artist's name, technique,

medium) of paintings such that the willingness to pay for each characteristic can be estimated.⁵

The econometric model is written:

$$p_i = \sum_{t=1}^T \gamma_t z_{it} + \sum_{j=1}^J \alpha_j w_{ij} + u_i, i = 1, \dots, n, \quad (1)$$

where p_i is the logarithm of the price of sale i , the number of sales is $n = 25,003$, z_{it} is the value of a period- t dummy variable, equal to 1 if painting i was sold in period t and zero otherwise, with the number of time periods T being 80 when the data are grouped semi annually (1968:2-2008:1). Our estimates of the vector of associated parameters $\{\gamma_t\}_{t=1}^T$ will form our price index, to be used in the unit root and co-integration tests that we undertake in the following section.

The regressors $\{w_{ij}\}$ in (1) represent the characteristics of painting i . These include 274 painter dummies, 20 medium/support dummies, 42 auction house dummies, 8 genre dummies, height, width, surface area and a dummy for whether or not the work is dated, 428 regressors in total. One dummy in each category was omitted to avoid collinearity with the time period dummies, hence 274 painter dummies correspond to a set of 275 painters. Equation (1) can be re-written as follows:

$$p_i = x_i' \beta + u_i, i = 1, \dots, n. \quad (2)$$

where $x_i' = (z_{i1}, \dots, z_{iT}, w_{i1}, \dots, w_{iJ})$, $\beta = (\gamma_1, \dots, \gamma_T, \alpha_1, \dots, \alpha_J)'$

The time period dummies are used to compute rates of return. For example, the rate of return between period t to $t+1$ can be written as follows:

$$r_{t+1} = e^{(\gamma_{t+1} - \gamma_t)} - 1.$$

⁵ See Velthuis (2005), p.99.

To interpret the other regression parameter estimates, consider the dummies for painter. We omit the dummy for A.Y. Jackson from the regression (1), so that the dummy parameters α_j for each of the remaining painters will reflect their market values vis-à-vis Jackson. The percentage difference between the value of a work by painter j and a work by Jackson, controlling for all other factors, will be:

$$e^{\alpha_j} - 1.$$

One can estimate (1) and (2) using ordinary least squares (OLS). Under the standard assumptions, OLS will be consistent and asymptotically normal and will be asymptotically efficient if the disturbances are normally distributed. Due to efficiency concerns we estimate (2) adaptively, following the technique of Bickel (1982), in order to obtain asymptotically efficient estimates when the distribution function of the disturbances $\{u_i\}$ is unknown.⁶

3.3 Hedonic Price Index

For the purposes of this paper, we focus on the nominal returns in Canadian dollars. The semi-annual percentage changes in the hedonic price index for the Canadian paintings market for the 1968-2008 period in CAD dollar terms are presented in Table 1.

< Table 1 approximately here >

Investing in paintings can be shown to have lower financial returns than stocks in Canada. This is in line with the general findings in the literature. The semi-annual dummy estimates are reported in Table 1. For each period, we have provided the estimated dummy parameter, its standard error and the nominal returns. The returns are plotted in Figure 2. We observe a very high volatility prior to 1988. One

⁶ See Hodgson and Vorkink (2004) for a detailed description of this method.

apparent reason for this finding is related to limited data availability. It may also be related to the relative shallowness of Canadian art market during the early periods together with general macroeconomic instability of world economies. The returns on the portfolio of Canadian paintings discussed above yielded around 19% during the period 1969-2008(1). The average annual return between 1969 and 1980 is over 21% , whereas the average annual nominal return between 1981-1991 is less than 1%. The average annual nominal return corresponding to the period 1992-2002 was 4.76% and for the period 2003-08 it is around 13 %. The annual returns in the last period show a clear sign of appreciation of Canadian paintings; however, the returns are not as high as the ones generated in international art markets.

The top 25 list of painter dummy estimates of Hodgson and Vorkink (2004) seems to stay almost identical with the updated dataset. The ranking is not necessarily significant. The reported standard errors permit us to interpret the significance of the parameter estimates relative to A.Y. Jackson. One major weakness of the hedonic method is that it is a reduced-form model that doesn't tell us anything about supply and demand behavior in the art market. ⁷

< Table 2 approximately here >

Tom Thomson (1877-1917) is the number one artist in the art market. This result is not surprising since he is considered to be the most important painter in developing an original national style of Canadian landscape that inspired the Group of Seven, whose members are mostly in the top 25 list. ⁸

⁷ See Velthuis (2005), p.99. This point is also mentioned in Hodgson and Vorkink (2004).

⁸ The Group of Seven's founding members were Frank Carmichael, Lawren S.Harris, Fred Varley, A.J. Casson, J.E.H. MacDonald, A.Y. Jackson and Franz Johnston.

The top list also includes old masters such as William Berczy (1744-1813), James Duncan (1806-81), Jean Baptiste Roy-Audy (1778-c.1848), Paul Kane (1810-71), and W.G.R. Hind (1833-89), whose works are mostly quite rare and of major historical importance.

Some of the results for the remaining hedonic variables are reported in Tables 4-6. The medium and support have important effects on the price of a painting. Oil on canvas is considered as the most valuable type of medium-support combination such that for example paintings in the classification of oil on paper are priced 35% less than an oil painting on canvas. In the Canadian art market, the paintings considered as genre scene and still life are priced 19% and 6.5% more relative to landscapes, respectively. A painting's price can be 15% higher if it is dated compared to a one which has no date on it. The width and height contribute positively to price. However, as the area gets larger an extreme size painting may encounter some negative effects on its price.

3.4 Global Paintings Market

Co-movements of international art prices are studied by Ginsburgh and Jeanfils (1995). They construct price indices on the basis of hedonic regressions using auction prices covering the period 1963-1992. They group paintings under three categories, Great Masters, Other Painters and US Painters, and collect auction data from three key art markets, London, Paris and New York. Using a VAR (vector autoregressive) model they show that art markets indeed move closely together. They also examine art and stock markets' short-run and long-run co-movements. Their findings confirm the absence of any long-run relation between art and stock markets but confirm the presence of short-run influences of stock markets on art prices.

In this context, Worthington and Higgs (2003) examine the short-run and long-run linkages of prices among eight major painting categories and the global equity market for the period 1976-2001 using Artprice.com's price indices. Worthington and Higgs's (2003) analysis basically focuses on the inner dynamics of the international paintings markets and their reactions to general financial market conditions.⁹

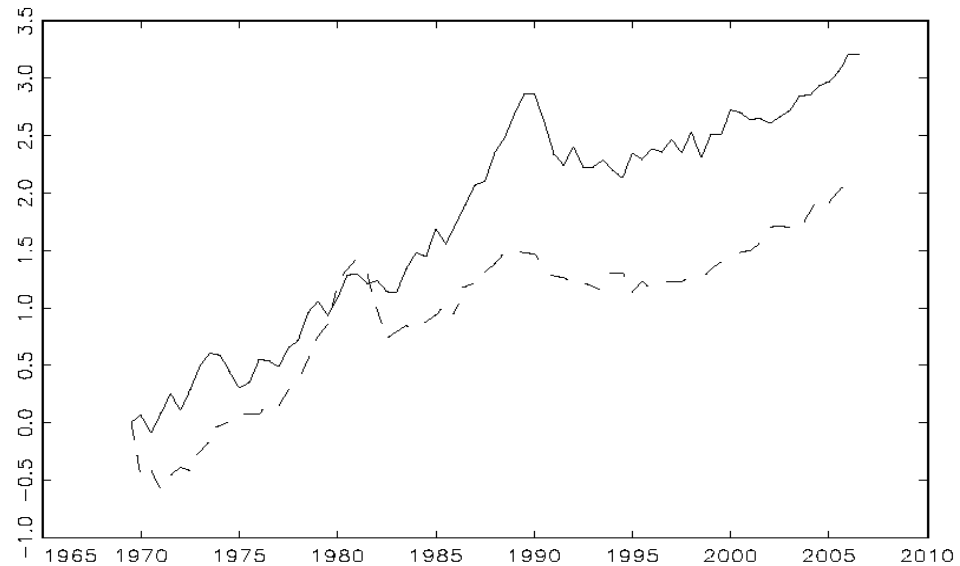
Worthington and Higgs (2003) employ multivariate co-integration procedures, Granger non-causality tests, level VARs, and generalized variance decomposition techniques to identify the presence (or lack thereof) and the degree of linkages among these markets. They find strong evidence for the high level of integration of international art markets for short as well as long time spans together with significant interrelationships between major stock markets and art markets.¹⁰

For the international paintings market index we make use of the price index on international paintings calculated by Michael Moses and Jinpeing Mei (Mei Moses Fine Art Price index). They use the repeat-sales method in constructing their index. The indices are available on a semi-annual basis from mid-1969. They use over 13,000 repeat sale pairs under five categories: old master and 19th century, impressionist and modern, American before 1950, post war and contemporary, and Latin American. Figure 1 provides the graphs of MMFAI index together with semi-annual Canadian art price index for the period 1969-2006 in log terms.

⁹ The painting categories included in Worthington and Higgs (2003) are: "contemporary masters", "French impressionists", "modern European", "19th century European", "old masters", "Surrealists", "20th century English", and "modern US paintings". They use Artprice data, www.artprice.com.

¹⁰ Nevertheless, Worthington and Higgs (2003) argue that their results suggest possibilities of portfolio diversification among several alternative painting markets. In particular, they find that most of the market categories they study are found to be isolated markets where only a low level of variance is explained by other markets.

Fig. 1 – Log Mei–Moses Index (Solid) and Log Canadian Index (Broken)



As Figure 1 shows, the world market for paintings displays four phases since 1969. The first period sees the rise of art prices especially starting from the early seventies until the end of the decade.¹¹ The first oil shock of 1973 had its negative effect only in 1974, similarly the second oil shock (however to a smaller extent) decreases the art prices. The second phase covers the eighties. The recession of 1981-82 had its impact on the sales prices but the recovery came fast and spectacular. The whole decade is characterized as the main art market bubble. Up until the early 1990s, the prices in the international art markets were increasing – mainly driven by demand from the Japanese who invested their gains from the high performing Japanese economy and the stock market in art. With the substantial downturn in the Japanese economy in the 1990s, the art market prices also collapsed. The euphoria ends with the collapse of Nikkei stock exchange and the withdrawal of Japanese art loving investors from the world art markets. That is the beginning of the third phase and can be defined as the slowdown and continuous fall in world prices. This period

¹¹ The graphs are in nominal terms. The same currency log real Mei-Moses art index and log real Canadian art price index as well as real returns of both indexes have been calculated. The related graphs are in the appendix.

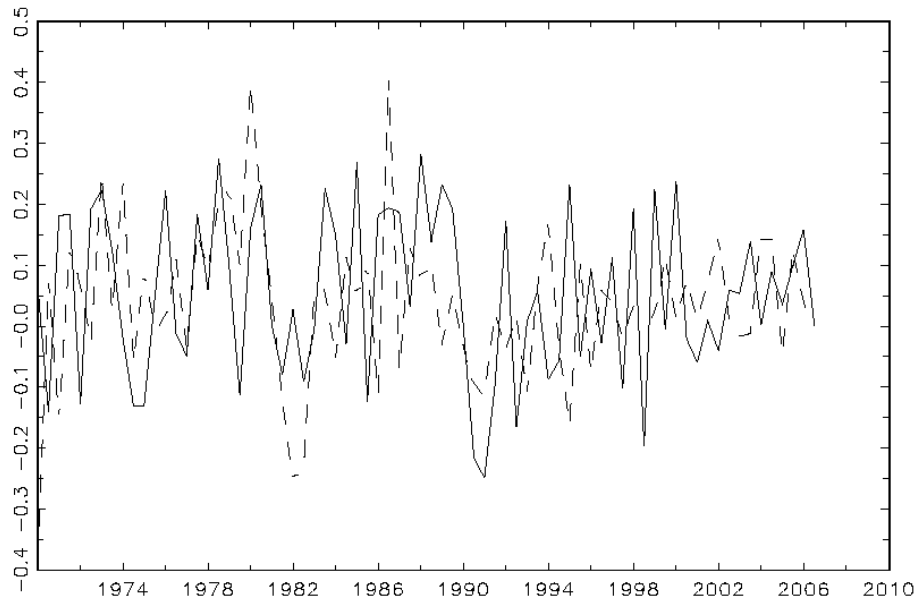
runs to about the mid-nineties. The fourth and last phase (according to the graph which ends in 2006) incorporates the last ten years in world art markets. Indeed, the market was relatively flat from 1994 to 1998. The 1999 – 2001 period involved fluctuations, which again coincides with a volatile period in the international economy. After 2001, however, we observe a period of growth, which extends into all art investment categories. This may again be related to wealth effects coming from the international economy and stock market developments in dot-com companies in the US stock market¹².

When we examine Figure 1, the first striking observation is that the Canadian art price index lags behind the Mei Moses Fine Art Index almost the whole period except for 1980. This year's extremely high rate of return may be related to the composition of artists and works sold on that particular year, which needs further investigation. Another important point is that there seems to be closer comovement between the series in recent years. This observation can also be confirmed in Figure 2 where we observe the movement of both semi-annual nominal returns over the same period. The convergence of price movements, still a highly arguable observation, needs to be followed as the data becomes available. The true effect of the world economic and financial crisis on the global art prices would mostly be apparent by the end of 2009.

Given the comparison of the developments and indices in the Canadian and international art markets, we now examine the relationships between the rate of returns of Canadian paintings and the returns of world art investments.

¹² Unfortunately our sample does not include the recent financial and economic crisis following the US mortgage crisis. The Canadian data for the first half of 2008 show a clear sign of a price drop.

Fig. 2 – Returns: Mei–Moses Index and Canadian Index (Broken)



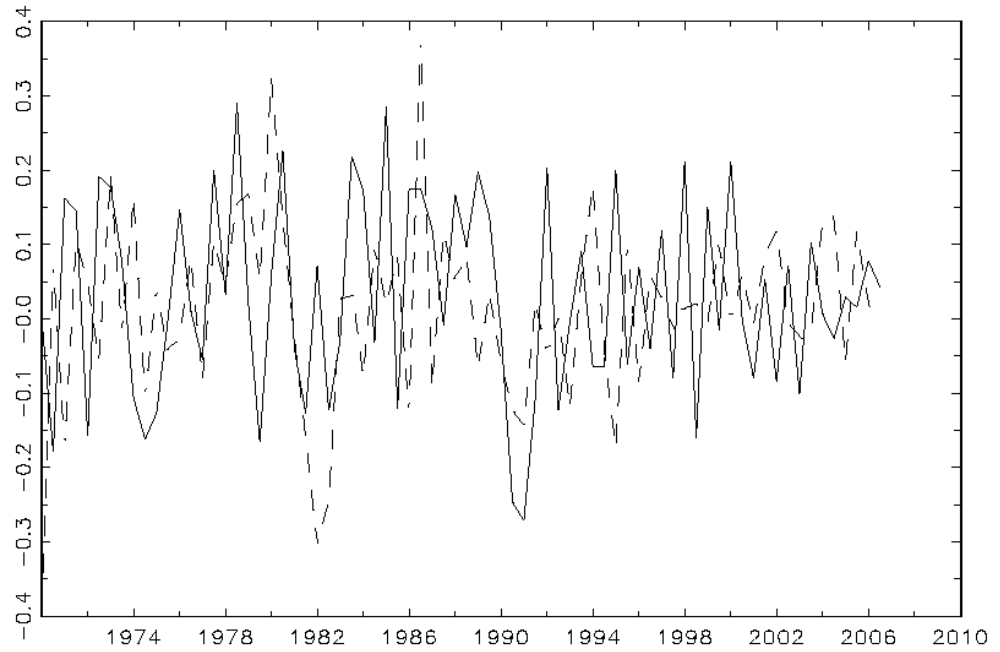
Comparing the returns in the global paintings market to those in the Canadian market, the Canadian market appears to have underperformed the international market. Another point to be mentioned is that the 1981-82 world economic slow down hit Canadian art market more severely compared to the world markets. Also, the bursting of the art bubble of 1990 less affected Canadian art markets compared to world art markets. This may be related to the size of the Canadian market and its degree of integration with the main world art markets. Throughout the 1990's the returns of both indices show a weak relationship. However, from 2004 we see closer movements between the two series. This empirical observation needs further to be investigated to better understand the extent of this link.

We have also calculated real price indices and returns, in the same currency units. We have deflated the Mei Moses index using US Consumer Price Index (CPI), the Canadian index with Canadian CPI, and then converted them to the same currency units using the Canada-US exchange rate. Graphs of the resulting real log index and real returns are shown below.

Fig. 3 – Log Real Index (Same Currency): Mei-Moses and Canada (Broken)



Fig. 4 – Real Returns (Same Currency): Mei-Moses and Canada (Broken)



The graphs for log real indexes for Canadian Art and Mei-Moses fine art and real returns (same currency) are similar to the graph expressed in nominal terms,

although the relative weakness of returns in the Canadian market is even more pronounced in this case (this was period of general depreciation of the Canadian dollar) .

3.5 Unit Root and Granger-causality Test Results

It is well known in the econometrics literature that simple measures of statistical association do not imply causality; and that they may indeed turn out to be spurious. The search for unit roots in time series and the statistical methods to deal with the integrated variables have been an important research area in macroeconomics since the 1980's.

In view of this, we investigate the time-series properties of the Canadian paintings market price index and Mei and Moses global paintings market price index, (MMFAI). In doing so, we first test for the order of integration in the Canadian art index and the MMFAI series. If both indices are found to be $I(1)$ processes, then we can proceed to test for co-integration. If the two series are found to be co-integrated, then it can be said that the two markets move together in the long run.

We test for the order of integration in the series using the augmented-Dickey-Fuller (1979) (ADF) and the Phillips and Perron (1988) (PP) tests on the natural logarithms of the variables and on the first differences in nominal terms. The results are reported in Table 8.

< Table 8-a approximately here >

< Table 8-b approximately here >

The unit root tests are in accord that both series are best modeled as being integrated of order 1. We proceed to test for cointegration of the two log-indices,

applying the ADF and PP tests to the residuals of the OLS regression of the Canadian index on the international one.

< Table 9 approximately here >

As seen from Table 9, neither test can reject the null that the series are not cointegrated at any conventional significance level. Canadian art prices are not responsive to the developments in the international art markets even in the long-run. This is counter-evidence to “the globalization of tastes” argument made by Goetzmann (1993).

Turning our attention to the nominal returns series, we find that the simple contemporaneous correlation coefficient between the returns to investing in the Canadian and the international paintings markets for the period of 1969–2006 is 0.1489. The volatility of Canadian paintings market is slightly higher than that of the global art market. The standard deviations of the nominal returns in the Canadian and international paintings markets are 13.29 % and 12.74 % respectively.

< Table 10 approximately here >

The results from Granger-causality tests (Table 11) show that there is no causality between the price developments in the global paintings market and the Canadian paintings market, in either direction (the tests are computed in estimating by OLS a second-order VAR in returns).

< Table 11 approximately here >

The fact that price movements in the Canadian market do not precede those in the mainstream global market should surprise no one. However, the reverse finding, that international returns have no predictive power for Canadian returns, may be a bit surprising to some (although those maintaining that a strict efficiency of financial markets hypothesis should also apply to art returns would be comforted, as they would be by the lack of cointegration found between the series).

The previous time series analysis has been repeated with the same currency price indices for Canadian and world art and the real, same-currency returns. However, the main results are not changed. In fact, there is even less dependence between the series in this case.

< Table 12 approximately here >

< Table 13 approximately here >

Similarly, the standard deviations of the real returns (same currency) in the Canadian and international paintings markets are 13.01 % and 12.33 % respectively. The simple contemporaneous correlation coefficient between the real returns to investing in the Canadian and the international paintings markets for the period of 1969–2006 is even smaller, 0.1069 (Table 14).¹³

< Table 14 approximately here >

The Granger-causality tests using real, same currency returns (Table 15) yield similar results confirming again the lack of causality between the price developments

¹³ Atukeren and Seckin (forthcoming) find the simple contemporaneous correlation coefficient between the returns to investing in the Turkish and international paintings markets between the period 1991-2005 as 0.40.

in the global paintings market and the Canadian paintings market, in either direction (the tests are computed in estimating by OLS a second-order VAR in returns).

< Table 15- approximately here >

Nevertheless, the main result here – that there is very little time series relationship between the evolution of prices for Canadian art and those for the mainstream international art market, is not entirely what we expected to find and is at variance with the results of some of the previous studies in the literature. Further investigation of the result is warranted in order to try and better explain and understand it. A starting point is to consider the relative dependence of the two art series on other economic indicators, such as overall asset prices and indicators of real economic activity.

Since art investments are investments with longer horizons, long term wealth effects are the true motivation in buying art, besides its portfolio diversification properties. One explanation for our result could be the differences in the aesthetic pleasure between Canadian and world art market participants. The effort of creating a national identity and having concentrated for long time on landscapes and still life paintings rather than abstract and conceptual art may have limited the size of the audience for the Canadian art.¹⁴

Moreover, Canadian art markets could have been influenced by factors other than aesthetics. The social structure, communities and other cultural networks within the art markets in Canada may have structural differences.

4. Art Prices and Macroeconomic Indicators

¹⁴ This is an argument which has been put forward by Valsan (2002) as well.

We next want to examine whether Canadian paintings can be used to diversify an international investment portfolio. Our time series analyses show that the Canadian art prices seem to be pretty independent of the American ones, and thus it is of interest to see how they would contribute to the diversification of non-Canadian collectors. To this end, we have estimated the capital asset pricing model (CAPM) for the Mei-Moses and Canadian indexes, using the Dow Jones as the proxy for market returns and the US Federal Funds Rate as the return series on a risk-free asset. The Canadian index was converted to US dollars using the exchange rate.

We have used the general stock index because under the CAPM, the "market" portfolio is the portfolio of all assets that exist in the world. The betas here then indicate how paintings contribute to an overall investment portfolio. We are basically interested in the contribution of Canadian paintings to the diversification of the financial portfolio of mainstream global asset markets as proxied by the Dow Jones. This is a different question than the one that was asked by the Hodgson and Vorkink (2004). They use the Toronto Stock Exchange as the market proxy, to examine portfolio diversification capabilities of Canadian paintings in the case of Canadian investors, who have mostly invested in Canadian stocks.

< Table 16. approximately here >

The beta is very close to zero in this case, again supporting the results we have already obtained.¹⁵ The fact that we obtain a very small beta suggests that there

¹⁵ The beta parameter in the CAPM model captures the sensitivity of the excess returns on a particular asset to the excess returns on the market portfolio. The constant term shows the excess returns on that asset that cannot be explained by its risk and return relationship with the market portfolio. In the art economics literature, the constant term can be interpreted as non-financial or psychic returns. Atukeren and Seckin (2007) estimate the psychic returns to Turkish art market investments to be around 30 per cent.

is diversification potential with Canadian art more than with US art, which may be why the average return of US art is higher. The fact that very few non-Canadian investors take advantage of this diversification opportunity suggests a particularity of the Canadians' tastes for art. The consumption dividends (or "psychic returns") of Canadians from collecting Canadian art are higher than that of non-Canadians.

We have done more work on trying to see how Canadian art prices can be explained by general economic variables. To this end, we have added Canadian GDP and Canadian stock returns to the mix. Our aim is to see how much extra explanatory power for the Canadian index (relative to the Mei-Moses one) is contained in Canadian stock prices and Canadian GDP. Two graphs below show how these variables move (in log real levels and real returns) compared to art prices.

The Canadian stock prices and art prices move closely for the period 1973-1990. However, art prices have been much more volatile than the stock prices. Canadian art prices do seem to have participated to some extent in the global decline in art prices of the early 1990's. Prices recovered in the late 1990's, again in common with global art price movements, but lagged behind stock prices. Another interesting observation is that although art prices declined following both the 1982 and 1990-1992 recessions, they did react only slightly to the stock price corrections following the dot.com bubble and losses in high tech stocks. This point needs to be further investigated. Real stock returns and real returns for art were highly volatile during the seventies and eighties. The volatility in art investment returns has increased in recent years as shown in the graph. The volatility of art and equity returns has been much larger than that of real GDP growth.

Fig. 5 – Log Real Canadian Art, GDP(Broken), and Stocks (Dots)

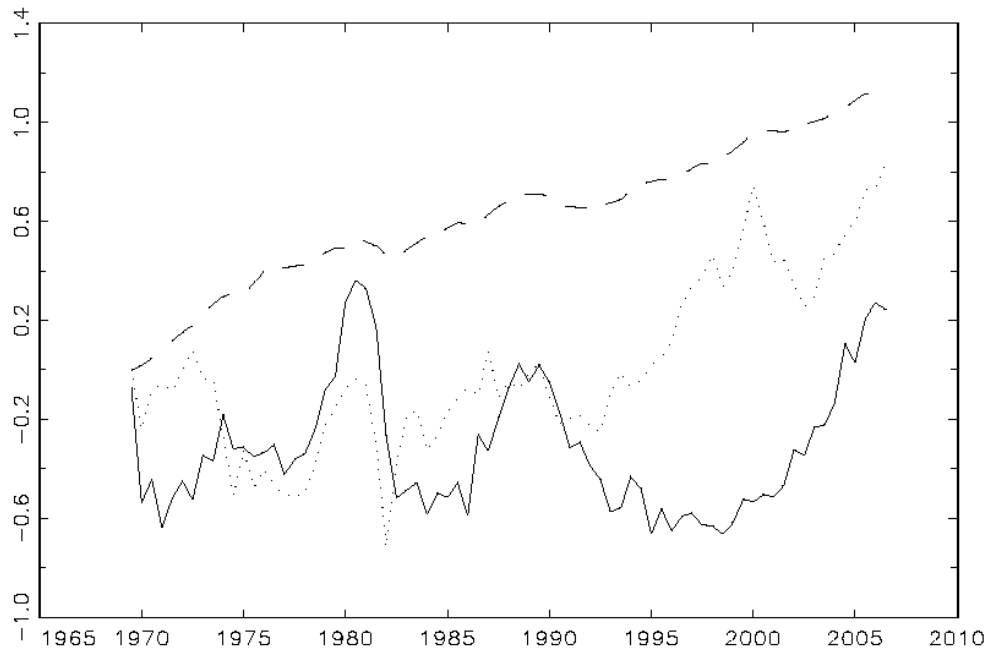
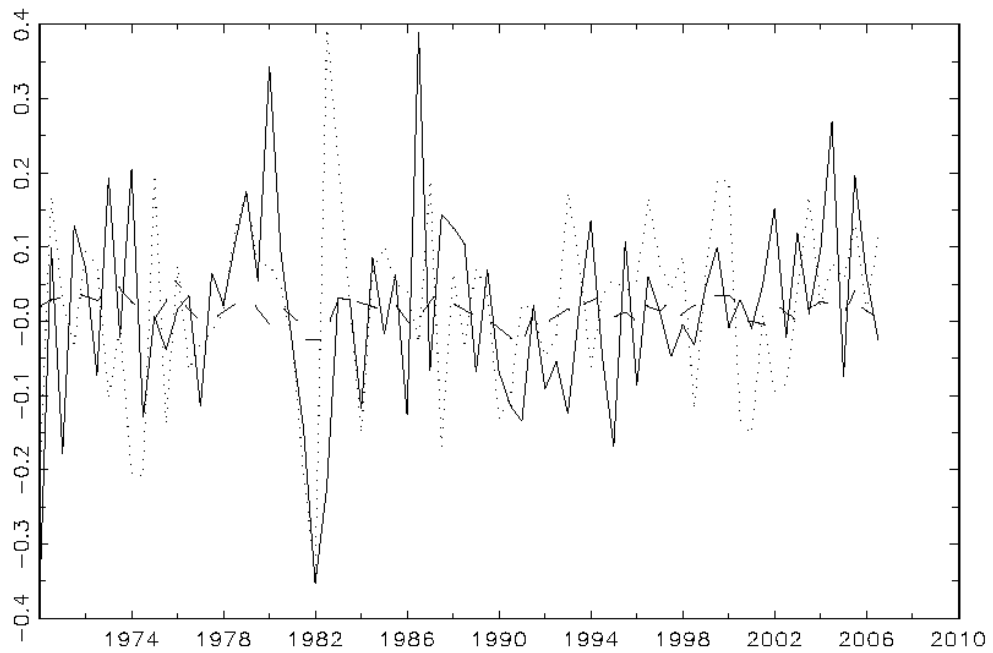


Fig. 6 – Real Returns: Canadian Art, GDP(Broken), and Stocks (Dots)



Overall, although there is some connection between movements in Canadian art prices and the global art market, this connection is very weak. In the absence of a good theory of art price determination that could explain this phenomenon or suggest alternative explanatory covariates, we proceed to investigate the statistical explanatory power, beyond that present in international art prices, of aggregate indicators of wealth and income in Canada, as measured by stock prices and national income. Log levels and returns for Canadian GDP and the Toronto Stock Exchange are plotted in Figures 5 and 6. In addition, a variety of statistics have been computed to measure this marginal explanatory power of Canadian aggregates.

There is no cointegration in any combination of Canadian art prices with US art prices, Canadian GDP, or Canadian stocks.¹⁶ We have also tested Granger-causality of 2 lags of these three variables on Canadian art returns, and we have obtained a chi-square (6 D.F.) statistic of 1.53. Therefore, we cannot reject the null hypothesis of no Granger causality.¹⁷ From these results we can conclude that there is no long-run relation between Canadian art prices and any of these variables, and that, furthermore, none of them are useful for the prediction of art returns. Looking at the contemporaneous impact of these variables on art returns, we then run a regression of Canadian art returns on a constant and the returns to these three variables (Mei-Moses Art price index, Canadian GDP and Canadian stock prices). The results are presented in Table below:

Dependent Variable: Cdn art			
Sample: 1968 –2008 , N =41			
Variable	Coefficient	Std. Error	t-Statistic
Constant	-0.0275	0.0192	1.43229
US Art	-0.0189	0.1136	0.16637
CGDP	2.49	0.849	2.9328
CStocks	0.117	0.965	0.12124

¹⁶ The results are available upon request.

¹⁷ The related tests are not reported in detail in the paper. They are available upon request.

R-squared	0.141		
-----------	-------	--	--

Real GDP growth and the increase in real returns of Canadian stocks have positive effects while global art price returns have a slightly negative effect on Canadian art prices. Only the coefficient of Canadian GDP turned out to be significant, whereas Canadian stocks and US art prices are not significant at any standard significance level. Therefore, we conclude that these three variables are only partly useful for explaining art prices. The only variable with an important effect on art price changes is real GDP, which has a strong contemporaneous effect, with a one per cent change in real GDP inducing a change in art prices of 2.49 per cent.

Our results in this paper support the hypothesis that Canadian art prices move fairly independently of world prices. This does suggest independence of Canadian tastes, especially as Canadian art seems to yield lower real returns than the global market overall, suggesting that the consumption value of Canadian art is particularly high to Canadian collectors. This is consistent with the very limited interest of non-Canadian collectors in Canadian paintings.

The particularity of Canadian taste may be one of the factors in explaining price movements in the Canadian art market. The collecting styles of several famous Canadian art collectors and their tastes have had important effects in shaping the demand for Canadian art and hence the art supply in Canada. We may ask why it is that Canadian collectors are so attached to landscape? The answer will also be helpful to understand lack of common price dynamics between Canadian and world art markets.

Canadian art collectors have been very influential in shaping major Canadian museums' art collections either through their own art foundations or through direct

donations to public art holdings. In this way, they have contributed to the taste formation for art and paintings in particular and a significant accumulation of art capital in Canada. Among the the most famous and influential collectors are R. McMichael and S. McMichael, J.S. McLean, and K. Thomson.

Robert McMichael and his wife, Signe, were passionate collectors of art by the Group of Seven. Their collection “*began out of the deep affection of its founders for their country and its painting.*”¹⁸ R. McMichael expressed his love for Canadian art in his 1986 book in the following words: “*...we had been obsessed with the desire to bring together a much larger collection of art with an unabashedly nationalistic flavour. In our log and stone lodge the combination of these symbols of the land and its cultures would be a stirring salute to nationhood.*”¹⁹

J.S. McLean was another Canadian collector who felt a personal connection to objects and images in the minds of the Canadian artists. He was committed *to the creation of nationhood in a country of seemingly newly born.*²⁰ He was proud to refer his collection as “My Canadians”. His collection covers basically the works of Jackson, Schaefer, Clark and Milne, some of whom became later his friends. McLean believed that these artists painted the “*most sensitive and beautiful images of the cultivated Canadian landscape*”.²¹ McLean’s desire was to introduce art into the everyday lives of Canadians. In 1942, he decided to reproduce modern Canadian paintings as silkscreen prints for distribution to Canadian Armed Forces bases in Canada and overseas in order to boost morale and to “make them conscious of the

¹⁸ See McMichael, 1986, the introduction by Paul Duval.

¹⁹ See Murray (2006) for the detailed analysis of the hundred selected masterworks in the McMichael Collection.

²⁰ Italics taken from Hudson (1999), p.7.

²¹ See *ibid.* p.29.

land and cause for which they are called upon to fight.”²² The success of the program encouraged him to promote sales of the prints for home and office decoration.²³

Ken Thomson also was well known for his art collection and love for the paintings of the artists of the Group of Seven. Following his retirement, Thomson donated nearly 3,000 pieces of art to the Art Gallery of Ontario. His Canadian collection includes many works of the Group of Seven,²⁴

5. Conclusion

In the economics of art literature, there exist a number of studies which investigate whether the inclusion of art works into a financial portfolio can bring diversification benefits and the general conclusion is a qualified ‘yes’. There are, however, only a handful of studies which investigate the price dynamics between different segments of the art market. In this context, we use co-integration analysis and Granger-causality tests to investigate the inter-linkages between price dynamics in the Canadian and global paintings markets.

While Hodgson and Vorkink (2004) provide independent evidence (relative to the existing literature) on the general question of the properties of art as an investment, our findings indicate that the prices in the Canadian paintings auctions

²² Lambert (1943).

²³ See *ibid.* p.27.

²⁴ The Canadian Collection, apart from the First Nations objects, comprises three major components: 19th century Canadian art, with a particular emphasis on the paintings of Cornelius Krieghoff; the Group of Seven and their contemporaries, with strong holdings of the work of Tom Thomson, Lawren S. Harris, J.E.H. Macdonald, David Milne and James Wilson Morrice and significant paintings by post-war artists Paul-Emile Borduas and William Kurelek. See www.ago.net

and the international art market prices are not co-integrated. This implies that, despite low short-term fluctuations, price developments in the Canadian and international art markets do not move together in the long-run. Technically speaking, this does not mean that the returns necessarily diverge, but it only implies that the variance of the return differential between the two markets becomes infinitely large. Furthermore, the results from Granger-causality tests show that, even in the short run, there is no feedback (or spillovers) from the world art market to the Canadian art markets.

We can confidently conclude from the results that deeper explanations are needed on the questions of the nature and origin of Canadian collectors' tastes in art. Canadian collectors' tastes for landscapes lie in nationalist sentiments deeply rooted in independent identity and nation building efforts throughout the early decades of 20th century. They invest in their national identity when buying art. Abstract expressionist and contemporary art are considered as the symbols of universal tastes, and not sufficiently "Canadian".

The taste formation issue may somehow be related to the public policies. The involvement of the Canadian government in art market in terms of subsidies and direct funding has promoted not only artistic development but also the sentiments of nationhood. These policies furthermore created incentives for the art market to remain local and somehow *protected*.

The idiosyncrasy of Canadian tastes and the government cultural policies may be two important factors in explaining art market dynamics specific to Canada. The collecting styles of several famous Canadian art collectors and their tastes have been important influences in shaping supply and demand for Canadian art. The focus on

these issues may help to clarify the demand and art price divergences between Canadian and world art markets. This is left for future work.

BIBLIOGRAPHY

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

Arvin, M. and M. Scigliano (2004), “Hedonic Prices in Art and Returns to Art Investment: Evidence from the Group of Seven at Auction”, *Économie Appliquée*, LVII(1), pp. 137- 162.

Ashenfelter, O. and K. Graddy (2003), “Auctions and the Price of Art”, *Journal of Economic Literature*, Vol. 41, pp.763-786.

Atukeren, E. and A. Seckin, “An Analysis of The Price Dynamics Between The Turkish and The International Paintings Markets”, *Applied Financial Economics*, (forthcoming).

Atukeren, E. and A. Seckin (2007) “On the Measurement of Psychic Returns to the Ownership of Art Object: An Application to the Market for Paintings in Turkey”, *Economic Bulletin*, Vol.26, No.5, pp.1-12

Baumol, W. J. (1986), “Unnatural Value: or Art Investment as Floating Crap Game”, *American Economic Review*, Vol. 76, No. 2, pp.10-14.

Bickel, P. (1982), "On Adaptive Estimation", *Annals of Statistics*, Vol. 10, pp. 647-671.

Burton, B. J. and J. P. Jacobsen (1999), "Measuring Returns on Investment in Collectibles", *Journal of Economic Perspectives*, Vol. 13, No. 4, pp.193-212.

Campbell, H. 1970-1975. *Canadian Art Auction Record 1969-1974*, vols 1-6. Toronto: Canadian Antiques and Fine Arts; and Montreal: Bernard Amtmann.

Campbell, H. 1980. *Canadian Art Auctions, Sales, and Prices, 1976-1978*. Don Mills, Ont.: General.

Dickey, D. and Fuller, W. 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association* Vol.74, pp.427-31.

Edwards, S. (2004), "On the Economics of Latin American Art: Creativity Patterns and Rates of Return", *Economia*, Spring Issue, pp.1-35.

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

Frey, B. S. and W. W. Pommerehne (1989), "Art Investment: An Empirical Inquiry", *Southern Economic Journal*, Vol. 56, No. 2, pp.396-409.

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

Goetzmann, W. N. (1993), "Accounting For Taste: Art and the Financial Markets Over Three Centuries", *American Economic Review*, Vol. 83, No. 5, pp.1370-1376.

Harper, J.R. 1977. *Painting in Canada: A history (2nd ed.)*. Univ. of Toronto.

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

Hodgson, D.J. (in press), "An Analysis of Pricing and Returns in the Market for French Canadian Paintings", *Applied Economics*.

Hodgson, D. J. and K. P. Vorkink (2004), "Asset Pricing Theory and the Valuation of Canadian Paintings", *Canadian Journal of Economics*, Vol. 37, No.3, pp.629-655.

Hudson, A. (1999), *A Collector's Vision, J.S. McLean and Modern Painting in Canada*, Art Gallery of Ontario: Toronto.

Lambert, R.S. (1943), "Bringing Canadian Art to Our Armed Forces", *Saturday Night*, (April 3, 1943), p.18.

McMichael, R. (1986), *One Man's Obsession*, Prentice-Hall Canada: Scarborough.

Mei, J. and M. Moses (2002), "Art as an Investment and the Underperformance of Masterpieces", *American Economic Review*, Vol. 92, No. 5, pp.1656-1668.

Mok, H.M.K., Ko, V.M.K., Woo, S.S.M. and Kwok, K.Y.S. (1993), “Modern Chinese Paintings: An Investment Alternative”, *Southern Economic Journal*, Vol. 92, pp. 808-816.

Murray, J. (2006), *McMichael Canadian Art Collection One Hundred Masterworks*, McMichael Canadian Art Collection: Kleinburg

Phillips, P.C.B. and P. Perron (1988), “Testing for a Unit Root in Time Series Regression”, *Biometrika*, Vol. 75, pp.335-346.

Reid, D. 1973. *A Concise History of Canadian Painting*. Toronto: Oxford.

Reid, D. 1979. *Our own Country Canada*. Ottawa: National Gallery of Canada.

Reid, D. 1988. *A Concise History of Canadian Painting (2nd ed.)*. Toronto: Oxford.

Seckin, A. and E. Atukeren (2006a), “Art and the Economy: A First Look at the Market for Paintings in Turkey”, *Economics Bulletin*, Vol. 26, No. 3, pp.1-13. [<http://economicsbulletin.vanderbilt.edu/2006/volume26/EB-06Z10130A.pdf>]

Sotheby's. 1975. *Canadian Art at Auction, 1968-1975*. Toronto: Sotheby's.

Sotheby's. 1980. *Canadian Art at Auction, 1975-1980*. Toronto: Sotheby's.

Stein, J. P. (1977), “The Monetary Appreciation of Paintings”, *Journal of Political Economy*, Vol. 85, No. 5, pp.1021-1035.

Valsan, C. (2002), “Canadian versus American Art, What Pays Off and Why”,
Journal of Cultural Economics, Vol. 26, pp.203-216.

Velthuis, O. (2005), *Talking Prices*, Princeton University Press: Princeton.

Westbridge, A.R. 1981-2008. *Canadian Art Sales Index, 1977-2008*. Vancouver:
 Westbridge.

Worthington, A. C. and H. Higgs (2003), “Art as an Investment: Short and Long-
 term Co-movements in Major Painting Markets”, *Empirical Economics*, Vol. 28,
 pp.649-668.

APPENDIX

Table 1: Hedonic price index and returns, 1968-2008

Half-year	Index	S.E.	Return (%)	S.E.	Half-year	Index	S.E.	Return (%)	S.E.
68:2	6.767	.110	0	0	88:2	8.763	.044	10.13	5.05
69:1	7.070	.091	35.40	18.52	89:1	8.730	.043	-3.26	4.43
69:2	7.279	.088	23.25	14.83	89:2	8.781	.044	5.24	4.89
70:1	6.791	.049	-38.60	5.72	90:1	8.749	.044	-3.19	4.58
70:2	6.865	.055	7.66	6.20	90:2	8.639	.045	-10.40	4.36
71:1	6.698	.056	-15.42	5.32	91:1	8.521	.052	-11.16	5.00
71:2	6.821	.065	13.11	8.16	91:2	8.541	.049	2.05	6.04
72:1	6.887	.057	6.82	7.83	92:1	8.502	.050	-3.80	5.54
72:2	6.862	.057	-2.50	6.48	92:2	8.518	.049	1.56	5.81
73:1	7.083	.063	24.82	8.92	93:1	8.398	.052	-11.25	5.25
73:2	7.109	.061	2.64	7.72	93:2	8.463	.052	6.70	6.55
74:1	7.325	.060	24.01	9.09	94:1	8.621	.051	17.07	7.04
74:2	7.265	.060	-5.74	6.89	94:2	8.585	.049	-3.50	5.60
75:1	7.353	.081	9.12	10.22	95:1	8.410	.048	-16.08	4.71
75:2	7.350	.092	-0.25	11.70	95:2	8.508	.050	10.26	6.25
76:1	7.355	.061	0.48	10.45	96:1	8.430	.049	-7.50	5.18
76:2	7.459	.070	10.95	9.03	96:2	8.494	.048	6.61	5.88
77:1	7.423	.063	-3.50	8.09	97:1	8.530	.049	3.74	5.74
77:2	7.564	.066	15.12	9.31	97:2	8.512	.046	-1.82	5.18
78:1	7.655	.059	9.55	8.54	98:1	8.545	.048	3.32	5.40
78:2	7.838	.058	20.09	8.60	98:2	8.563	.045	1.89	5.24
79:1	8.045	.061	22.93	9.00	99:1	8.576	.049	1.30	5.21
79:2	8.139	.060	9.84	8.35	99:2	8.683	.046	11.22	5.86
80:1	8.472	.061	39.63	10.60	00:1	8.696	.047	1.29	5.22
80:2	8.652	.052	19.61	8.32	00:2	8.767	.044	7.36	5.34
81:1	8.695	.051	4.49	6.37	01:1	8.779	.044	1.21	4.59
81:2	8.568	.053	-12.01	5.41	01:2	8.848	.047	7.14	5.16
82:1	8.267	.053	-25.97	4.66	02:1	8.986	.044	14.82	5.59
82:2	8.012	.064	-22.48	5.66	02:2	8.994	.044	0.84	4.65

83:1	8.065	.060	5.38	8.27	03:1	8.978	.042	-1.65	4.35
83:2	8.124	.062	6.14	8.10	03:2	8.966	.044	-1.19	4.37
84:1	8.068	.059	-5.51	7.15	04:1	9.109	.046	15.45	5.50
84:2	8.175	.059	11.35	8.16	04:2	9.242	.046	14.22	5.73
85:1	8.220	.052	4.57	7.05	05:1	9.196	.043	-4.49	4.62
85:2	8.318	.049	10.27	6.47	05:2	9.316	.044	12.73	5.05
86:1	8.200	.048	-11.09	4.88	06:1	9.351	.045	3.56	4.80
86:2	8.543	.044	40.91	7.12	06:2	9.360	.045	0.86	4.84
87:1	8.471	.044	-6.97	4.34	07:1	9.512	.044	16.47	5.39
87:2	8.597	.045	13.42	5.44	07:2	9.644	.043	14.05	5.20
88:1	8.667	.043	7.28	5.06	08:1	9.630	.044	-1.38	4.62

Table 2-- Top 25 Canadian Painters

Rank	Artist	Dummy estimates for Top 25 painters			
		Dummy estimate	Std.Err.	% Ch.rel.	Std. Err.
1	Tom Thomson	2.065	0.065	688.1	51.61
2	William Berczy	1.587	0.499	388.86	243.94
3	Frank Carmichael	1.312	0.078	271.31	29.09
4	Paul-Emile Borduas	1.101	0.084	200.85	25.13
5	Lawren S Harris	0.993	0.036	170.02	9.68
6	Cornelius Krieghoff	0.952	0.037	159.03	9.69
7	Emily Carr	0.928	0.053	152.94	13.32
8	J.W. Morrice	0.871	0.05	139.01	11.86
9	Jean-Paul Riopelle	0.811	0.051	125	11.59
10	David Milne	0.776	0.061	117.45	13.2
11	Paul Kane	0.759	0.237	113.59	50.56
12	James Duncan	0.724	0.5	106.37	103.23
13	Fred Varley	0.421	0.058	52.38	8.79
14	Helen McNicholl	0.342	0.121	40.73	17.08
15	Alex Colville	0.332	0.226	39.42	31.45
16	J-B Roy-Audy	0.305	0.5	35.66	67.83
17	W.G.R. Hind	0.183	0.5	20.04	60
18	J.E.H. Macdonald	0.171	0.037	18.67	4.42
19	Clarence Gagnon	0.073	0.044	7.52	4.76
20	A. Y. Jackson	-	-	0	0
21	A.J. Casson	-0.002	0.032	-0.22	3.17
22	Jean-Paul Lemieux	-0.022	0.053	-2.16	5.18
23	Paul Peel	-0.044	0.072	-4.29	6.85

24	Kathleen Morris	-0.059	0.072	-5.7	6.84
25	Christopher Pratt	-0.093	0.289	-8.85	26.32

Table 3 – Individual artist dummy parameter estimates (A.Y. Jackson excluded)
Each parameter measures effect of artist relative to Jackson

Artist	Parameter	S.E.	% Change rel. to Jackson	S.E.	Artist	Parameter	S.E.	% Change rel. to Jackson	S.E.
Carl Ahrens	-3.134	.099	-95.64	0.43	Illingworth	-2.026	.050	-86.82	0.65
John Alfsen	-3.337	.141	-96.44	0.50	Kerr				
Edmund Alleyn	-2.498	.099	-91.78	0.81	Roy Kiyooka	-2.153	.412	-88.39	4.79
William Armstrong	-2.895	.214	-94.47	1.18	Harold Klunder	-2.189	.411	-88.80	4.61
William E. Atkinson	-2.888	.073	-94.43	0.40	Dorothy Knowles	-2.269	.088	-89.66	0.91
Marcel Barbeau	-2.397	.116	-90.91	1.05	John Korner	-3.4147	.160	-96.82	0.51
J.M. Barnsly	-2.113	.083	-87.91	1.00	Cornelius Krieghoff	0.952	.037	159.03	9.69
Maxwell Bates	-1.932	.056	-85.51	0.82	William Kurelek	-0.871	.081	-58.13	3.39
William Beatty	-1.411	.039	-75.62	0.94	Ludger Larose	-2.139	.120	-88.22	1.42
Henri Beau	-1.926	.071	-85.43	1.04	Fernand Leduc	-1.023	.226	-64.06	8.11
Leon Bellefleur	-1.213	.066	-70.26	1.97	Ozias Leduc	-0.556	.104	-42.66	5.95
F.M. Bell-Smith	-1.492	.045	-77.51	1.02	Joseph Legare	-1.142	.251	-68.09	8.01
Louis Belzile	-3.365	.162	-96.55	0.56	Jean-Paul Lemieux	-0.022	.053	-2.16	5.18
Aleksandre Bercovitch	-3.250	.133	-96.12	0.52	Rita Letendre	-2.074	.088	-87.44	1.11
William Berczy	1.587	.499	388.86	243.94	Ernst Lindner	-1.487	.214	-77.40	4.84
Suzanne Bergeron	-3.356	.216	-96.51	0.75	Arthurer Lismer	-0.349	.035	-29.43	2.44
G.T. Berthon	-1.321	.252	-73.32	6.73	Kenneth Lochhead	-2.022	.165	-86.76	2.18
Andre Bieler	-1.840	.075	-84.12	1.19	Mabel Lockerby	-0.868	.205	-58.02	8.59
B.C. Binning	-0.666	.147	-48.64	7.57	Alexandra Luke	-1.822	.215	-83.83	3.47
Ebenezer Birrell	-2.870	.705	-94.33	4.00	Laura Muntz Lyll	-1.772	.086	-83.00	1.45
Ronald Bloore	-1.924	.200	-85.40	2.92	John Lyman	-1.197	.070	-69.79	2.13
Bruno Bobak	-2.547	.055	-92.16	0.43	Frank Lynn	-0.478	.709	-38.02	43.94
David Bolduc	-2.587	.190	-92.47	1.43	J.E.H. Macdonald	0.171	.037	18.67	4.42
Paul-Emile Borduas	1.101	.084	200.85	25.13	Jock Macdonald	-0.984	.097	-62.62	3.61
Joseph Bouchette	-3.867	.410	-97.91	0.86	Hugh Mackenzie	-1.351	.355	-74.11	9.19
Napoleon Bourassa	-1.953	.354	-85.82	5.03	Pegi Nichol MacLeod	-1.984	.082	-86.25	1.13
John Boyle	-3.772	.500	-97.70	1.15	Helen McNicholl	0.342	.121	40.73	17.08
Fritz Brandtner	-1.420	.099	-75.84	2.40	Mabel May	-1.687	.064	-81.49	1.18
Claude Breeze	-3.369	.272	-96.56	0.94	Ron Martin	-2.296	.239	-89.93	2.41
Fred Brigden	-2.299	.061	-89.97	0.61	T.M. Martin	-2.532	.045	-92.05	0.36
Miller Brittain	-1.023	.254	-64.05	9.12	Henri Masson	-1.629	.032	-80.39	0.63
Bertram Brooker	-1.509	.100	-77.89	2.21	Marmaduke Matthews	-2.553	.140	-92.22	1.09
D.P. Brown	-2.888	.705	-94.43	3.92	Clark McDougall	-2.264	.178	-89.61	1.85
Archibald	-3.205	.062	-95.88	0.25	Jean Mcewen	-1.556	.075	-78.90	1.57
					Yvonne	-2.012	.068	-86.63	0.90

Browne					Mckague				
Franklin	-1.681	.064	-81.37	1.20	Arthur Mckay	-2.435	.355	-91.24	3.11
Brownell									
W.B. Bruce	-2.025	.143	-86.81	1.88	Isabel	-2.365	.143	-90.61	1.34
					Mclaughlin				
William	-1.473	.062	-77.08	1.41	Ray Mead	-2.205	.192	-88.98	2.11
Brymner									
Dennis Burton	-2.946	.169	-94.75	0.89	John Meredith	-2.087	.162	-87.60	2.00
Jack Bush	-1.036	.087	-64.53	3.07	David Milne	0.776	.061	117.45	13.20
Oscar Cahen	-1.324	.411	-73.40	10.93	Guido Molinari	-1.074	.172	-65.84	5.87
Alex Cameron	-4.460	.706	-98.84	0.82	Guy Monpetit	-2.819	.357	-94.03	2.13
Frank	1.312	.078	271.31	29.09	Ron Moppett	-3.050	.710	-95.26	3.36
Carmichael									
Emily Carr	.928	.053	152.94	13.42	J.W. Morrice	0.871	.050	139.01	11.86
A.J. Casson	-.002	.032	-0.22	3.17	Edmund	-2.305	.106	-90.02	1.06
					Morris				
Jack Chambers	-1.418	.290	-75.78	7.02	Kathleen	-0.059	.072	-5.70	6.84
					Morris				
W.H. Clapp	-1.474	.091	-77.10	2.09	Michael Morris	-3.484	.291	-96.93	0.89
Paraskeva	-2.259	.111	-89.56	1.16	Norval	-2.345	.064	-90.41	0.62
Clark					Morriseau				
F.S. Coburn	-0.736	.040	-52.07	1.91	Douglas	-2.962	.709	-94.83	3.67
					Morton				
Alex Colville	0.332	.226	39.42	31.45	Jean-Paul	-2.261	.197	-89.57	2.06
					Mousseau				
Charles	-1.580	.059	-79.41	1.21	Louis	-2.818	.093	-94.03	0.56
Comfort					Muhlstock				
Emily Coonan	-2.506	.173	-91.84	1.41	Kathleen	-4.144	.707	-98.41	1.12
					Munn				
Stanley	-1.177	.032	-69.17	0.98	Kazuo	-1.661	.103	-81.00	1.95
Cosgrove					Nakamura				
Graham	-2.433	.207	-91.22	1.82	H. Ivan	-3.687	.354	-97.50	0.89
Coughtry					Neilson				
William	-2.364	.137	-90.59	1.29	Ernst	-2.945	.111	-94.74	0.59
Cresswell					Neumann				
William	-2.084	.236	-87.56	2.94	Lilias T.	-1.986	.191	-86.28	2.62
Cruikshank					Newton				
Maurice Cullen	-0.097	.045	-9.21	4.11	Marion Nicholl	-2.045	.179	-87.06	2.32
Jean Daltaire	-0.370	.084	-30.91	5.83	Jack Nichols	-3.316	.355	-96.37	1.29
Ken Danby	-3.897	.500	-97.97	1.01	John O'Brien	-1.612	.407	-80.05	8.13
Georges	-2.295	.062	-89.93	0.63	Lucius O'Brien	-1.451	.131	-76.55	3.06
Delfosse									
Louis de	-2.746	.225	-93.58	1.44	Daphne Odjig	-2.129	.177	-88.11	2.10
Niverville									
Rodolphe de	-0.585	.252	-44.31	14.05	Will Ogilvie	-2.895	.132	-94.47	0.73
Repentigny									
Jacques de	-1.362	.093	-74.38	2.38	Toni Onley	-2.528	.079	-92.01	0.63
Tannancour									
Joseph Drapell	-3.421	.290	-96.73	0.95	Paul Peel	-0.044	.072	-4.29	6.85
Rodolphe	-2.173	.085	-88.62	0.97	Alfred Pellan	-0.418	.080	-34.20	5.30
Duguay									
Louis	-3.374	.706	-96.58	2.42	Sophie	-2.425	.207	-91.15	1.83
Dulongpre					Pemberton				
Albert	-2.423	.169	-91.13	1.49	William	-2.581	.137	-92.43	1.04
Dumouchel					Perehudoff				
James Duncan	0.724	.500	106.37	103.23	Henri Perré	-2.494	.173	-91.74	1.43
Wyatt Eaton	-1.903	.408	-85.09	6.09	Christiane	-1.810	.705	-83.64	11.54
					Pflug				
Allan Edson	-2.010	.076	-86.60	1.02	W.J. Phillips	-2.144	.408	-88.28	4.78
Ric Evans	-2.854	.706	-94.24	4.07	Robert Pilot	-0.465	.032	-37.21	2.00
Patterson	-1.124	.161	-67.49	5.24	A.S.	-1.800	.199	-83.47	3.28
Ewen					Plamondon				
Ivan Eyre	-1.090	.167	-66.37	5.61	Christopher	-0.093	.289	-8.85	26.32
					Pratt				
A.S. Falardeau	-2.411	.201	-91.02	1.81	Mary Pratt	-0.9249	.186	-61.29	7.20
Marcelle	-1.491	.081	-77.49	1.83	William	-1.622	.076	-80.24	1.49
Ferron					Raphael				
Robert Field	-0.938	.705	-60.84	27.62	Carl Ray	-4.081	.323	-98.31	0.55
Brian Fisher	-4.292	.409	-98.63	0.56	Gordon	-3.064	.290	-95.33	1.35
					Rayner				
Lemoine	-0.602	.077	-45.24	4.24	George Reid	-2.210	.069	-89.03	0.75
Fitzgerald									
John C. Forbes	-2.850	.074	-94.21	0.43	Jean-Paul	0.811	.051	125.00	11.59

Tom Forrestall	-2.036	.182	-86.95	2.37	Riopelle					
J.W.L. Forster	-3.049	.090	-95.26	0.43	Milly Ristvedt- Handerek	-4.369	.709	-98.73	0.90	
Michael Forster	-2.716	.154	-93.39	1.02	Goodridge	-0.941	.033	-60.96	1.28	
M-A Fortin	-0.387	.037	-32.08	2.55	Roberts					
Paul Fournier	-2.905	.206	-94.53	1.13	H. Tomtu	-2.782	.271	-93.81	1.68	
Daniel Fowler	-1.880	.708	-84.75	10.80	Roberts					
Joseph Franchere	-2.012	.062	-86.63	0.83	Sarah Robertson	-1.538	.103	-78.51	2.21	
John A Fraser	-1.770	.214	-82.96	3.64	Albert Robinson	-0.202	.047	-18.26	3.87	
Louise Gadbois	-3.513	.072	-97.02	0.21	Otto Rogers	-2.778	.181	-93.78	1.13	
Robert Gagen	-2.166	.168	-88.53	1.92	William Ronald	-2.501	.083	-91.80	0.68	
Charles Gagnon	-0.710	.499	-50.86	24.54	Harry Rosenberg	-1.816	.499	-83.73	8.12	
Clarence Gagnon	0.073	.044	7.52	4.76	J-B Roy-Audy	0.305	.500	35.66	67.83	
Erik Gamble	-3.897	.709	-97.97	1.44	Ludger Ruelland	-3.870	.269	-97.91	0.56	
Yves Gaucher	-1.528	.254	-78.31	5.50	John Russell	-2.471	.095	-91.55	0.80	
Pierre Gauvreau	-1.022	.170	-64.01	6.13	Joseph St- Charles	-2.661	.106	-93.01	0.74	
Alexandre Giffard	-1.222	.408	-70.55	12.00	Henry Sandham	-2.145	.097	-88.29	1.14	
Charles Gill	-2.979	.152	-94.92	0.77	Allen Sapp	-2.390	.057	-90.84	0.52	
Ted Godwin	-2.603	.109	-92.59	0.81	Anne Savage	-1.129	.070	-67.67	2.26	
Jean Goguen	-1.658	.500	-80.96	9.52	William Sawyer	-2.810	.179	-93.98	1.08	
Eric Goldberg	-2.962	.081	-94.83	0.42	Rolph Scarlett	-1.770	.706	-82.97	12.02	
Hortense Gordon	-2.775	.109	-93.77	0.68	Carl Schaefer	-1.041	.116	-64.70	4.10	
Richard Gorman	-2.452	.158	-91.39	1.36	Charles Scott	-2.704	.129	-93.30	0.86	
Kate Graham	-3.102	.318	-95.51	1.43	Gerald Scott	-3.831	.270	-97.83	0.58	
John Greer	-1.728	.502	-82.24	8.92	Marian Scott	-2.877	.130	-94.37	0.73	
John Hall	-2.964	.251	-94.84	1.29	Julian Seavey	-3.075	.214	-95.38	0.99	
Joice Hall	-3.573	.409	-97.19	1.15	Jack Shadbolt	-1.568	.069	-79.14	1.44	
Jay Hambidge	-2.863	.706	-94.29	4.03	Gordon Smith	-2.345	.072	-90.41	0.69	
Theophile Hamel	-1.196	.199	-69.77	6.02	Jori Smith	-2.600	.078	-92.57	0.58	
John Hammond	-1.851	.040	-84.30	0.63	Michael Snow	-1.153	.318	-68.44	10.02	
Lawren S Harris	0.993	.036	170.02	9.68	Daniel Solomon	-2.702	.361	-93.29	2.42	
Lawren P Harris	-2.508	.268	-91.86	2.18	Martin Somerville	-1.119	.408	-67.33	13.32	
Robert Harris	-1.687	.059	-81.50	1.09	Bruce St Clair	-2.908	.501	-94.54	2.73	
Doug Haynes	-3.650	.217	-97.40	0.56	Lionel Stephenson	-2.407	.075	-90.99	0.68	
Adrien Hebert	-2.094	.070	-87.68	0.86	William Stevenson	-2.545	.070	-92.15	0.55	
Robert Hedrick	-3.542	.225	-97.11	0.65	Francoise Sullivan	-3.444	.705	-96.80	2.25	
George Heriot	-2.865	.500	-94.30	2.85	Philip Surrey	-1.581	.061	-79.43	1.25	
Prudence Heward	-1.586	.096	-79.53	1.97	M-A Suzor- Cote	-0.414	.045	-33.89	2.95	
Randolph Hewton	-1.482	.062	-77.28	1.42	Takao Tanabe	-2.522	.106	-91.97	0.85	
W.G.R. Hind	0.183	.500	20.04	60.00	Tony Tascona	-3.450	.410	-96.83	1.30	
Tom Hodgson	-2.480	.179	-91.63	1.50	Tom Thomson	2.065	.065	688.31	51.61	
A.W. Holdstock	-1.381	.214	-74.88	5.37	Robert Todd	-0.150	.354	-13.94	30.42	
Edwin Holgate	-0.103	.062	-9.86	5.56	Fernand Toupin	-2.777	.098	-93.78	0.61	
Robert Holmes	-4.454	.706	-98.84	0.82	Claude Tousignant	-2.067	.240	-87.35	3.04	
William R. Hope	-3.853	.267	-97.88	0.57	Harold Town	-2.011	.081	-86.62	1.08	
Frances	-3.179	.705	-95.84	2.93	Tony Urquart	-2.401	.190	-90.93	1.72	
					Fred Varley	0.421	.058	52.38	8.79	
					Robert Varvarande	-3.973	.317	-98.12	0.60	
					Frederick	-0.692	.070	-49.94	3.49	

Hopkins					Verner				
E.J. Hughes	-0.095	.072	-9.05	6.50	Zacharie	-4.359	.705	-98.72	0.90
Jack	-2.051	.089	-87.13	1.14	Vincent				
Humphrey					Adolph Vogt	-1.911	.198	-85.21	2.93
Charles Huot	-1.955	.097	-85.84	1.38	Horatio Walker	-1.197	.072	-69.80	2.17
Jacques	-2.155	.208	-88.41	2.41	Charles Caleb	-1.655	.239	-80.89	4.57
Hurtubise					Ward				
Gershon	-1.641	.138	-80.63	2.68	Esther Warkov	-3.523	.271	-97.05	0.80
Iskowitz									
Otto Jacobi	-2.108	.066	-87.86	0.80	Homer Watson	-1.423	.044	-75.91	1.07
Alex Janvier	-4.330	.318	-98.68	0.42	Gordon	-2.389	.197	-90.83	1.81
					Webber				
Donald Jarvis	-2.394	.409	-90.88	3.73	W.P. Weston	-1.193	.064	-69.67	1.94
C.W. Jeffreys	-1.570	.190	-79.20	3.95	Robert Whale	-2.115	.098	-87.93	1.19
Jean-Paul	-3.097	.131	-95.48	0.59	Joyce Wieland	-2.126	.317	-88.07	3.78
Jerome									
Frank Johnston	-0.882	.030	-58.61	1.26	Curtis	-3.094	.112	-95.47	0.51
					Williamson				
Henri Julien	-1.692	.289	-81.58	5.32	W.J. Wood	-2.584	.268	-92.46	2.02
Denis Juneau	-2.394	.409	-90.88	3.73	Percy	-2.175	.128	-88.64	1.46
					Woodcock				
Paul Kane	0.759	.237	113.59	50.56	Walter	-2.142	.190	-88.26	2.23
					Yarwood				

Table 4 – Medium/support dummy parameter estimates (oil/canvas excluded)
Each parameter measures effect of medium support relative to oil/canvas

Medium/support	Parameter	S.E.	% Change rel. to oil/canvas	S.E.
Oil/panel	-0.171	.017	-15.74	1.42
Oil/board	-0.240	.015	-21.30	1.16
Oil/canvas on board	-0.206	.037	-18.63	3.03
Oil/cardboard	-0.293	.030	-25.41	2.22
Oil/paper	-0.435	.044	-35.29	2.85
Oil/masonite	-0.184	.033	-16.83	2.73
Acrylic/canvas	-0.251	.041	-22.23	3.20

Table 5 – Genre dummy parameter estimates (landscape excluded)
Each parameter measures effect of genre relative to landscape

Genre	Parameter	S.E.	% Change rel. to Landscape	S.E.
Genre scene	0.172	.017	18.75	1.99
Still life	0.063	.023	6.52	2.42
Portrait	-0.184	.030	-16.84	2.50
Abstract	-0.392	.029	-32.45	1.96
Animal	-0.192	.036	-17.44	3.01
Figurative	-0.168	.039	-15.43	3.30
History	-0.434	.080	-35.19	5.16

Table 6 – Size and dating effects

(a) Size variable	Parameter	S.E.	% Change from additional cm (H & W) or cm ² (A)	S.E.
Height	1.57×10^{-2}	4.03×10^{-4}	1.58	0.04
Width	1.16×10^{-2}	2.74×10^{-4}	1.17	0.03
Area	-6.77×10^{-5}	3.06×10^{-6}	-6.78×10^{-3}	3.06×10^{-4}
(b)	Parameter	S.E.	% Change rel. to Undated	S.E.
Dated	0.144	.011	15.46	1.27

Table 7 – Nominal Returns: raw statistics

Statistic	Mei-Moses	Canada
Mean	.0530	.0367
Standard Deviation	.1329	.1274
Correlation	.1489	

Table 8 - Unit root tests (nominal prices & returns)

(a) Log index (time trend and 3 lags included)

Variable	Test	Statistic	10 % C.V.
Mei-Moses index	ADF	-2.04	-3.16
	PP $Z\alpha$	-7.93	-17.39
	PP Z_t	-2.06	-3.17
Canada index	ADF	-2.82	-3.16
	PP $Z\alpha$	-9.20	-17.39
	PP Z_t	-2.18	-3.17

(b) Returns (intercept and 3 lags included)

Variable	Test	Statistic	1 % C.V.
Mei-Moses index	ADF	-3.92	-3.57
	PP $Z\alpha$	-76.37	-19.80
	PP Z_t	-8.81	-3.57
Canada index	ADF	-3.97	-3.57
	PP $Z\alpha$	-74.45	-19.80
	PP Z_t	-8.88	-3.57

Table 9 – Cointegration tests, nominal prices (residual-based, with time trend in cointegrating regression of Canadian index on Mei-Moses and 3 lags in unit root tests)

Test	Statistic	10% C.V.
ADF	-2.70	-3.61
PP $Z\alpha$	-11.82	-22.06
PP Z_t	-2.57	-3.61

Table 10 – Granger causality statistics, nominal returns (2 lags in VAR)

Direction	Statistic (chi-square, 2 d.f.)
MM to Can	0.52
Can to MM	2.34

Table 11 - Unit root tests (real, same-currency prices & returns)

(c) Log index (time trend and 3 lags included)

Variable	Test	Statistic	10 % C.V.
Mei-Moses index	ADF	-2.25	-3.16
	PP $Z\alpha$	-11.36	-17.39
	PP Z_t	-2.45	-3.17
Canada index	ADF	-3.03	-3.16
	PP $Z\alpha$	-14.02	-17.39
	PP Z_t	-2.72	-3.17

(d) Returns (intercept and 3 lags included)

Variable	Test	Statistic	1 % C.V.
Mei-Moses index	ADF	-4.14	-4.09
	PP $Z\alpha$	-77.43	-27.42
	PP Z_t	-9.18	-4.09
Canada index	ADF	-4.13	-4.09
	PP $Z\alpha$	-78.78	-27.42
	PP Z_t	-9.31	-4.09

Table 12 – Cointegration tests, real, same-currency prices (residual-based, with time trend in cointegrating regression of Canadian index on Mei-Moses and 3 lags in unit root tests)

Test	Statistic	10% C.V.
ADF	-2.86	-3.61
PP $Z\alpha$	-13.31	-22.06
PP Z_t	-2.64	-3.61

Table 13 – Real, Same-Currency Returns: raw statistics

Statistic	Mei-Moses	Canada
Mean	.0303	.0132
Standard Deviation	.1301	.1233
Correlation	.1069	

Table 14 – Granger causality statistics, real, same-currency returns (2 lags in VAR)

Direction	Statistic (chi-square, 2 d.f.)
MM to Can	0.35
Can to MM	1.68

Table 15 – Capital Asset Pricing Model (Dependent Variable: Excess returns of DJIA with respect to FF rate)

Index	Intercept (S.E.)	Beta (S.E.)	R-squared
Mei-Moses	-0.010 (0.016)	0.150 (0.127)	.019
Canada (in U.S. \$)	-0.028 (0.016)	0.071 (0.133)	.004