

Dynamic price dependence of Canadian and international art markets: an empirical analysis

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Abstract Although the market for Canadian paintings is now of substantial magnitude, with several works having recently been 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 seem to be held only by Canadian collectors. This market can thus be viewed as largely local, and it is therefore not clear whether 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 article 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 dataset of Hodgson and Vorkink (Can J Econ 37:629–655, 2004), while for the international prices, we use an index provided by Mei and Moses (Am Econ Rev 92:1656–1668, 2002).

Keywords Alternative investments · Economics of art markets · Market for paintings · Time series analysis · CAPM

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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. However, owing 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 his or her 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. 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 \(2011\)](#) 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; [Mok et al. \(1993\)](#) on the returns to modern Chinese paintings; and [Seçkin and Atukeren \(2006\)](#) on the returns to Turkish paintings.

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 till now, there has only been a small portion of the literature that 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 co-integrated, 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—we will refer to them in the present article 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, which has a similar impact on prices in all the 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 the 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 seem to be held largely by Canadian collectors. Nearly all the sales of Canadian art reported by our data sources occur in Canadian auction houses—only Jean-Paul Riopelle has a significant number of works that sell in international locations. Only very rarely are Canadian paintings exhibited in major art museums outside Canada, or mentioned in major surveys of nineteenth- or twentieth-century art. The U.S. Department of Commerce data supplied by Benjamin Mandel (see [Mandel 2010](#) for more detail) on the U.S. imports and exports of artworks finds that imports from Canada represent a very small proportion of overall imports of paintings into the U.S.A (Canada ranks fourteenth among countries from which the U.S.A imports paintings behind, among others, Norway, Austria, and Mexico, and just ahead of Hong Kong). This probably overstates the interest in Canadian art in the U.S., as not all the artworks exported from Canada are necessarily of Canadian origin. We note, however, that 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, and that Canada ranks ninth among countries that the U.S. exports art works to. For a Canadian collector, 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, then 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 article, 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 the nature of such time-series dependence econometrically, both in terms of long-term trends as reflected in the presence or the 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 dataset of [Hodgson and Vorkink \(2004\)](#), while for the international prices, we use an index provided by [Mei and Moses \(2002\)](#).

The rest of the article is organized as follows. In Sect. 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 Sect. 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 \(1970–1975, 1980\)](#), [Sotheby’s \(1975, 1980\)](#), and [Westbridge \(1981–2008\)](#). Our dataset 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 \(1988\)](#). 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”. 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 dataset, 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, dating back to the seventeenth century, and most Canadians are familiar with the names of several Canadian painters from a variety of historic periods and regions (see [Reid 1973](#)). 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, finally, 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. (Also of historical importance are the works of the early European cartographers who traversed and mapped the territories.)

Landscape and portraiture formed the backbone of Canadian art before the 1867 Confederation. Much of this art work was produced to meet 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 (see [Reid 1979](#)). Indeed, these collectors built their collections largely on the importation of major European masters, and the position of Canadian artists in their collections was largely in filling the “niche” of domestic subjects, particularly landscape, which could only be provided by domestic painters (see [Brooke \(1989\)](#), for a profile of leading Canadian collectors in the years around 1900). It was not until the 1960s that a significant market developed in Canada for the art of domestic artists working on anything other than specifically domestic themes. These considerations probably explain the lack of interest in most Canadian art outside Canada. 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 1910–1920 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 the 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 their American counterparts. In Montreal, a group of young artists influenced by European modernism, especially surrealism, was 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 relationships 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 articles. 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 article extends the hedonic price index presented in [Hodgson and Vorkink \(2004\)](#) by updating the dataset until the first half of 2008. The hedonic regression helps us address the question of regularities in art prices by including various characteristics (the genre, artist's name, technique, and medium) of paintings in the pricing function such that the willingness to pay for each characteristic can be estimated.

The econometric model is written as follows:

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

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 the 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 next section.

The regressors $\{w_{ij}\}$ in (1) represent the characteristics of painting i . These include various dummies: 274 painter, 20 medium/support, 42 auction house, eight genre, 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:

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

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 for computing 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. Owing to efficiency concerns arising from the strong leptokurtosis found in the empirical error distribution, we estimate (2) adaptively, based on the technique of Bickel (1982), to obtain asymptotically efficient estimates when the distribution function of the disturbances $\{u_i\}$ is unknown. See Hodgson and Vorkink (2004) for a detailed description of this method.

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.

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 before 1988. This result is discussed by Hodgson and Vorkink (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. 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 2003–2008, 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

Table 1 Hedonic price index and returns, 1968–2008

Half-year	Index	SE	Return (%)	SE	Half-year	Index	SE	Return (%)	SE
68:2	6.767	0.110	0	0	88 : 2	8.763	0.044	10.13**	5.05
69:1	7.070	0.091	35.40*	18.52	89 : 1	8.730	0.043	-3.26	4.43
69:2	7.279	0.088	23.25	14.83	89 : 2	8.781	0.044	5.24	4.89
70:1	6.791	0.049	-38.60***	5.72	90 : 1	8.749	0.044	-3.19	4.58
70:2	6.865	0.055	7.66	6.20	90 : 2	8.639	0.045	-10.40**	4.36
71:1	6.698	0.056	-15.42***	5.32	91 : 1	8.521	0.052	-11.16**	5.00
71:2	6.821	0.065	13.11	8.16	91 : 2	8.541	0.049	2.05	6.04
72:1	6.887	0.057	6.82	7.83	92 : 1	8.502	0.050	-3.80	5.54
72:2	6.862	0.057	-2.50	6.48	92 : 2	8.518	0.049	1.56	5.81
73:1	7.083	0.063	24.82***	8.92	93 : 1	8.398	0.052	-11.25**	5.25
73:2	7.109	0.061	2.64	7.72	93 : 2	8.463	0.052	6.70	6.55
74:1	7.325	0.060	24.01***	9.09	94 : 1	8.621	0.051	17.07**	7.04
74:2	7.265	0.060	-5.74	6.89	94 : 2	8.585	0.049	-3.50	5.60
75:1	7.353	0.081	9.12	10.22	95 : 1	8.410	0.048	-16.08***	4.71
75:2	7.350	0.092	-0.25	11.70	95 : 2	8.508	0.050	10.26*	6.25
76:1	7.355	0.061	0.48	10.45	96 : 1	8.430	0.049	-7.50	5.18
76:2	7.459	0.070	10.95	9.03	96 : 2	8.494	0.048	6.61	5.88
77:1	7.423	0.063	-3.50	8.09	97 : 1	8.530	0.049	3.74	5.74
77:2	7.564	0.066	15.12	9.31	97 : 2	8.512	0.046	-1.82	5.18
78:1	7.655	0.059	9.55	8.54	98 : 1	8.545	0.048	3.32	5.40
78:2	7.838	0.058	20.09**	8.60	98 : 2	8.563	0.045	1.89	5.24
79:1	8.045	0.061	22.93**	9.00	99 : 1	8.576	0.049	1.30	5.21
79:2	8.139	0.060	9.84	8.35	99 : 2	8.683	0.046	11.22*	5.86
80:1	8.472	0.061	39.63***	10.60	00 : 1	8.696	0.047	1.29	5.22
80:2	8.652	0.052	19.61**	8.32	00 : 2	8.767	0.044	7.36	5.34
81:1	8.695	0.051	4.49	6.37	01 : 1	8.779	0.044	1.21	4.59
81:2	8.568	0.053	-12.01**	5.41	01 : 2	8.848	0.047	7.14	5.16
82:1	8.267	0.053	-25.97***	4.66	02 : 1	8.986	0.044	14.82***	5.59
82:2	8.012	0.064	-22.48***	5.66	02 : 2	8.994	0.044	0.84	4.65
83:1	8.065	0.060	5.38	8.27	03 : 1	8.978	0.042	-1.65	4.35
83:2	8.124	0.062	6.14	8.10	03 : 2	8.966	0.044	-1.19	4.37
84:1	8.068	0.059	-5.51	7.15	04 : 1	9.109	0.046	15.45***	5.50
84:2	8.175	0.059	11.35	8.16	04 : 2	9.242	0.046	14.22**	5.73
85:1	8.220	0.052	4.57	7.05	05 : 1	9.196	0.043	-4.49	4.62
85:2	8.318	0.049	10.27	6.47	05 : 2	9.316	0.044	12.73**	5.05
86:1	8.200	0.048	-11.09**	4.88	06 : 1	9.351	0.045	3.56	4.80
86:2	8.543	0.044	40.91***	7.12	06 : 2	9.360	0.045	0.86	4.84
87:1	8.471	0.044	-6.97	4.34	07 : 1	9.512	0.044	16.47***	5.39
87:2	8.597	0.045	13.42**	5.44	07 : 2	9.644	0.043	14.05***	5.20
88:1	8.667	0.043	7.28	5.06	08 : 1	9.630	0.044	-1.38	4.62

Parameter t -statistics with * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

Table 2 Top 25 Canadian painters

Rank	Artist	Dummy estimate	SE	% Δ rel. Jackson	SE
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

Parameter t -statistics with * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

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.

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. 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, namely, William Berczy (1744–1813), James Duncan (1806–1881), Jean Baptiste Roy-Audy (1778–c.1848), Paul Kane (1810–1871), and W.G.R. Hind (1833–1889), and so on, whose works are mostly quite rare and of major historical importance. Detailed results on all the painters included in our study are available on request.

Table 3 Other hedonic variables

(a) Medium/support (rel. to oil/canvas)	Parameter	SE	% Change rel. to oil/canvas	SE
Oil/panel	-0.171***	0.017	-15.74	1.42
Oil/board	-0.240***	0.015	-21.30	1.16
Oil/canvas on board	-0.206***	0.037	-18.63	3.03
Oil/cardboard	-0.293***	0.030	-25.41	2.22
Oil/paper	-0.435***	0.044	-35.29	2.85
Oil/masonite	-0.184***	0.033	-16.83	2.73
Acrylic/canvas	-0.251***	0.041	-22.23	3.20
(b) Genre (rel. to landscape)	Parameter	SE	% Change rel. to landscape	SE
Genre scene	0.172***	0.017	18.75	1.99
Still life	0.063***	0.023	6.52	2.42
Portrait	-0.184***	0.030	-16.84	2.50
Abstract	-0.392***	0.029	-32.45	1.96
Animal	-0.192***	0.036	-17.44	3.01
Figurative	-0.168***	0.039	-15.43	3.30
History	-0.434***	0.080	-35.19	5.16
(c) Size-of-painting variable	Parameter	SE	% Change from additional cm (H & W) or cm ² (A)	SE
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}
(d) Painting dated or not	Parameter	SE	% Change rel. to undated	SE
Dated (rel. to undated)	0.144***	0.011	15.46	1.27

Parameter *t*-statistics with * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

Some of the results for the remaining hedonic variables are reported in Table 3. 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, respectively, 19 and 6.5% more than the landscapes. 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 the 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- 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- 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' \(2003\)](#) analysis basically focuses on the inner dynamics of the international paintings markets and their reactions to general financial market conditions. (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 Art-price data, www.artprice.com.)

[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- and 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.

In the absence of specification errors, the repeat-sale and hedonic methods of index construction both provide consistent estimates of the "true" underlying effect of time period on overall market prices. The choice of estimation method has been analyzed in detail by several authors, including [Meese and Wallace \(1997\)](#) and [Ginsburgh et al. \(2006\)](#), who recommend one or the other approach, depending on the nature of the dataset, based on the one that will deliver estimates of the return series that are most accurate. For our Canadian art dataset, the short time period for which auction data are available, so that relatively few repeat sales will have likely occurred, along with the near impossibility of identifying more than a very small number of repeat sales based on our data source, makes the application of the hedonic method the most easily preferred. Given that the two returns series analyzed here were both estimated by the method that was best suited for delivering the most precise estimates possible for the particular datasets involved, there is no econometric reason for any problems or

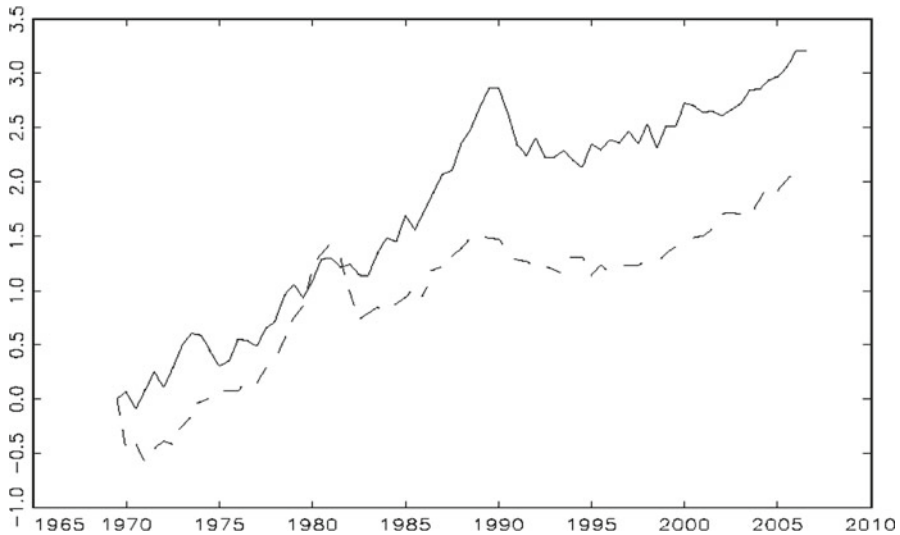


Fig. 1 Log Mei-Moses index (*solid*) and log Canadian index (*broken*)

incompatibilities to arise in their comparative analysis, beyond the estimation error that is always present when working with estimated time indices. The best approach that can be taken is to use indices that are estimated with minimal estimation error, which is what we indeed do in this study.

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. As can be seen, the international art price index for paintings displays four phases since 1969. The first period sees the rise of art prices especially starting from the early 1970s until the end of the decade. 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 1980s. The recession of 1981–1982 had its impact on the sales prices but the recovery came fast and was spectacular. The whole decade is characterized as the main art market bubble. Up to 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, after the withdrawal of Japanese art collectors from the world's art markets. That is the beginning of the third phase that can be defined as the slowdown and continuous fall in international prices. This period runs to about the mid-1990s. The fourth and the 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 period.

When we examine Fig. 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

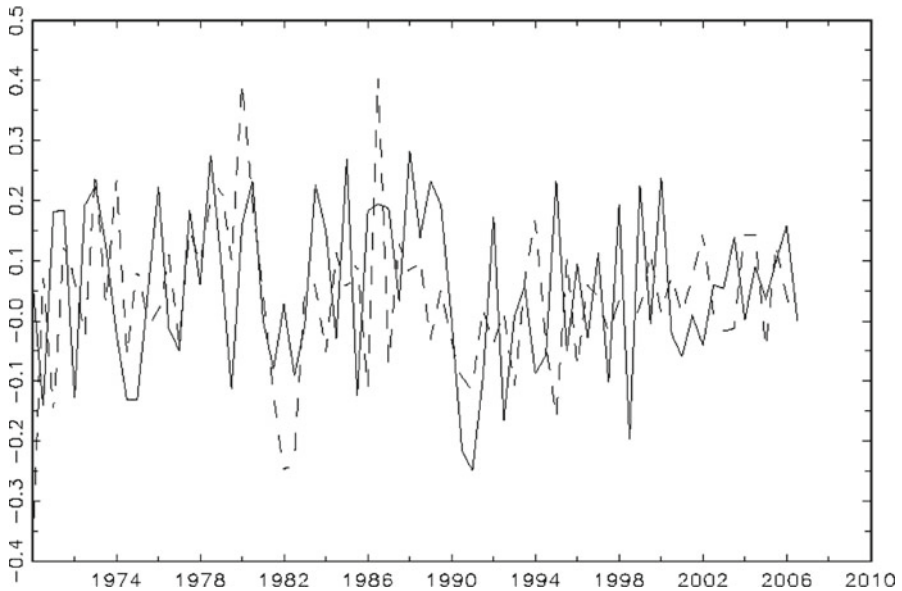


Fig. 2 Returns: Mei–Moses index and Canadian index (*broken*)

important point is that there seems to be closer comovement between the series in recent years. This observation can also be confirmed in Fig. 2 wherein we observe the movement of both semi-annual nominal returns over the same period.

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.

Comparing the returns in the international paintings market to those in the Canadian market, the Canadian market appears to have underperformed relative to the international market. Another point to be mentioned is that the 1981–1982 world economic slowdown hit the Canadian market more severely compared with the world markets. Also, the bursting of the art bubble of 1990 was less severe in Canada than elsewhere. This may be related to the size of the Canadian market and its degree of integration with the main world market. Throughout the 1990s, 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 the 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 in Figs. 3 and 4.

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 the period of general depreciation of the Canadian dollar).

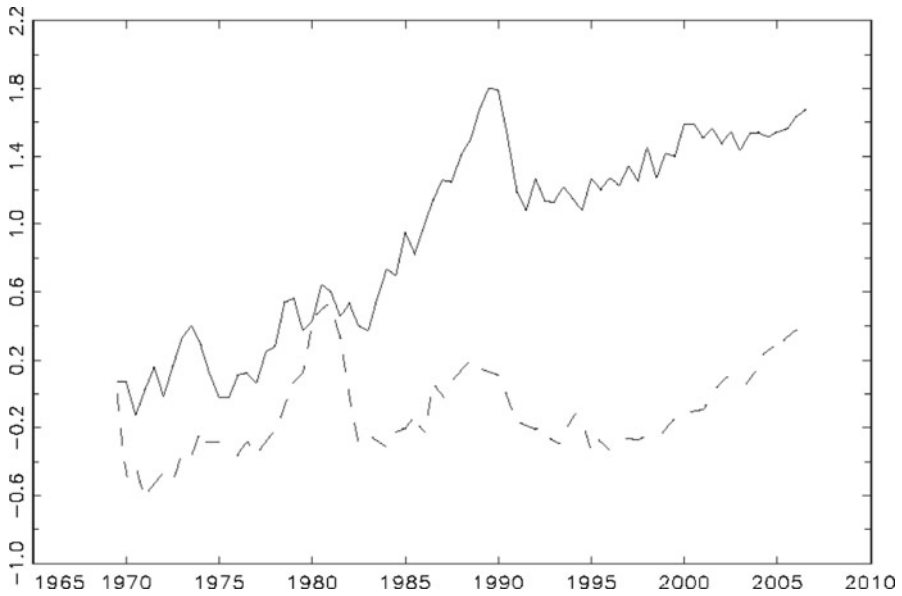


Fig. 3 Log real index (same currency): Mei-Moses and Canada (*broken*)

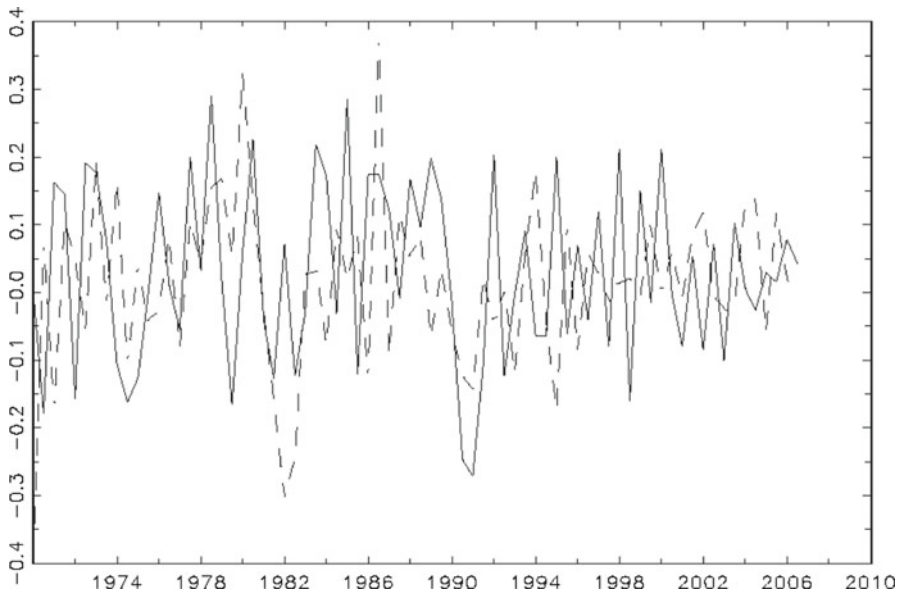


Fig. 4 Real returns (same currency): Mei-Moses and Canada (*broken*)

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

Table 4 Unit root tests (real, same-currency prices & returns)

Variable	Test	Statistic
(a) Log index (time trend and p lags included) ^a		
Mei–Moses index ($p = 1$)	ADF	-2.29
	PP $Z\alpha$	-10.81
	PP Z_t	-2.39
	DF-GLS	-2.34
Canada index ($p = 3$)	ADF	-2.81
	PP $Z\alpha$	-10.29
	PP Z_t	-2.13
	DF-GLS	-2.90*
(b) Returns (intercept and p lags included) ^b		
Mei–Moses index ($p = 1$)	ADF	-6.26***
	PP $Z\alpha$	-77.90***
	PP Z_t	-9.16***
Canada index ($p = 3$)	ADF	-3.97***
	PP $Z\alpha$	-80.34***
	PP Z_t	-9.24***

^a For critical values, please see (i) Hamilton (1994, Table B.5, Case 4 [PP $Z\alpha$]), (ii) Hamilton (1994, Table B.6, Case 4 [PP Z_t and ADF]), and Elliott et al. (1996, Table 1.C [DF-GLS])

^b For critical values, please see (i) Hamilton (1994, Table B.5, Case 2 [PP $Z\alpha$]), (ii) Hamilton (1994, Table B.6, Case 2 [PP Z_t and ADF])

Parameter t -statistics with * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

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 1980s. In view of this, we investigate the time-series properties of the Canadian paintings market price index and Mei–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, and hence these are omitted.

We test for the order of integration in the series using the augmented Dickey and Fuller (1979) (ADF) and the Phillips and Perron (1988) (PP) tests on the natural logarithms of the variables and on the first differences. The DF–GLS statistic, calculated as described on pp. 824–825 of Elliott et al. (1996), and more powerful than the preceding tests in the presence of an estimated time trend, is also applied to the log-levels series. The results are reported in Table 4 (sources for critical values of all statistics are indicated in the footnotes to the table). 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),

Table 5 Cointegration tests, real, same-currency prices (residual-based, with time trend in cointegrating regression of Canadian index on Mei–Moses and three lags in unit root tests)

Test	Statistic
ADF	−2.66
PP $Z\alpha$	−9.69
PP Zt	−2.04
DF-GLS	−2.71

For critical values, please see (i) Hamilton (1994, Table B.8, Case 3 [PP $Z\alpha$]), (ii) Hamilton (1994, Table B.9, Case 3 [PP Zt and ADF]), and Perron and Rodriguez (2001, Table 4c [DF-GLS])

Parameter t -statistics with * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

Worthington and Higgs (2003), and Atukeren and Seckin (2009) are indeed consistent with this reasoning.

Our unit root tests are in accordance with the literature in that both the series are found to be the best modeled as integrated of order 1 ($I(1)$). In both the cases, we calculated the ADF and DF–GLS statistics with an estimated time trend and lag orders ranging from one to six (only the values of the statistics for the lag orders that minimize the Akaike Information Criterion (AIC)—one for Mei–Moses and three for Canada—are reported in Table 4). For the ADF test for both the series, and DF–GLS for Mei–Moses, no change in the results was obtained in considering lag orders up to six. For Canada, the reported DF–GLS statistic is slightly below the 10% critical value, while the same statistic at other lags is not significant at the 10% level. 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).

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 whether 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, PP, and DF-GLS (as described by Perron and Rodriguez 2001) 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.

As seen from Table 5, 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 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

Table 6 Returns: raw statistics

Statistic	Mei–Moses	Canada
(a) Nominal returns		
Mean	0.0530	0.0367
SD	0.1329	0.1274
Correlation	0.1489	
(b) Real, same-currency returns		
Mean	0.0303	0.0132
SD	0.1301	0.1233
Correlation	0.1069	

indices considered here by investigating the nature of the short-run dependence that may or may not be existing 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 6). 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.

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 6). 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.

The results of a Wald test of the null that one variable does not Granger-cause the other are provided in Table 7. 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 (the lag order that minimizes the AIC), 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

Table 7 Granger causality statistics, real, same-currency returns

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

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

AIC minimized for lag = 1

Parameter *t*-statistics with * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$

contemporaneous correlation and possibly some Granger causality at one lag. In the remainder of the article, 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. Our finding that the Canadian art market largely goes its own way could be because of differences in the esthetic pleasure between Canadian and the world's art market participants. The effort of creating a national identity and having concentrated for several generations on landscapes and genre scenes 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 esthetics. 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 for diversifying an international investment portfolio. Our time-series analyses show that Canadian art prices seem to be largely independent of the American and the 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 analysis was repeated using the Standard and Poor's 500 index as market proxy, with almost identical estimates and identical inferences). The Canadian index was converted to US dollars using the exchange rate. The following is the econometric equation that we estimate:

$$r_t - r_{ft} = \alpha + \beta (r_{mt} - r_{ft}) + u_t,$$

Table 8 CAPM (dependent variable: excess returns of DJIA with respect to FF rate)

Index	Intercept (SE)	Beta (SE)	R-squared
Mei–Moses	−0.010 (0.016)	0.150 (0.127)	0.019
Canada (in U.S. \$)	−0.028* (0.016)	0.071 (0.133)	0.004

Parameter t -statistics with
 * $p < 0.10$, ** $p < 0.05$, and
 *** $p < 0.01$

for $t = 1, \dots, n$, with n being the number of observations, where r_t is the return on the relevant art index between t and $t - 1$, r_{ft} and r_{mt} are the respective returns on the risk-free rate and market proxy, and u_t is a random disturbance. The estimated parameters are α and β .

We have used the general stock index because under the CAPM, the “market” portfolio is the portfolio of all the 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 rather a different question than the one that was asked by [Hodgson and Vorkink \(2004\)](#). The latter 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 investing in Canadian stocks.

As seen from [Table 8](#), the beta is very close to zero in this case, again supporting the results we have already obtained (the beta parameter in the CAPM captures the sensitivity of the excess returns on a particular asset to the excess returns on the market portfolio). The fact that we obtain a very small beta suggests that there is a greater diversification potential with Canadian art than with US and European art which may be why the average return of US and European art is higher. (As 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.) 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 those of non-Canadians.

To put the diversification potential of buying Canadian art in a different perspective, we have computed modified Sharpe ratios (mean divided by standard deviation) for a handful of portfolios consisting of the Dow-Jones index and/or Canadian art, working with nominal same-currency returns. As is consistent with previous findings, the ratio is higher for the stock index alone (0.387) than for Canadian art alone (0.271). However, diversified portfolios do better, with a 75:25 split in favor of stocks having a Sharpe ratio of 0.464 and the ratio of an evenly weighted portfolio being 0.462.

It is of interest to see whether 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 with art prices.

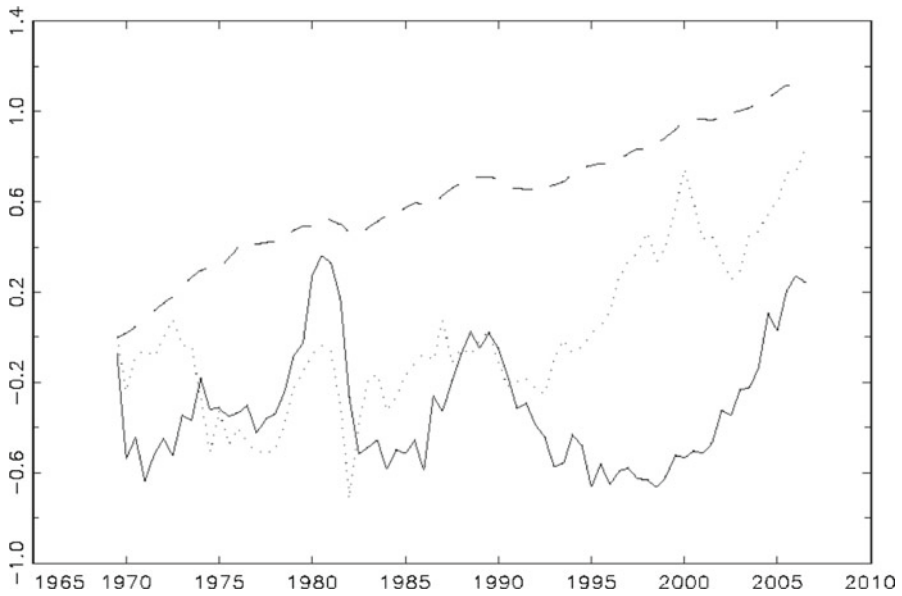


Fig. 5 Log real Canadian art, GDP (*broken*), and stocks (*dots*)

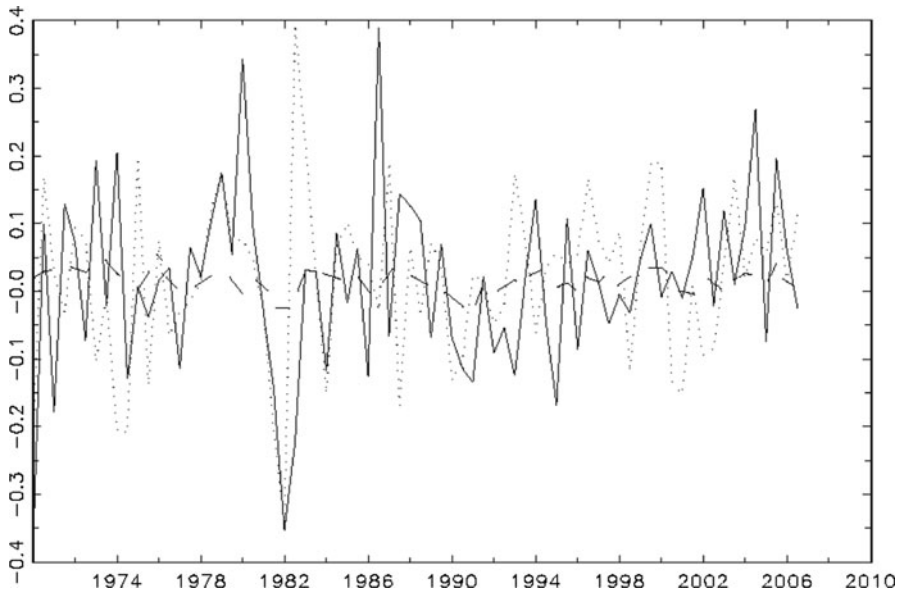


Fig. 6 Real returns: Canadian art, GDP (*broken*), and stocks (*dots*)

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 1990s. Prices recovered in the late 1990s, again in common with global art price movements, but

Table 9 Macroeconomic variables to explain Canadian art returns

Variable	Coefficient	SE
Constant	-0.0275	0.0192
US art (returns)	-0.0189	0.1136
CGDP (growth rate)	2.49***	0.849
CStocks (returns)	0.117	0.965
<i>R</i> -squared	0.141	

Parameter *t*-statistics with
 * $p < 0.10$, ** $p < 0.05$, and
 *** $p < 0.01$

lagged behind stock prices. Another interesting observation is that although art prices declined after 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 1970s and 1980s. 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.

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 existing 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 Figs. 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 (results available upon request). We have also tested Granger causality of 1–6 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 (the related tests are not reported in detail in the article and are available upon request). 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 have 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 9.

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 the 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 1% change in real GDP inducing a change in art prices of 2.49%.

Our results in this article 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 then 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 have investigated the price dynamics between different segments of the art market. In this context, we have used cointegration analysis and Granger-causality tests to investigate the interlinkages 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 cointegrated. 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 the twentieth 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 research 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 research in the international trade literature stemming from [Armington \(1969\)](#) in which international price differentials for heterogeneous goods are explained by such home biases (see [Whalley and Xin 2009](#) for a recent discussion of this subject). The focus on home bias may help us clarify the demand and art price divergences between Canadian and world art markets. This is left for future study.

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