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

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

Douglas J. Hodgson^{}, Aylin Seçkin[†]*

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 international 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 international market, and in terms of short-run co-movements as represented in correlations. The possibility that the local market "follows" the international 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.

Mots clés : Alternative investments, Economics of art markets, Market for paintings, Time series analysis, CAPM.

Codes JEL : Z11, G11

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1. Introduction

It is common among those interested in the prices of art works to speak of “the” art market, as if there were one aggregate market for the many different categories of art that exist. However, due to the existence of different artistic media, national schools, historical periods, and individual artists, it is reasonable to suppose that art markets may be more or less segmented, with each segment following its own internal price dynamics, based on criteria related to the investors in the segment under consideration (whether it be due to particularities in the evolution of their economic fortunes or, indeed, of their tastes)

For an art collector who views their collection as being, at least in part, a significant financial investment, the design of an optimal art collection (or “portfolio”) should take into account the overall risk and return combination of the collection, which may include several genres, categories and artists from different countries. For such a collector, it is important to understand the degree to which the changes in prices of the different components of the collection are likely to depend upon one another: the presence of art works from largely independent segments of the art market offers the possibility of risk diversification of an art market portfolio.¹

It is thus of interest to have a measure of the degree of interdependence of price dynamics of different segments of the art market, and there is now a small literature that

¹ 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) on the returns to modern Chinese paintings and Seckin and Atukeren (2006) on the returns to Turkish paintings.

investigates various aspects of this question. Ginsburgh and Jeanfils (1995) find that price indices based on auction sales of major old master, impressionist, and modern European and American paintings sold in New York, London, and Paris, are cointegrated, and thus have shared long term price evolution, whether considered across artistic category or across cities and auction houses, with significant short-term interdependence also being present in returns. Worthington and Higgs (2003) analyze eight categories of major international art and find the presence of seven cointegrating relationships, and thus one sole common stochastic trend that drives the entire art market, indicating a very high degree of long-run uniformity in the market. They also find substantial short-run dependence to be present. These studies focus on segments of what we will refer to in the present paper as the mainstream international art market, and find these segments to be highly interdependent, so that, at this level, it is not inappropriate to speak of “the” art market.

The above findings suggest that the degree of diversification possible within a single collection of art works, viewed from a financial perspective, is limited. They also suggest that there is a commonality in the characteristics of collectors in the different segments of the mainstream market, whether it be due to personal economic circumstances, or to tastes, that has a similar impact on prices in all segments. It is of interest, both from the standpoint of portfolio diversification possibilities, as well as the more basic issue of economics of price formation and of tastes, to investigate the degree to which prices of art works not belonging to the international mainstream, particularly works from smaller or marginal national schools, are more or less dependent, statistically, on the mainstream market. Along these lines, Atukeren and Seckin (2009) examine the correlation and price dependence of Turkish and international art markets

for the period 1990-2005. They find that despite any short-term fluctuations, prices in the Turkish and international art markets are cointegrated, and thus move together in the long-run, indicating a significant degree of integration (statistical and economic) of the Turkish and international markets..

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. However, some of the most important Canadian collectors, such as the late Ken Thomson, who paid a record \$70 million for Rubens' "Massacre of the Innocents", are also highly active in the mainstream international market. For such an individual, or for any other collector interested in Canadian art, it is of interest to determine the degree to which this market can be viewed as mainly local, and to investigate the presence of linkages between price movements for Canadian art and those for the mainstream global market in old master, impressionist, and modern art.

An additional interest in an investigation of the degree of dependence of Canadian and mainstream markets stems from the findings of Hodgson and Vorkink (2004) that the risk-return relationship in the Canadian market is very similar to that found in many other studies of mainstream markets (see Worthington and Higgs (2003) and Atukeren and Seckin (2009) for surveys of the literature): viz., that the average rate of increase of art prices equals that of government bonds, whereas the variance of art price returns is of equal or greater magnitude than major stock index returns, and that the correlations between these two (the market "beta" of art prices) is very weakly positive. If the Canadian art market closely mimics the international market, the results of

Hodgson and Vorkink (2004) would be as expected; however, if the dynamic of the Canadian art market is largely driven by internal factors independent of the international market, then the results of Hodgson and Vorkink (2004) would be of greater interest to those with a general interest in the question of art as an investment, as they would constitute fresh evidence on the nature of the risk-return relation in art markets, in effect providing a new “data point” in the literature.

In this paper, we examine the price dynamics between the Canadian and the international 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.

We investigate 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 international markets, and in terms of short-run co-movements as represented by correlations. The possibility that the local market "follows" the international 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 (2002).

The rest of the paper is organized as follows. In section 2, we review the main results of the previous studies on 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. Section 3 considers the influence on the relative art price dynamics of aggregate indices of financial markets and general economic activity, and Section 4 concludes.

2. A Time-series Analysis of the Relationship between Canadian and International Art Markets

We seek to investigate the degree of time series interdependence between Canadian and mainstream international art prices. We will begin by describing and analyzing the hedonic regression used to compute our new Canadian art index. We then present the international art price index as provided by Mei and Moses, and detailed results of our time series analysis of the joint dynamics of these two series follows.

2.1 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)². 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 and most Canadians are familiar with the names of several Canadian painters from a variety of historical periods and regions.³ There are many museums of Canadian art

² As the Mei-Moses international index, described below, includes primarily major international painters, we only want to include "major" Canadian painters here, effectively comparing "blue chip" with "blue chip".

³ See Reid (1973).

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.⁵ 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

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

⁵ See Reid (1979).

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 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.

2.2 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 pricing 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 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 including in the pricing function

various characteristics (the genre, artist's name, technique, medium) of paintings such that the willingness to pay for each characteristic can be estimated.

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 and $t+1$ can be written as follows:

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

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 arising from the strong leptokurtosis found in the empirical error distribution 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

2.3 Hedonic Price Index

We initially consider 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. We observe a very high volatility prior to 1988. This result is discussed by Hodgson and Vorkink

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

(2004), and may partially be due to inefficient estimates stemming from relatively limited data availability in the earliest years of this period. However, it can also be attributed to the relative thinness of the Canadian art market during the early years 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 (Table 2). 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 tells us nothing 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 The top list also includes old masters such as

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.

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. Detailed results on all the painters included in our study are reported in Table 3.

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. 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.

2.4 International 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.

For the international paintings market index we use 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. Although all sales in their sample occur in New York City, the results of Ginsburgh and Jeanfils (1995) cited above on the cointegration between New York auction prices and those of Paris and London for the same mainstream categories of international art justify, in our view, the use of the Mei-Moses index as a proxy for the mainstream international art market. The repeat sales and hedonic methods of index construction

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.

both provide consistent estimates of the “true” underlying effect of time period on overall market prices. This fact, along with the fact that the nature of our Canadian art data set makes the application of the repeat-sales method impractical (it is almost impossible to identify more than a very small number of repeat sales base don our data source), justifies our comparative analysis of these two series. No serious problem should arise because they have been computed differently.

< Figure 1 approximately here >

Figure 1 provides the graphs of MMFAI index together with the semi-annual Canadian art price index for the period 1969-2006 in log terms. Summary statistics are reported in Table 7. As can be seen, the international 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.¹⁰ The first oil shock of 1973 had its negative effect only in 1974, similarly the second oil shock in 1979 (however to a smaller extent) is associated with a small decrease in 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 and stock market in the 1990s, art prices also fell, following the withdrawal of Japanese art collectors from world art markets. That is the beginning of the third phase and can be defined as the slowdown and continuous fall in international

¹⁰ 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.

prices. This period runs to about the mid-nineties. The fourth and most recent phase includes the more or less continuous price increases from 1996 to 2006. This may be related to wealth effects stemming from the growth in the international economy and stock markets during this period¹¹.

When we examine Figure 1, the first striking observation is that the Canadian art price index lags behind the Mei Moses Fine Art Index for almost the whole period (except 1980). An extremely high rate of return may be related to the composition of artists and works sold in 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 more data become available. The true effect of the world economic and financial crisis on the international 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 international art investments.

< Figure 2 approximately here >

Comparing the returns in the international 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 slowdown hit the Canadian market more severely compared to the world markets. Also, the bursting of the art bubble of 1990 was less severe in Canada than elsewhere. This may

¹¹ 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.

be related to the size of the Canadian market and its degree of integration with the main world market. 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 to be further investigated.

We have also calculated real price indices and returns, in same-currency units. We have deflated the Mei Moses index using US Consumer Price Index (CPI), the Canadian index with the 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.

< Figure 3 approximately here >

< Figure 4 approximately here >

The graphs for log real indexes for Canadian Art and Mei-Moses fine art and real returns (same currency) are similar to the graphs 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) .

2.5 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 integrated variables has 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 note that we will only report the results of our time series analysis as applied to the same-currency, real indices. The results are, in all cases, almost identical when the nominal own-currency indices are used, so these are omitted.

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. The results are reported in Table 7. It is standard in the literature to view art price indices as being a form of asset price series, and so being best modeled as martingales, and thus integrated of order one (possessing a unit root or stochastic trend). The findings of the time series analysis in the studies by Ginsburgh and Jeanfils (1995), Worthington and Higgs (2003), and Atukeren and Seckin (2009) are indeed consistent with this reasoning.

< Table 7-a approximately here >

< Table 7-b approximately here >

Our unit root tests are in accord with the literature in that both series are found to be best modeled as being integrated of order 1 (I(1)). In both cases, the ADF test applied to the index included a time trend and one autoregressive lag, with an intercept and one autoregressive lag being included in the test applied to the returns (no change in the results was obtained in considering lag orders up to six). In the case of the PP test, the deterministic regressors are as in the ADF tests, and the long-run variance of the autoregressive component is computed with a Parzen kernel and a bandwidth of one (no change in results was obtained in considering bandwidths up to six). The application of the BIC and AIC order selection criteria to the returns found that a model with no

autoregressive lags fit both return series better than any $AR(p)$ model for p from 1 to 6, supporting the martingale hypothesis for art price returns.

Given that both indices are well modeled as being $I(1)$, and so possessing long-run stochastic trending components, we proceed to test for cointegration of the indices, in order to see if there is a common stochastic trend shared by the series, as has been found in other studies of multiple art markets. We apply the ADF and PP tests to the residuals of the OLS regression of the Canadian index on the international one. The tests are applied essentially as discussed above for the raw data.

< Table 8 approximately here >

As seen from Table 8, neither test can reject the null that the series are not cointegrated at any conventional significance level. This finding is robust to the inclusion of up to six autoregressive lags in the ADF test and a bandwidth of up to six in the PP case. 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).

The cointegration tests run counter to the existing literature, which has found that all segments of the art market so far studied do indeed share stochastic trends. This is not the case for the Canadian market, however. Its long run evolution follows its own course and its driving stochastic trend is different from the one driving other art markets. We consider this result to be noteworthy and it is discussed further below. However, we will terminate our analysis of the joint time series behavior of the two indices considered here by investigating the nature of the short run dependence that may or may not exist between the returns series.

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 (Table 9). The volatility of the Canadian market is slightly higher than that of the global market. The standard deviations of the nominal returns in the Canadian and international markets are 13.29 % and 12.74 % respectively.

< Tables 9 and 10 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 10). Although there is some contemporaneous correlation between the series, it is quite weak, and much smaller than the correlation coefficient of 0.40 found by Atukeren and Seckin (2009) to exist between the Turkish and international indices.

We finish by exploring the presence of any short-run dynamic dependence between the return series through the application of tests of Granger-causality. This allows us to determine whether returns in either market “lead” those in the other. Supposing that international trends in art pricing are established by the mainstream international market, it is possible that this market Granger-causes the Canadian one. We would not expect to see returns in the Canadian market leading those in the international one. We have estimated the bivariate VAR for lag orders of one to six.

< Table 11 approximately here >

The results of a Wald test of the null that one variable does not Granger-cause the other are provided in Table 11. Note that the null asymptotic distribution of each statistic will be chi-squared with degrees of freedom equal to the number of lags. We do find that in the model with one lag, there is bidirectional Granger causality, so that changes in one price index do have some predictive power for the other, although this finding is not robust to the inclusion in the VAR of additional lags.

We can therefore conclude that the overall time series dependence between the Canadian and international markets is much weaker than has been found in the literature for all other studies of multiple art markets. There is no long-run dependence between the series, and the short-run dependence is limited to a small positive contemporaneous correlation and possibly some Granger-causality at one lag. In the rest of the paper, we discuss the possible interpretations and explanations for this finding, and investigate the explanatory power for the Canadian art index, over and above that of international art prices, of aggregate economic variables that would seem to be of relevance for art prices, such as aggregate income and wealth.

Since art investments are investments with longer horizons, long term wealth effects are presumably the principal economic determinant of art demand, along with art's portfolio diversification properties. One explanation for our finding that the Canadian art market largely goes its own way 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 several generations on landscapes and genre scenes paintings rather than abstract and conceptual art may have limited the size of the audience for Canadian art. 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 relative to global art markets.

3. Art Prices and Macroeconomic Indicators

We next examine the degree to which Canadian paintings can be used to diversify an international investment portfolio. Our time series analyses show that Canadian art prices seem to be largely independent of American and European 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.¹²

< Table 12. approximately here >

The beta is very close to zero in this case, again supporting the results we have already obtained.¹³ The fact that we obtain a very small beta suggests that there is diversification potential with Canadian art that is greater than with US and European art,

¹²This is a different question than the one that was asked by 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 are assumed to be mostly invested in Canadian stocks.

¹³The 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.

which may be why the average return of US and European art is higher.¹⁴ 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.

It is of interest to see if the independent variation of Canadian art prices can be associated with movements in 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. Figures 5 and 6 show how these variables move (in log real levels and real returns) compared to art prices.

Canadian stock and art prices move closely for the period 1973-1990. However, art prices are much more volatile than 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 reacted 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. The volatility of art and equity returns has been much larger than that of real GDP growth.

¹⁴As for the regression of the Canadian art excess returns on the US art excess returns (using the Federal Funds rate and the same nominal returns) we find similar results.

< Figure 5 approximately here >

< Figure 6 approximately here >

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 international art prices, Canadian GDP, or Canadian stocks.¹⁵ We have also tested Granger-causality of 1 to 6 lags of these three variables on Canadian art returns, and we have obtained an insignificant chi-square statistic at all lags, with the largest being 4.72 at one lag (3 degrees of freedom). Therefore, we cannot reject the null hypothesis of no Granger causality.¹⁶ 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, they are of limited use for the prediction of art returns (beyond what we found for the bivariate model reported above). Looking at the contemporaneous impact of these variables on art returns, we then ran 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 13.

¹⁵ The results are available upon request.

¹⁶ The related tests are not reported in detail in the paper. They are available upon request.

< Table 13 approximately here >

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 percent 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 landscapes, by far the predominant genre in the Canadian art market. The answer will also be helpful to understand the lack of common price dynamics between Canadian and world art markets.

4. 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 have used 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 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. However, the results from Granger-causality tests show that there may be some short-run feedback (or spillovers) between these 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 idiosyncrasy of Canadian tastes may be an important factor 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. In this context, it may be of interest in future work to study the extent to which the lack of dynamic price dependence between global and local art markets may be attributable to home bias in the preferences of art collectors. There is a substantial body of work in the international trade literature stemming from Armington (1969) in which international price differentials for heterogeneous goods are explained by such home biases.¹⁷ The focus on home bias may help to clarify the demand and art price divergences between Canadian and world art markets. This is left for future work.

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¹⁷ See Whalley and Xin (2009) for a recent discussion of this subject.

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APPENDIX

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

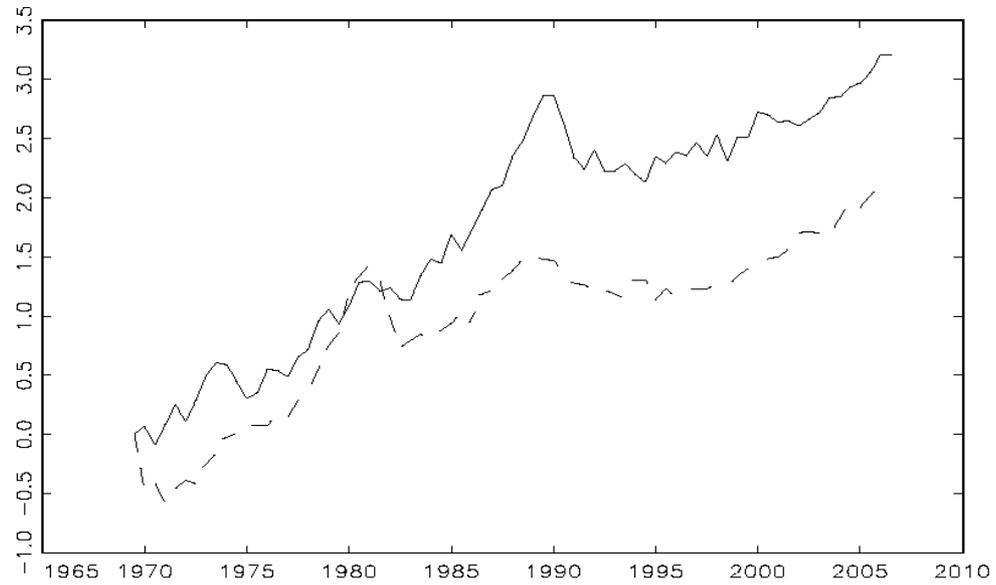


Fig. 2 – Returns: Mei–Moses Index and Canadian Index (Broken)

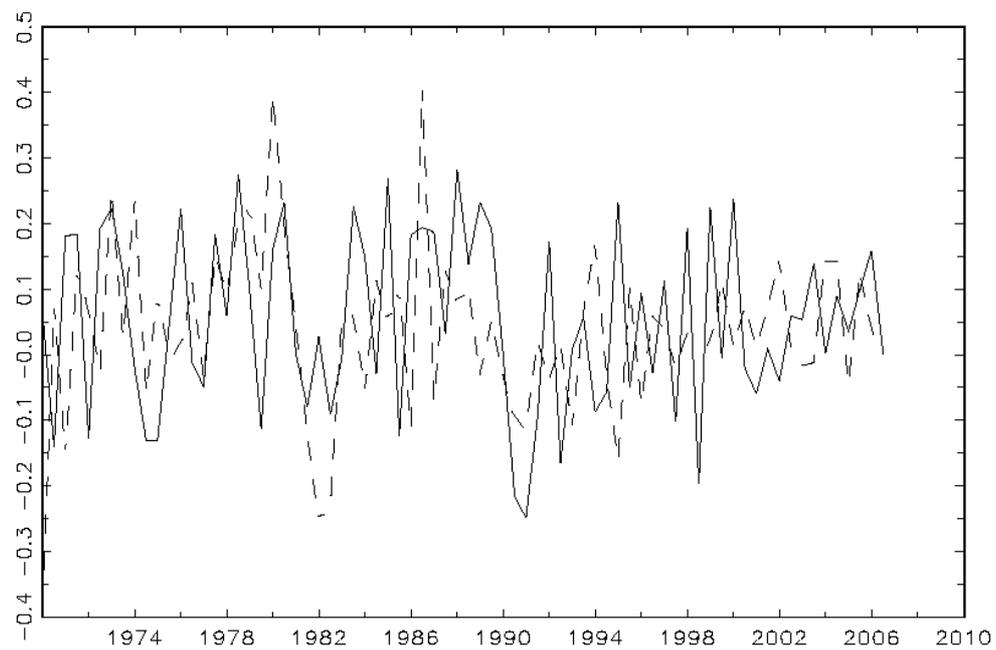


Fig. 3 – Log Real Index (Same Currency): Mei–Moses and Canada (Broken)

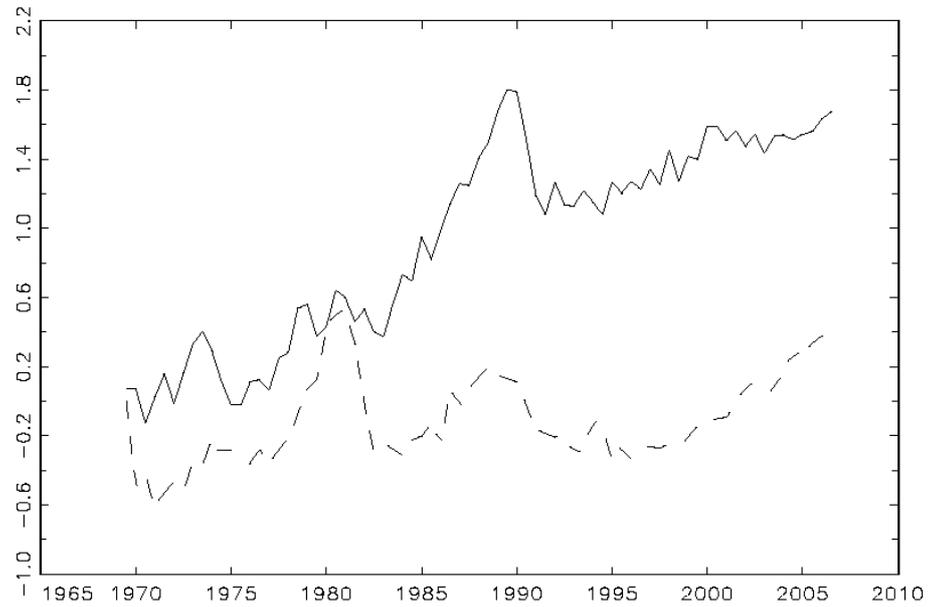


Fig. 4 – Real Returns (Same Currency): Mei–Moses and Canada (Broken)

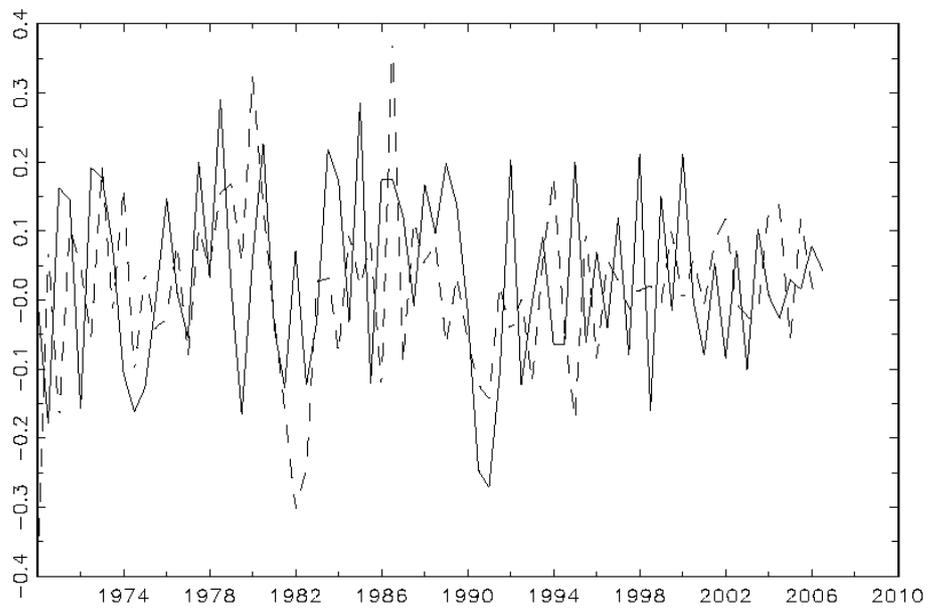


Fig. 5 – Log Real Canadian Art, GDP(Broken), and Stocks (Dots)

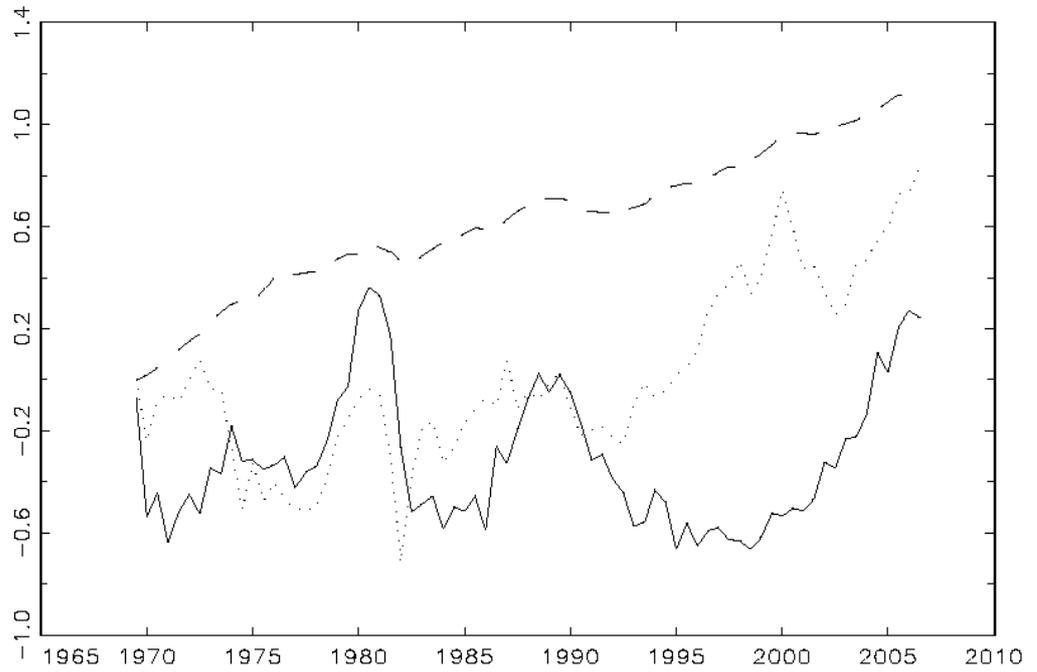


Fig. 6 – Real Returns: Canadian Art, GDP(Broken), and Stocks (Dots)

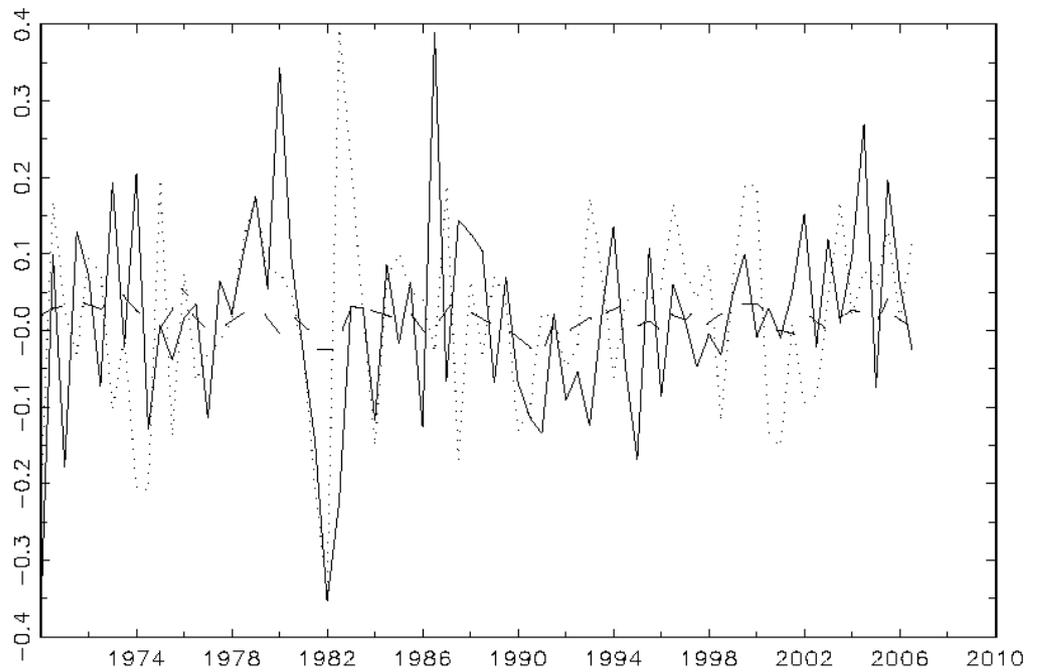


Table 1: Hedonic price index and returns, 1968-2008

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 estimate	Std.Err.	% Δ.rel. Jackson	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	-2.498	.099	-91.78	0.81	Roy Kiyooka	-2.153	.412	-88.39	4.79
Alley					Harold	-2.189	.411	-88.80	4.61
William	-2.895	.214	-94.47	1.18	Klunder				
Armstrong					Dorothy	-2.269	.088	-89.66	0.91
William E.	-2.888	.073	-94.43	0.40	Knowles				
Atkinson					John Korner	-3.4147	.160	-96.82	0.51
Marcel	-2.397	.116	-90.91	1.05	Cornelius	0.952	.037	159.03	9.69
Barbeau					Krieghoff				
J.M. Barnsly	-2.113	.083	-87.91	1.00	William	-0.871	.081	-58.13	3.39
					Kurelek				
Maxwell	-1.932	.056	-85.51	0.82	Ludger Larose	-2.139	.120	-88.22	1.42
Bates									
William	-1.411	.039	-75.62	0.94	Fernand	-1.023	.226	-64.06	8.11
Beatty					Leduc				
Henri Beau	-1.926	.071	-85.43	1.04	Ozias Leduc	-0.556	.104	-42.66	5.95
Leon	-1.213	.066	-70.26	1.97	Joseph Legare	-1.142	.251	-68.09	8.01
Bellefleur									
F.M. Bell-	-1.492	.045	-77.51	1.02	Jean-Paul	-0.022	.053	-2.16	5.18
Smith					Lemieux				
Louis Belzile	-3.365	.162	-96.55	0.56	Rita Letendre	-2.074	.088	-87.44	1.11
Aleksandre	-3.250	.133	-96.12	0.52	Ernst Lindner	-1.487	.214	-77.40	4.84
Bercovitch									
William	1.587	.499	388.86	243.94	Arthuer	-0.349	.035	-29.43	2.44
Berczy					Lismer				
Suzanne	-3.356	.216	-96.51	0.75	Kenneth	-2.022	.165	-86.76	2.18
Bergeron					Lochhead				
G.T. Berthon	-1.321	.252	-73.32	6.73	Mabel	-0.868	.205	-58.02	8.59
					Lockerby				
Andre Bieler	-1.840	.075	-84.12	1.19	Alexandra	-1.822	.215	-83.83	3.47
					Luke				
B.C. Binning	-0.666	.147	-48.64	7.57	Laura Muntz	-1.772	.086	-83.00	1.45
					Lyall				
Ebenezer	-2.870	.705	-94.33	4.00	John Lyman	-1.197	.070	-69.79	2.13
Birrell									
Ronald	-1.924	.200	-85.40	2.92	Frank Lynn	-0.478	.709	-38.02	43.94
Bloore									
Bruno Bobak	-2.547	.055	-92.16	0.43	J.E.H.	0.171	.037	18.67	4.42
					Macdonald				
David Bolduc	-2.587	.190	-92.47	1.43	Jock	-0.984	.097	-62.62	3.61
					Macdonald				
Paul-Emile	1.101	.084	200.85	25.13	Hugh	-1.351	.355	-74.11	9.19
Borduas					Mackenzie				
Joseph	-3.867	.410	-97.91	0.86	Pegi Nichol	-1.984	.082	-86.25	1.13
Bouchette					MacLeod				
Napoleon	-1.953	.354	-85.82	5.03	Helen	0.342	.121	40.73	17.08

Bourassa					McNicholl				
John Boyle	-3.772	.500	-97.70	1.15	Mabel May	-1.687	.064	-81.49	1.18
Fritz	-1.420	.099	-75.84	2.40	Ron Martin	-2.296	.239	-89.93	2.41
Brandtner									
Claude	-3.369	.272	-96.56	0.94	T.M. Martin	-2.532	.045	-92.05	0.36
Breeze									
Fred Brigden	-2.299	.061	-89.97	0.61	Henri Masson	-1.629	.032	-80.39	0.63
Miller Brittain	-1.023	.254	-64.05	9.12	Marmaduke	-2.553	.140	-92.22	1.09
					Matthews				
Bertram	-1.509	.100	-77.89	2.21	Clark	-2.264	.178	-89.61	1.85
Brooker					McDougall				
D.P. Brown	-2.888	.705	-94.43	3.92	Jean Mcewen	-1.556	.075	-78.90	1.57
Archibald	-3.205	.062	-95.88	0.25	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	-2.946	.169	-94.75	0.89	John Meredith	-2.087	.162	-87.60	2.00
Burton									
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	-1.074	.172	-65.84	5.87
					Molinari				
Alex	-4.460	.706	-98.84	0.82	Guy Monpetit	-2.819	.357	-94.03	2.13
Cameron									
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	-1.418	.290	-75.78	7.02	Kathleen	-0.059	.072	-5.70	6.84
Chambers					Morris				
W.H. Clapp	-1.474	.091	-77.10	2.09	Michael	-3.484	.291	-96.93	0.89
					Morris				
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	-0.097	.045	-9.21	4.11	Marion	-2.045	.179	-87.06	2.32
Cullen					Nicholl				
Jean Dallaire	-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 Delfosse	-2.295	.062	-89.93	0.63	Lucius O'Brien	-1.451	.131	-76.55	3.06
Louis de Niverville	-2.746	.225	-93.58	1.44	Daphne Odjig	-2.129	.177	-88.11	2.10
Rodolphe de Repentigny	-0.585	.252	-44.31	14.05	Will Ogilvie	-2.895	.132	-94.47	0.73
Jacques de Tannancour	-1.362	.093	-74.38	2.38	Toni Onley	-2.528	.079	-92.01	0.63
Joseph Drapell	-3.421	.290	-96.73	0.95	Paul Peel	-0.044	.072	-4.29	6.85
Rodolphe Duguay	-2.173	.085	-88.62	0.97	Alfred Pellan	-0.418	.080	-34.20	5.30
Louis Dulongpre	-3.374	.706	-96.58	2.42	Sophie Pemberton	-2.425	.207	-91.15	1.83
Albert Dumouchel	-2.423	.169	-91.13	1.49	William Pehudoff	-2.581	.137	-92.43	1.04
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 Pflug	-1.810	.705	-83.64	11.54
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. Plamondon	-1.800	.199	-83.47	3.28
Ewen Ivan Eyre	-1.090	.167	-66.37	5.61	Christopher Pratt	-0.093	.289	-8.85	26.32
A.S. Falardeau	-2.411	.201	-91.02	1.81	Mary Pratt	-0.9249	.186	-61.29	7.20
Marcelle Ferron	-1.491	.081	-77.49	1.83	William Raphael	-1.622	.076	-80.24	1.49
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 Rayner	-3.064	.290	-95.33	1.35
Lemoine Fitzgerald	-0.602	.077	-45.24	4.24	George Reid	-2.210	.069	-89.03	0.75
John C. Forbes	-2.850	.074	-94.21	0.43	Jean-Paul Riopelle	0.811	.051	125.00	11.59
Tom Forrestall	-2.036	.182	-86.95	2.37	Milly Ristvedt-Handerek	-4.369	.709	-98.73	0.90
J.W.L. Forster	-3.049	.090	-95.26	0.43	Goodridge Roberts	-0.941	.033	-60.96	1.28
Michael Forster	-2.716	.154	-93.39	1.02	H. Tomtu Roberts	-2.782	.271	-93.81	1.68
M-A Fortin	-0.387	.037	-32.08	2.55	Sarah Robertson	-1.538	.103	-78.51	2.21
Paul Fournier	-2.905	.206	-94.53	1.13	Albert Robinson	-0.202	.047	-18.26	3.87
Daniel Fowler	-1.880	.708	-84.75	10.80	Otto Rogers	-2.778	.181	-93.78	1.13
Joseph Franchere	-2.012	.062	-86.63	0.83	William Ronald	-2.501	.083	-91.80	0.68
John A Fraser	-1.770	.214	-82.96	3.64	Harry Rosenberg	-1.816	.499	-83.73	8.12
Louise Gadbois	-3.513	.072	-97.02	0.21	J-B Roy-Audy	0.305	.500	35.66	67.83
Robert Gagen	-2.166	.168	-88.53	1.92	Ludger Ruelland	-3.870	.269	-97.91	0.56
Charles Gagnon	-0.710	.499	-50.86	24.54	John Russell	-2.471	.095	-91.55	0.80

Clarence Gagnon	0.073	.044	7.52	4.76	Joseph St-Charles	-2.661	.106	-93.01	0.74
Erik Gamble	-3.897	.709	-97.97	1.44	Henry Sandham	-2.145	.097	-88.29	1.14
Yves Gaucher	-1.528	.254	-78.31	5.50	Allen Sapp	-2.390	.057	-90.84	0.52
Pierre Gauvreau	-1.022	.170	-64.01	6.13	Anne Savage	-1.129	.070	-67.67	2.26
Alexandre Giffard	-1.222	.408	-70.55	12.00	William Sawyer	-2.810	.179	-93.98	1.08
Charles Gill	-2.979	.152	-94.92	0.77	Rolph Scarlett	-1.770	.706	-82.97	12.02
Ted Godwin	-2.603	.109	-92.59	0.81	Carl Schaefer	-1.041	.116	-64.70	4.10
Jean Goguen	-1.658	.500	-80.96	9.52	Charles Scott	-2.704	.129	-93.30	0.86
Eric Goldberg	-2.962	.081	-94.83	0.42	Gerald Scott	-3.831	.270	-97.83	0.58
Hortense Gordon	-2.775	.109	-93.77	0.68	Marian Scott	-2.877	.130	-94.37	0.73
Richard Gorman	-2.452	.158	-91.39	1.36	Julian Seavey	-3.075	.214	-95.38	0.99
Kate Graham	-3.102	.318	-95.51	1.43	Jack Shadbolt	-1.568	.069	-79.14	1.44
John Greer	-1.728	.502	-82.24	8.92	Gordon Smith	-2.345	.072	-90.41	0.69
John Hall	-2.964	.251	-94.84	1.29	Jori Smith	-2.600	.078	-92.57	0.58
Joice Hall	-3.573	.409	-97.19	1.15	Michael Snow	-1.153	.318	-68.44	10.02
Jay Hambidge	-2.863	.706	-94.29	4.03	Daniel Solomon	-2.702	.361	-93.29	2.42
Theophile Hamel	-1.196	.199	-69.77	6.02	Martin Somerville	-1.119	.408	-67.33	13.32
John Hammond	-1.851	.040	-84.30	0.63	Bruce St Clair	-2.908	.501	-94.54	2.73
Lawren S Harris	0.993	.036	170.02	9.68	Lionel Stephenson	-2.407	.075	-90.99	0.68
Lawren P Harris	-2.508	.268	-91.86	2.18	William Stevenson	-2.545	.070	-92.15	0.55
Robert Harris	-1.687	.059	-81.50	1.09	Francoise Sullivan	-3.444	.705	-96.80	2.25
Doug Haynes	-3.650	.217	-97.40	0.56	Philip Surrey	-1.581	.061	-79.43	1.25
Adrien Hebert	-2.094	.070	-87.68	0.86	M-A Suzor-Cote	-0.414	.045	-33.89	2.95
Robert Hedrick	-3.542	.225	-97.11	0.65	Takao Tanabe	-2.522	.106	-91.97	0.85
George Heriot	-2.865	.500	-94.30	2.85	Tony Tascona	-3.450	.410	-96.83	1.30
Prudence Heward	-1.586	.096	-79.53	1.97	Tom Thomson	2.065	.065	688.31	51.61
Randolph Hewton	-1.482	.062	-77.28	1.42	Robert Todd	-0.150	.354	-13.94	30.42
W.G.R. Hind	0.183	.500	20.04	60.00	Fernand Toupin	-2.777	.098	-93.78	0.61
Tom Hodgson	-2.480	.179	-91.63	1.50	Claude Tousignant	-2.067	.240	-87.35	3.04
A.W. Holdstock	-1.381	.214	-74.88	5.37	Harold Town	-2.011	.081	-86.62	1.08
Edwin Holgate	-0.103	.062	-9.86	5.56	Tony Urquart	-2.401	.190	-90.93	1.72
Robert Holmes	-4.454	.706	-98.84	0.82	Fred Varley	0.421	.058	52.38	8.79
William R. Hope	-3.853	.267	-97.88	0.57	Robert Varvarande	-3.973	.317	-98.12	0.60
Frances Hopkins	-3.179	.705	-95.84	2.93	Frederick Verner	-0.692	.070	-49.94	3.49
E.J. Hughes	-0.095	.072	-9.05	6.50	Zacharie	-4.359	.705	-98.72	0.90

Jack Humphrey	-2.051	.089	-87.13	1.14	Vincent 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 Hurtubise	-2.155	.208	-88.41	2.41	Charles Caleb Ward	-1.655	.239	-80.89	4.57
Gershon Iskowitz	-1.641	.138	-80.63	2.68	Esther Warkov	-3.523	.271	-97.05	0.80
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 Webber	-2.389	.197	-90.83	1.81
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 Jerome	-3.097	.131	-95.48	0.59	Joyce Wieland	-2.126	.317	-88.07	3.78
Frank Johnston	-0.882	.030	-58.61	1.26	Curtis Williamson	-3.094	.112	-95.47	0.51
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 Woodcock	-2.175	.128	-88.64	1.46
Paul Kane	0.759	.237	113.59	50.56	Walter Yarwood	-2.142	.190	-88.26	2.23

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 - Unit root tests (real, same-currency prices & returns)**(a) Log index (time trend and 1 lag included)**

Variable	Test	Statistic	10 % C.V.
Mei-Moses index	ADF	-2.29	-3.16
	PP $Z\alpha$	-10.81	-17.39
	PP Z_t	-2.39	-3.17
Canada index	ADF	-1.62	-3.16
	PP $Z\alpha$	-8.23	-17.39
	PP Z_t	-1.88	-3.17

(b) Returns (intercept and 1 lag included)

Variable	Test	Statistic	1 % C.V.
Mei-Moses index	ADF	-6.26	-3.57
	PP $Z\alpha$	-77.90	-19.80
	PP Z_t	-9.16	-3.57
Canada index	ADF	-4.47	-3.57
	PP $Z\alpha$	-75.25	-19.80
	PP Z_t	-9.31	-3.57

Table 8 – Cointegration tests, real, same-currency prices (residual-based, with time trend in cointegrating regression of Canadian index on Mei-Moses and 1 lag in unit root tests)

Test	Statistic	10% C.V.
ADF	-1.31	-3.61
PP $Z\alpha$	-8.23	-22.06
PP Z_t	-1.86	-3.61

Table 9 – Nominal Returns: raw statistics

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

Table 10 – Real, Same-Currency Returns: raw statistics

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

Table 11 – Granger causality statistics, real, same-currency returns (2 lags in VAR)

Each statistic is a Wald statistic of the null hypothesis of no Granger-causality, and has a null distribution that is chi-squared with d.f. equal to number of lags

Lags in VAR	Can to International	International to Can
1	5.51	8.43
2	1.50	0.43
3	0.34	1.64
4	0.29	1.49
5	0.02	3.11
6	1.47	2.93

Table 12 – 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

Table 13 – Macroeconomic Variables to Explain Canadian Art Returns

Dependent Variable: Cdn art

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
R-squared	0.141		