A reprinted article from Volume 15, Number, 2014

THE JOURNAL OF
Investment Consulting

Northern Exposure: How Canadian Micro-Cap Stock Investments Can Benefit Investors

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Abstract

Micro-cap stocks, a subset of small stocks, have the potential to provide additional diversification benefits and increased returns to investors. The ways that micro-cap stocks can contribute to investors' actual portfolios have not been rigorously investigated. In this study, we examine micro-cap stocks in Canada and consider investability constraints and transaction costs that are overlooked in most other size-effect studies. We find that micro-cap stocks in Canada have relatively high returns and a low correlation to large stocks in Canada, the United States, and other developed markets. We conclude that these findings demonstrate that Canadian micro-cap stocks appear to represent a unique asset class and that investing in this unique asset class can improve the risk-return characteristics for global investors' overall portfolios. We therefore suggest that global investors consider adding Canadian micro-cap stocks to their portfolios.

Introduction

We revisit the benefits of portfolio diversification in general, as initially documented by Markowitz (1952), and in particular international diversification (e.g., Solnik 1974). A major shift in portfolio management occurred in the early 1980s when research started to focus on the relationship between stock returns and size or market capitalization. Banz (1981) and Reinganum (1981) discovered a size effect in the United States that subsequently was uncovered in other countries whereby a portfolio of small stocks outperformed a portfolio of large stocks. The return differential between small and large stocks has gained prominence among academics since the seminal work of Fama and French (1992, 1993) that characterized the differential as the small-minus-big (SMB) factor in their three-factor asset pricing model. This research spurred the development of mutual funds that focus on size in portfolios, such as those offered by Dimensional Fund Advisors, as well as numerous exchange-traded funds (ETFs) and indexes. In the continued search for higher returns, researchers once again are focusing on the potential of small stocks, especially the smallest of small stocks, often referred to as micro-cap stocks (see Fama and French 2008, 2012).

Because of the relative novelty of investing in micro-cap stocks, relatively little is known about their return potential and diversification value when included in an investment portfolio. The evidence suggesting a value to investing in micro-cap stocks led us to evaluate the benefits of micro-cap stocks as an asset class using an analysis at the individual security level for all publicly listed equities on one market. To confirm the viability of these investment strategies, we also test investability for such a portfolio where factors such as illiquidity, transaction costs, and ownership restrictions are likely to be significant.

There is no standard definition of a micro-cap stock, so for this study we arbitrarily define micro-cap stocks as those stocks in the decile of smallest Canadian stocks sorted by market capitalization without any filters (e.g., no minimum price or market capitalization). We use this definition because the maximum cut-off threshold for the decile of smallest stocks in Canada is much smaller than in the United States. Examining one market in-depth allows us to gather the necessary data to more carefully investigate investability issues and to incorporate the most relevant transaction costs and constraints.

We have chosen to focus on Canada for two reasons. First, Canada and the United States generally are viewed as having the world's largest and most comprehensive trading relationship for goods, services, and, of most relevance for our study, financial securities. In securities markets, the two countries have broadly similar regulations (see Mittoo 1992; Fama and French 2012; Karolyi and Wu 2012), which facilitates the flow of investment capital between the countries. Second, micro-cap stocks are relatively more prevalent in Canada than in the larger U.S. market, but the percentage in Canada is more similar to that in most other international markets. These factors allow for the direct comparison of returns for this asset class to the United States and for conclusions to be drawn regarding many other developed financial markets that are similar in size to Canada.

In the course of this study, we found that the average size of Canadian stocks in the deciles of small stocks is much smaller than comparable U.S. small stocks. Consequently, these Canadian small stocks should be considered as micro-cap stocks. We document that Canadian micro-cap stocks have demonstrated superior long-term return performance compared to larger stocks. Unlike other recent studies of the U.S. market (e.g., Fama and French 2012), we find that small (micro-cap) Canadian stocks have continued to perform

relatively better than large stocks, even recently. By examining several aspects of micro-cap versus other size portfolio returns from other countries, we establish that micro-cap stocks can be considered a unique asset class. Based on these initial results, we suggest that an investor may benefit by adding micro-cap stocks to a broad, internationally diversified portfolio of equities—if an investor can actually invest in these micro-cap stocks.

Our initial results demonstrate a consistency in the significance of returns and diversification benefits for our micro-cap returns not found in previous studies. Therefore, it is important to examine the often-overlooked issue of "investability" from investing in a micro-cap portfolio—whether an investor could actually implement such a strategy and realize returns suggested by back-testing studies—an issue raised by Malkiel (2004) among others. Most previous studies of small stocks implicitly assume that trading is costless and positions can be entered into and exited from immediately; an exception is Horowitz et al. (2000), which considers market capitalization and trading costs in a study of small stocks. We, however, explicitly quantify the costs of different trading constraints on the hypothetical returns from micro-cap investing by incorporating realistic investability assumptions and constraints. Investability is an important issue given the relatively small float and low liquidity of micro-cap stocks. It is important to determine the impact of different investing constraints in a systematic manner and to develop guidelines regarding issues to consider when examining investability for any trading strategy. We compare unfiltered returns with those based on minimum trading volumes, trade sizes, and ownership restrictions. We also consider the impact of different transaction costs for getting in and out of positions by considering brokerage fees and the differences between bid and ask prices required for each transaction.

Data

Our data are from the Canadian Financial Markets Research Center (CFMRC) database, which covers all securities that have been listed on the Toronto Stock Exchange over the sixty-year period 1950–2009 including stocks no longer listed. This results in a survivorship-free dataset. We focus on equities, so we screen to eliminate securities issued by mutual fund companies, preferred shares, exchangeable shares, warrants, and installment receipts to ensure we have a sample of common stocks. We eliminate stocks with no data on price, return, or shares outstanding. For dual class shares—a common occurrence in the Canadian context—the market values for the different classes are combined and the prices and returns we study are based on the class with the largest market capitalization.[1]

Overall Results

We begin by investigating returns across various size-based portfolios over the entire 1950–2009 sample period. Summary statistics are displayed in table 1. We present information for each of the ten decile-based portfolios (P1, the smallest or micro-cap stocks, through P10, the largest stocks), as well as portfolios made up of the smallest 30 percent and 50 percent (S30 and S50, respectively), and the largest 30 percent and 50 percent (B30 and B50, respectively).

In table 1A we document equal-weighted monthly returns as well as average portfolio size and number of stocks. We immediately recognize the size effect with the mean (median) return for the portfolio P1 (micro-cap) portfolio as 3.21 percent (1.69 percent) monthly or 46.10 percent (22.28 percent) annualized, compared with the P10 portfolio as 0.88 percent (1.05 percent) monthly or 11.09 percent (13.35 percent) annualized. The difference of the mean (median) return is 2.33 percent (0.64 percent) monthly or 31.87 percent (7.96 percent) annualized. Not surprisingly, P1 returns are much more volatile than P10 returns, with a monthly standard deviation of 10.29 percent compared to 4.60 percent. Minimum monthly returns for all portfolios occurred in October 1987 and maximum returns occurred in a variety of months. Mean returns are monotonic across the first seven decile portfolios and volatility measures are monotonic across all portfolios. The overall average size of stocks within each portfolio ranges from $1.83 million for P1 to $2.24 billion for P10; the small size is a result of this average being for market capitalization calculated since 1950. Considering small (not just micro) versus medium-size companies, the difference in monthly returns between the S30 and B30 portfolios is still substantial: 2.74 percent versus 0.94 percent, or 1.80 percent, which equates to an annualized difference of 23.88 percent. Even the difference in monthly returns between the S50 and B50 portfolios is large: 2.09 percent versus 0.94 percent, or 1.15 percent, which equates to an annualized difference of 14.71 percent. Thus with our updated sample, the Canadian size effect is substantial, though concentrated in the smallest firms, regardless of the measurement method.

The Sharpe ratio, calculated using an average Treasury-bill return over the period of 0.46 percent per month or 5.68 percent annually as reported in the CFMRC database, indicates the potential benefit of concentrating a portfolio on micro-cap stocks in terms of return-to-risk trade-offs. Even with a standard deviation of P1 at more than twice that of P10, the Sharpe ratio for P1 is three times as great as that for P10 and more than four times as great as some of the other portfolios.

Table 1B displays results based on value-weighted returns and displays average trading volume, average price, and beta. Results for value-weighted portfolios are similar to results for the equal-weighted portfolio though of a different order of magnitude. Not surprisingly the smaller-capitalization stocks tend to be lower-priced stocks, with P1 average prices of $2.23 per share compared with P10 average prices of $39.43. Average prices across portfolios increase monotonically. Average monthly trading volume (since 1963) per stock within each portfolio ranges from 700,000 shares for P1 stocks to 6.3 million shares for P10 stocks. Average betas within P1 are 1.14 and those in P10 are 0.99.

TABLE 1: SUMMARY STATISTICS

Summary statistics of monthly returns of portfolios, 1950–2009, as well as size, as measured by market capitalization of equity, as of December 31 of each year; average number of stocks; average monthly trading volume in thousands of shares; average prices; and average betas (as reported in the CFMRC database, based on sixty months of data for regressions). Betas are available starting in 1958 and trading volume is available starting in 1963. The Sharpe ratio is measured as the mean monthly return in excess of the monthly Treasury-bill return (from the CFMRC database) divided by the monthly standard deviation of returns. P1 is the portfolio comprising the decile of smallest stocks and P10 is the portfolio comprising the decile of largest stocks. S30 and S50 are the portfolios comprising the smallest 30 percent and 50 percent, respectively, and B30 and B50 are the portfolios comprising the biggest 30 percent and 50 percent, respectively. Each year on the last trading day (i.e., around December 31) stocks are sorted by size and must have a traded price on that day or the previous day. (A) displays equal-weighted returns; (B) displays value-weighted returns.

A. Equal-Weighted Returns (%), Sharpe Ratio, Size, and Number of Stocks

Portfolio	Mean Return	Median Return	Standard Deviation	Sharpe Ratio	Minimum Return	Maximum Return	Average Firm Size ($millions)	Average Number of Stocks
P1 (small)	3.21	1.69	10.29	0.27	–47.76	99.43	1.83	47
P2	1.77	1.29	6.95	0.19	–29.18	44.58	4.57	47
P3	1.11	1.00	5.84	0.11	–27.07	41.18	8.22	47
P4	1.07	1.10	5.71	0.11	–32.54	22.26	13.53	47
P5	0.95	0.88	5.58	0.09	–29.56	25.06	21.81	47
P6	0.87	1.07	5.34	0.08	–26.38	27.81	35.62	47
P7	0.80	0.77	5.32	0.06	–28.05	19.14	61.05	47
P8	0.94	1.13	5.30	0.09	–24.08	31.68	118.19	47
P9	0.89	0.83	5.12	0.08	–27.25	44.31	291.38	47
P10 (big)	0.88	1.05	4.60	0.09	–23.04	18.96	2,239.11	47
S30	2.74	1.82	9.00	0.25	–46.79	66.53	4.87	142
S50	2.09	1.79	7.35	0.22	–39.36	42.95	9.99	237
B50	0.94	1.16	5.21	0.09	–27.22	19.45	549.07	237
B30	0.94	1.11	5.08	0.09	–25.40	19.50	882.89	142

B. Value-Weighted Returns (%), Trading Volume, and Prices

Portfolio	Mean Return	Median Return	Standard Deviation	Minimum Return	Maximum Return	Average Trading Volume	Average Price ($)	Average Beta
P1 (small)	3.17	1.81	11.07	–48.08	131.36	699.6	2.23	1.14
P2	1.74	1.20	6.87	–28.63	42.77	772.1	4.38	1.15
P3	1.10	0.97	5.87	–26.94	44.94	910.7	5.74	1.10
P4	1.05	1.09	5.67	–32.39	22.33	756.6	7.92	1.11
P5	0.95	0.86	5.56	–29.47	25.85	960.2	9.55	1.12
P6	0.87	1.09	5.32	–26.95	23.73	950.7	13.16	1.06
P7	0.80	0.78	5.34	–28.54	20.84	1,184.0	16.60	1.03
P8	0.93	1.06	5.29	–25.07	27.58	1,768.4	21.89	1.01
P9	0.93	0.88	5.09	–25.40	46.32	2,476.2	35.07	0.96
P10 (big)	0.90	1.15	4.70	–20.05	18.20	6,315.7	39.43	0.99
S30	1.71	1.58	6.75	–32.08	40.60	794.1	4.12	1.13
S50	1.25	1.24	5.98	–31.88	28.23	819.8	5.96	1.12
B50	0.92	1.07	4.74	–21.13	17.59	2,539.0	25.23	1.01
B30	0.92	1.07	4.74	–20.88	17.50	3,520.1	32.13	0.99

Results by Decade

To determine how the results change over the sample period, the portfolio returns by decade are displayed in table 2 with significance tests comparing small versus big portfolios. Overall, for both equal-weighted returns (table 2A) and value-weighted returns (table 2B), the return differences are significant comparing the extreme decile portfolios (P1 and P10), the smallest and largest 30 percent (S30 and B30), and below and above median (S50 and B50). The size effect is robust across time with a positive monthly mean return (based on P1–P10 differences) ranging from 0.88 percent to 5.13 percent (based on equal-weighted results) and is significantly different in four of six decades. The size effect is strongest in the most recent two decades of the study. The significance of the results is similar for S30 and B30 though not as strong as for S50 and B50 portfolios.

TABLE 2: SMALL VERSUS BIG PORTFOLIO RETURNS BY DECADE

Average monthly portfolio returns, 1950–2009, overall and by decade. P1, S30, and S50 are the portfolios comprising of the 10 percent, 30 percent, and 50 percent of smallest stocks, respectively; P10, B30, and B50 are the portfolios comprising the 10 percent, 30 percent, and 50 percent of largest stocks, respectively. Each year on the last trading day (i.e., around December 31) stocks are sorted by size and must have a traded price on that day or the previous day. T-test p-values are displayed for tests of differences in means between corresponding small and big portfolios. (A) displays equal-weighted returns; (B) displays value-weighted returns.

A. Equal-Weighted

	Returns (%)						t-test p-values		
Portfolio	**P1 (small)**	**S30**	**S50**	**B50**	**B30**	**P10 (big)**	**P1–P10**	**S30–B30**	**S50–B50**
Overall	3.21	2.74	2.09	0.94	0.94	0.88	0.000	0.000	0.000
1950–1959	1.59	1.30	1.14	0.95	0.98	0.77	0.131	0.310	0.367
1960–1969	2.78	2.44	2.02	1.02	0.94	0.90	0.012	0.012	0.036
1970–1979	3.16	2.83	2.35	1.35	1.22	1.03	0.007	0.034	0.111
1980–1989	2.32	2.04	1.45	0.88	1.09	1.28	0.173	0.184	0.273
1990–1999	5.84	4.82	3.25	0.63	0.73	0.71	0.000	0.000	0.002
2000–2009	3.43	2.87	2.21	0.79	0.69	0.58	0.007	0.027	0.084

B. Value-Weighted

	Returns (%)						t-test p-values		
Portfolio	**P1 (small)**	**S30**	**S50**	**B50**	**B30**	**P10 (big)**	**P10–P10**	**S30–B30**	**S50–B50**
Overall	3.17	1.71	1.25	0.92	0.92	0.90	0.000	0.005	0.119
1950–1959	0.98	0.79	0.88	0.81	0.81	0.71	0.351	0.487	0.446
1960–1969	2.93	1.93	1.51	0.87	0.85	0.84	0.018	0.015	0.006
1970–1979	3.21	1.93	1.73	1.09	1.06	1.01	0.006	0.130	0.195
1980–1989	2.34	0.93	0.71	1.10	1.11	1.16	0.144	0.413	0.314
1990–1999	6.01	2.80	1.33	1.11	1.13	1.17	0.001	0.020	0.372
2000–2009	3.32	1.78	1.33	0.50	0.50	0.48	0.009	0.086	0.173

Results by Month

To investigate the calendar effect found in previous studies, the size effect results categorized by month are displayed in table 3; table 3A displays equal-weighted results and table 3B displays value-weighted results. Consistent with the study of U.S. stocks by Keim (1983), the size effect is most pronounced in January. The average monthly return difference of equal-weighted results for P1 and P10 portfolios is more than 10 percent. As in other studies, the new year appears to have a lingering impact on the size effect, because the next most prominent month is February. The difference in returns is predominately significant only in the months of January, February, April, May, and September. Even excluding January and examining the months of February through December collectively, we still find a significant size effect. The size effect is smallest and insignificant in the final three months of the calendar year and actually reverses in December.

Economic Factors and Crises

We investigate the relationship between the size effect and economic conditions to evaluate the possibility that the size effect is capturing the difference in how the equity values of small and large firms respond to economic conditions; in other words, the size effect may be a proxy for a type of economic risk factor. In prior research, Switzer (2010) finds that Canadian small stocks outperform large stocks in the year following an economic trough but underperform in the year before the business cycle peak.

Table 4 displays the magnitude of the size effect during different economic conditions. Table 4A displays the size effect during economic expansions and table 4B displays the size effect during recessions. Recession dates before 2008 are from Atta-Mensah and Tkacz (1998) and the 2008–2009 recession date is based on announced quarterly real gross domestic product (GDP) changes. The magnitude of the size effect, as captured by the P1–P10 return difference, is slightly larger during recessions than expansions, but given the increased volatility of returns in recessions the difference is statistically significant only during expansions. As well, given the relatively short duration of some expansions and recessions, many of the individual periods do not show significant differences. The stock market is a leading indicator of business cycles: Studies such as Siegel (1991) have shown that the stock market tends to peak approximately six months before a peak in the overall economy and tends to start rebounding approximately six months before the trough in the economy. This effect may drive some of the insignificant results.

Table 4C displays the size effect during loose versus tight monetary policy regimes as determined by the level of the bank rate relative to its twelve-month moving average. We expect periods characterized by loose monetary policy to

TABLE 3: SMALL VERSUS BIG PORTFOLIO RETURNS BY MONTH

Average monthly portfolio returns, 1950–2009, during January versus February through December. P1, S30, and S50 are the portfolios comprising 10 percent, 30 percent, and 50 percent of smallest stocks, respectively; P10, B30, and B50 are the portfolios comprising 10 percent, 30 percent, and 50 percent of largest stocks, respectively. Each year on the last trading day (i.e., around December 31) stocks are sorted by size and must have a traded price on that day or the previous day. T-test p-values are displayed for tests of differences in means between corresponding small and big portfolios. (A) displays equal-weighted returns; (B) displays value-weighted returns.

A. Equal-Weighted

	Returns (%)						t-test p-values		
Portfolio	**P1 (small)**	**S30**	**S50**	**B50**	**B30**	**P10 (big)**	**P1–P10**	**S30–B30**	**S50–B50**
January	11.80	10.36	8.06	2.88	2.32	1.74	0.000	0.000	0.000
February	4.81	3.84	3.00	0.94	0.85	0.66	0.002	0.008	0.028
March	2.38	2.35	1.93	1.43	1.42	1.15	0.121	0.202	0.313
April	3.99	3.22	2.48	0.62	0.83	0.71	0.024	0.046	0.055
May	2.43	2.41	1.84	0.90	1.01	1.16	0.099	0.898	0.167
June	2.08	1.33	0.65	–0.15	–0.04	0.38	0.193	0.184	0.245
July	1.84	1.34	1.06	0.95	0.90	0.78	0.157	0.321	0.447
August	2.09	1.75	1.16	0.37	0.40	0.66	0.133	0.132	0.246
September	2.84	1.93	0.94	–1.00	–1.12	–1.04	0.014	0.022	0.063
October	–0.27	–0.75	–1.02	–1.30	–1.04	–0.70	0.384	0.422	0.422
November	2.32	1.90	1.33	1.25	1.48	1.88	0.370	0.371	0.473
December	2.23	3.17	3.60	4.28	4.21	3.13	0.205	0.179	0.240
Feb. to Dec.	2.43	2.04	1.54	0.76	0.81	0.80	0.000	0.001	0.011

B. Value-Weighted

	Returns (%)						t-test p-values		
Portfolio	**P1 (small)**	**S30**	**S50**	**B50**	**B30**	**P10 (big)**	**P1–P10**	**S30–B30**	**S50–B50**
January	11.44	7.03	5.32	1.94	1.82	1.64	0.000	0.000	0.001
February	4.05	2.04	1.75	0.57	0.56	0.47	0.006	0.065	0.091
March	2.51	1.74	1.37	1.45	1.43	1.35	0.144	0.379	0.466
April	3.41	1.79	1.43	0.65	0.68	0.66	0.049	0.122	0.181
May	2.44	1.67	1.16	1.10	1.13	1.15	0.103	0.286	0.472
June	2.29	0.08	–0.33	0.17	0.20	0.33	0.212	0.448	0.280
July	1.43	0.31	0.55	1.01	0.99	0.94	0.305	0.180	0.280
August	2.01	1.31	0.59	0.54	0.52	0.53	0.124	0.232	0.479
September	3.15	0.41	–0.29	–1.21	–1.22	–1.23	0.017	0.064	0.181
October	–0.50	–1.36	–1.41	–0.54	–0.49	–0.34	0.456	0.254	0.247
November	2.49	0.90	0.58	1.78	1.84	2.04	0.374	0.192	0.112
December	3.31	4.55	4.23	3.51	3.48	3.22	0.471	0.154	0.174
Feb. to Dec.	2.42	1.23	0.89	0.82	0.84	0.83	0.000	0.104	0.416

be related to an increase in equity prices due to an increase in funds available for investment and an apparent decrease in the risk premium. Loose monetary policy periods are defined as periods when the bank rate is below the twelve-month average and tight monetary policy periods are periods when the bank rate is above the average. The size effect, as captured by the P1–P10 return difference, is significant during both loose and tight monetary policy regimes, but the magnitude is approximately twice as large during loose monetary regimes.

We also investigate the size effect during periods of market turmoil. Specifically, we examine the performance of small versus large stocks during the October 1987 stock market crash, during the July 1997 Asian crisis, and during the recent financial crisis from July to December 2008. In October 1987, P1 underperformed P10 by 28.03 percent. In July 1997, P1 underperformed P10 by 14.05 percent. During the last half of 2008, P1 underperformed P10 by a cumulative amount of 31.30 percent. In the following six months, from January to June 2009, P1 outperformed P10 by 58.00 percent. These results are consistent with the general notion that small stocks have higher betas than large stocks but are more sensitive than traditional risk measures would indicate during and following major financial events.

TABLE 4: SMALL VERSUS BIG PORTFOLIO RETURNS DURING EXPANSION OR RECESSION PERIODS

Average monthly value-weighted portfolio returns, 1950–2009, during expansionary or recessionary periods. Recession dates before 2008 are from Atta-Mensah and Tkacz (1998); the 2008–2009 recession date is based on announced quarterly real GDP changes. P1, S30, and S50 are the portfolios comprising 10 percent, 30 percent, and 50 percent of smallest stocks, respectively; P10, B30, and B50 are the portfolios comprising 10 percent, 30 percent, and 50 percent of largest stocks, respectively. Each year on the last trading day (i.e., around December 31) stocks are sorted by size and must have a traded price on that day or the previous day. T-test p-values are displayed for tests of differences in means between corresponding small and big portfolios. (A) displays expansionary period returns; (B) displays recessionary period returns; (C) monetary policy is loose (tight) if the bank rate is below (above) the twelve-month moving average.

A. Expansions

	Returns (%)						t-test p-values		
Year/Month	P1 (small)	S30	S50	B50	B30	P10 (big)	P1–P10	S30–B30	S50–B50
1950/1–1956/12	0.96	0.83	1.35	1.12	1.14	1.06	0.449	0.299	0.356
1958/1–1960/3	2.16	1.48	0.86	0.82	0.79	0.67	0.165	0.233	0.483
1961/4–1974/5	2.89	1.74	1.32	0.70	0.69	0.68	0.003	0.015	0.020
1975/4–1979/12	4.57	3.06	2.96	1.87	1.81	1.69	0.015	0.107	0.128
1980/7–1981/6	2.48	1.36	2.16	0.43	0.42	0.86	0.317	0.377	0.251
1983/1–1990/3	2.40	0.76	0.35	1.14	1.17	1.18	0.138	0.315	0.153
1991/4–2008/9	4.33	2.24	1.28	0.91	0.93	0.96	0.000	0.020	0.254
2009/7–2009/12	4.91	5.35	6.01	2.13	2.03	1.68	0.092	0.042	0.046
Average	3.17	1.71	1.25	0.92	0.92	0.99	0.000	0.005	0.119

B. Recessions

	Returns (%)						t-test p-values		
Year/Month	P1 (small)	S30	S50	B50	B30	P10 (big)	P1–P10	S30–B30	S50–B50
1957/1–1957/12	–2.67	–1.58	–2.47	–1.85	–1.89	–1.98	0.386	0.440	0.373
1960/4–1961/3	2.03	1.28	1.52	1.75	1.73	1.73	0.451	0.399	0.444
1974/6–1975/3	0.68	–0.22	–0.25	0.37	0.43	0.33	0.470	0.443	0.445
1980/1–1980/6	9.94	6.51	5.04	3.33	3.29	3.44	0.294	0.354	0.413
1981/7–1982/12	–0.63	–0.74	–0.50	–0.27	–0.25	–0.13	0.430	0.429	0.467
1990/4–1991/3	12.02	1.64	–0.25	0.21	0.21	0.35	0.149	0.260	0.416
2008/10–2009/6	3.41	3.16	2.49	–0.62	–0.67	–0.77	0.272	0.281	0.317
Average	2.82	0.92	0.89	0.68	0.68	0.15	0.119	0.375	0.386

C. Loose versus Tight Monetary Policy

	Returns (%)						t-test p-values		
Regime	P1 (small)	S30	S50	B50	B30	P10 (big)	P1–P10	S30–B30	S50–B50
Loose	4.09	2.36	1.87	1.14	1.12	1.06	0.000	0.002	0.030
Tight	2.21	1.05	0.62	0.69	0.71	0.74	0.014	0.227	0.438

Sector Impact

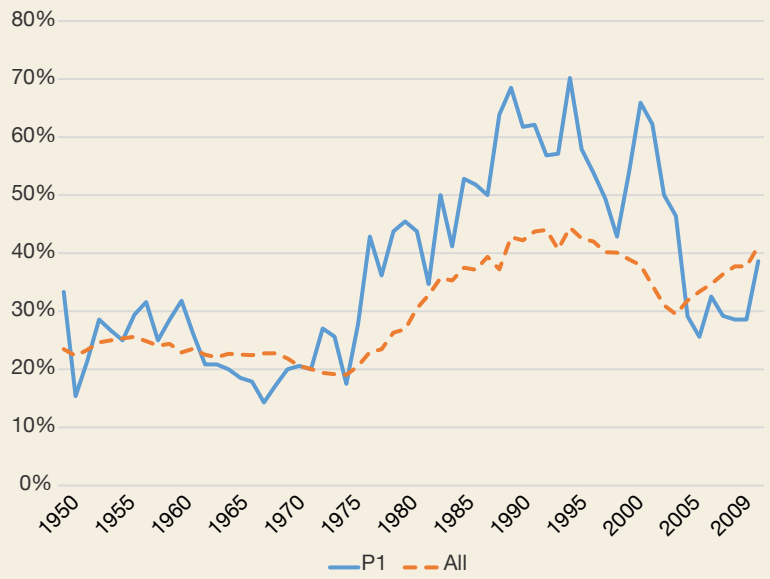
We consider the extent to which sector concentrations might be driving our results. Because the Canadian market tends to have a greater proportion of stocks in the energy and materials sectors, we examine the prevalence of such stocks across the various size portfolios. Specifically we examine the percentage of stocks in each portfolio that were either energy/materials or other. We find that, although smaller stocks tend to be more concentrated in those two sectors, the difference doesn't appear substantial. On average, 33.6 percent of P1 stocks are energy/materials and 30.4 percent of P10 stocks are energy/materials.

We obtain sector returns (based on the ten Global Industry Classification Standard [GICS] sectors) for our dataset using all the stocks traded on the Toronto Stock Exchange, but only since 1987. Annual returns for energy/minerals were 11.70 percent and returns in other sectors were 11.17 percent, but the standard deviation of returns were 19.67 percent and 13.86 percent, respectively.

We also investigate sector concentration over time. Figure 1 displays energy/materials percentage for P1 compared with the overall sample across for 1950–2009. Overall sector concentration varies from 20 percent to 43 percent. As the energy/materials overall concentration increases, it appears to increase more dramatically for P1 stocks, which show a maximum 70-percent concentration. The P1 concentration in these two sectors exceeds the overall average between 1974 and 2003. However, because average energy/materials returns are similar to those in other sectors, we conclude that sector returns do not appear to be driving our results.

FIGURE 1: SECTOR CONCENTRATION OVER TIME

Comparison of the percentage of stocks (vertical axis) in the P1 portfolio (smallest stocks) that is concentrated in either the energy or materials sectors versus a similar measure for the market, 1950–2009 (horizontal axis).



Canada–U.S. Comparison

We compared the Canadian micro-cap and U.S. small-cap returns to determine the potential value of a Canadian micro-cap portfolio to U.S.-based investors. The Canadian and U.S. markets are among the most integrated and highly correlated in the world, so we wanted to determine the relative nature of the size effect between the two countries. We begin our analysis by comparing overall Canadian market returns as measured by the CFMRC value-weighted index with the U.S. market returns as measured by the Center for Research in Security Prices (CRSP) value-weighted index, derived from data on Ken French's website, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/. During 1950–2009, the average monthly return is 0.92 on the Canadian market and 0.94 percent on the U.S. market. The correlation of the returns is 0.805 and the return series are not significantly different.

TABLE 5: CANADA–U.S. COMPARISON

Average monthly value-weighted portfolio returns (Return), standard deviations (SD) return differences between Canadian and the U.S. portfolios, and Sharpe ratios (Sharpe) for the period 1950–2009. Returns are in local currencies for each country. P1 is the portfolio comprising the decile of smallest stocks and P10 is the portfolio comprising the decile of largest stocks. S30 and S50 are the portfolios comprising the smallest 30 percent and 50 percent, respectively, and B30 and B50 are the portfolios comprising the biggest 30 percent and 50 percent, respectively. All U.S. data including Fama and French's SMB factor are from Ken French's webpage (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/). In the row "S50–B50," the U.S. data are based the SMB factor. T-test p-values are displayed for tests of differences in means between the Canadian and U.S. samples.

	Canada			United States				
Portfolio	Return	SD	Sharpe	Return	SD	Sharpe	Return Differences	t-test p-value
P1 (small)	3.17	11.07	0.24	1.17	6.09	0.13	1.99	0.000
P2	1.74	6.87	0.19	1.14	5.99	0.13	0.60	0.041
P3	1.10	5.87	0.11	1.19	5.74	0.14	–0.09	0.381
P4	1.05	5.67	0.10	1.14	5.52	0.14	–0.09	0.377
P5	0.95	5.56	0.09	1.15	5.33	0.14	–0.20	0.241
P6	0.87	5.32	0.08	1.10	5.02	0.14	–0.23	0.200
P7	0.80	5.34	0.06	1.11	4.93	0.15	–0.31	0.127
P8	0.93	5.29	0.09	1.06	4.82	0.14	–0.14	0.297
P9	0.93	5.09	0.09	1.02	4.45	0.14	–0.09	0.356
P10 (big)	0.90	4.70	0.09	0.89	4.15	0.12	0.01	0.494
P1–P10	2.27	10.32	0.18	0.28	4.66	–0.02	1.99	0.000
S30	1.71	6.75	0.19	1.17	5.85	0.13	0.54	0.054
B30	0.92	4.74	0.10	0.93	4.19	0.13	–0.01	0.479
S30–B30	0.79	5.21	0.06	0.24	3.71	–0.04	0.55	0.011
S50	1.25	5.98	0.13	n/a	n/a	n/a	n/a	n/a
B50	0.92	4.74	0.10	n/a	n/a	n/a	n/a	n/a
S50–B50	0.33	3.88	–0.03	0.18	2.93	–0.07	0.16	0.189

We divide the stocks by market capitalizations; table 5 displays results for the size portfolios by decile portfolios P1 through P10 as well as S30 and B30 and S50 and B50. For the U.S. market, our proxy for the S50/B50 is the Fama-French SMB factor.[2] The size effect in Canada is more pronounced than in the United States. The average monthly returns for P10 for each country are almost identical: 0.90 percent in Canada and 0.89 percent in the United States. The Canadian P10 return volatility is 4.70 percent versus 4.15 percent in the United States. The return differences are not significant for P3 through P10. P1 and P2 returns, however, are significantly different between the two countries, with a monthly difference of 1.99 percent for P1 and 0.60 percent for P2. The result is a more pronounced size effect in Canada, as captured by the P1–P10 monthly return difference of 2.27 percent in Canada versus 0.28 percent in the United States. Even as captured by S30 minus B30, the monthly return difference in Canada is 0.79 percent versus 0.28 percent in the United States, and as captured by S50 minus B50, 0.33 percent in Canada versus 0.18 percent in the United States.

Investment Opportunities

Because Canadian micro-cap and U.S. small-cap portfolios appear different, we investigate the impact that including Canadian micro-cap stocks in a portfolio may have on return and risk. Table 6 and figure 2 display the impact from a Canadian perspective. We compare returns and return-to-risk measures for a variety of equity-based portfolios before and after including a portion of dedicated micro-cap stocks. The Canadian index we use for standard equity returns is represented by the CFMRC value-weighted index for all domestic common equities. The bond index is from the CFMRC database and is derived from the long-term government bond rate series from Cansim (series B14013), which includes the

FIGURE 2: DOMESTIC PORTFOLIO COMPARISON

Comparison of annualized returns (vertical axis) and standard deviations (horizontal axis) on a variety of balanced Canadian portfolios including and excluding an investment in Canadian small stocks, 1950–2009. Stocks are measured by the overall CFRM index value-weighted return; small stocks (micro-cap) include a value-weighted portfolio comprising the decile of smallest stocks; bonds represent long-term government bond returns.

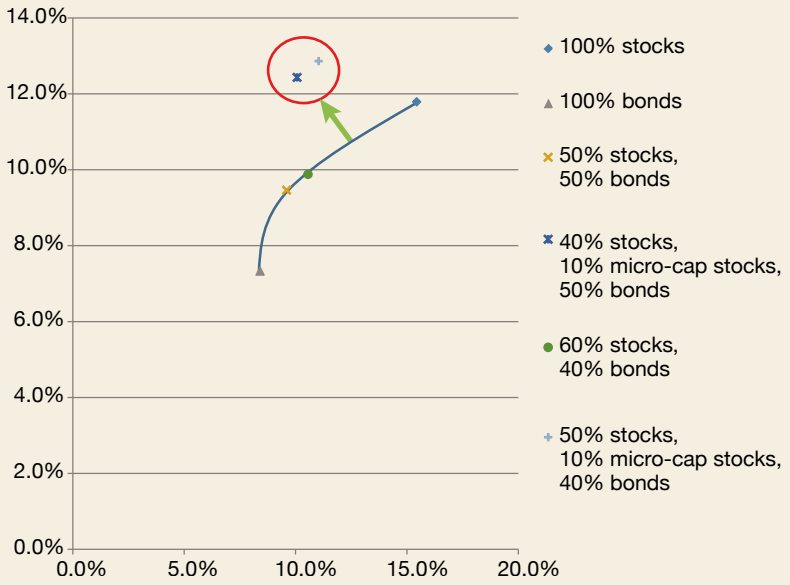


TABLE 6: DIVERSIFIED BALANCED PORTFOLIO COMPARISON

Comparison of annualized returns (Return), standard deviations (SD), and Sharpe ratios (Sharpe) on a variety of balanced portfolios including and excluding an investment in Canadian small stocks during 1950–2009 and two subperiods, 1950–1979 and 1980–2009. Stocks are measured by the overall CFRM index value-weighted return; micro-cap stocks include a value-weighted portfolio comprising the smallest stocks; and bonds represent long-term government bond returns. The Sharpe ratio is measured as annualized portfolio returns in excess of Treasury-bill returns divided by annualized standard deviation of returns.

	1950–2009			1950–1979			1980–2009		
	Return	SD	Sharpe	Return	SD	Sharpe	Return	SD	Sharpe
100% stocks	11.79%	15.44%	0.396	12.46%	14.15%	0.570	11.12%	16.64%	0.250
100% micro-cap stocks	45.39%	38.36%	1.035	33.25%	29.12%	0.991	58.13%	45.46%	1.126
100% bonds	7.33%	8.41%	0.197	3.24%	5.48%	–0.211	11.46%	10.40%	0.432
50% stocks, 50% bonds	9.46%	9.60%	0.394	7.61%	8.20%	0.392	11.29%	10.78%	0.401
40% stocks, 10% micro-cap stocks, 50% bonds	12.43%	10.07%	0.670	9.50%	8.44%	0.605	15.34%	11.40%	0.735
60% stocks, 40% bonds	9.88%	10.56%	0.398	8.48%	9.29%	0.440	11.25%	11.67%	0.368
50% stocks, 10% micro-cap stocks, 40% bonds	12.86%	11.04%	0.651	10.40%	9.50%	0.632	15.30%	12.33%	0.780

average yield on a portfolio of ten-plus-year Government of Canada bonds. The Sharpe ratio is measured as annualized portfolio returns in excess of Treasury-bill returns divided by annualized standard deviation of returns.

Despite the large volatility of the micro-cap stock portfolio during 1950–2009, the offsetting strong return allowed a 10-percent allocation of micro-cap stocks to a balanced portfolio to have a considerable return-to-risk impact. For example, a standard balanced portfolio with 50 percent in a stock index and 50 percent in a bond index has a Sharpe ratio of 0.394. When 10 percent of the stock is reallocated to micro-cap stocks, the Sharpe ratio increases by more than 70 percent to 0.670. For a portfolio with 60 percent in a stock index and 40 percent in a bond index, the Sharpe ratio is 0.398; reallocating 10 percent of the stock to micro-cap stocks increases the Sharpe ratio by 64 percent to 0.651. The results are not sensitive to the period under study. In the first subperiod, 1950–1979, the 50-50 stock-bond portfolio has a Sharpe ratio of 0.392, which increases by 54 percent to 0.605 with the 10-percent substitution of micro-cap stocks. The 60-40 stock-bond portfolio has a Sharpe ratio of 0.440, which increases by 44 percent to 0.632 with the 10-percent substitution of micro-cap stocks. In the second subperiod, 1980–2009, the 50-50 stock-bond portfolio has a Sharpe ratio of 0.401, which increases by 83 percent to 0.735 with the 10-percent substitution of micro-cap stocks. The 60-40 stock-bond portfolio has a Sharpe ratio of 0.368, which increases by 112 percent to 0.780 with the 10-percent substitution of micro-cap stocks. Thus even a modest reallocation among equities to include more micro-cap stocks can provide a substantial return-to-risk increase.

Because diversification is one key reason to consider the addition of new assets, we estimate the correlation between our different value-weighted size portfolios and the value-weighted CFMRC index. The correlations for each size-sorted portfolio relative to the overall market decreases monotonically from 0.96 with P10 to 0.42 for P1. To confirm the robustness of this result, we also estimate the mean-variance efficient frontier using the entire portfolio of Canadian equities and our bond index and compare this to the case that includes the small-size portfolio. Consistent with the previous results, we find an improvement in the mean-variance efficient (MVE) frontier by adding the micro-cap stock portfolio to our set of available assets and a significant weighting for the micro-cap stock portfolio in the resulting mean-variance efficient portfolio.

Next we examine the impact of adding Canadian micro-cap stocks to the portfolio of an international investor. We begin by examining the impact of global diversification on a U.S.-based investor's overall portfolio. Table 7A displays the correlation of stock returns in U.S. dollars among the ten developed markets studied in Eun et al. (2008).[3] Based on available data from Datastream, the sample covers 1973–2009. The two highest correlations are between Germany and the Netherlands (0.792) followed by Canada and the United States (0.752). The two lowest correlations are Hong Kong and Italy (0.290) followed by Hong Kong and Japan (0.310). We also include Canadian micro-cap stocks (value-weighted portfolio P1 converted to U.S. dollars), which has a correlation with the overall Canadian Datastream total return index of 0.372. Despite the large correlation between the overall Canadian and U.S. markets, the correlation between the micro-cap Canadian portfolio and the U.S. market is only 0.213, which is substantially lower than the correlation between U.S. market returns and any of the other developed-market country returns.

We use simple strategies to increase the diversification of a global portfolio and find significant improvements in the reward-risk trade-off for U.S. investors. Results are presented in figure 3 and table 7B. We begin by examining risk and return to a U.S. investor who invests exclusively in U.S. stocks. The annualized

FIGURE 3: INTERNATIONAL STOCK PORTFOLIO COMPARISONS WITH CANADIAN SMALL STOCKS

Comparison of U.S. dollar total returns (vertical axis) and standard deviations (horizontal axis) for U.S. equities, international equities (Australia, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, United Kingdom, and United States), and Canadian small (micro-cap) stocks. Monthly data for 1973–2009 are from Datastream. Canadian small (micro–cap) stocks comprise value-weighted returns of the decile of smallest stocks (P1, see table 1) converted to U.S. dollars.

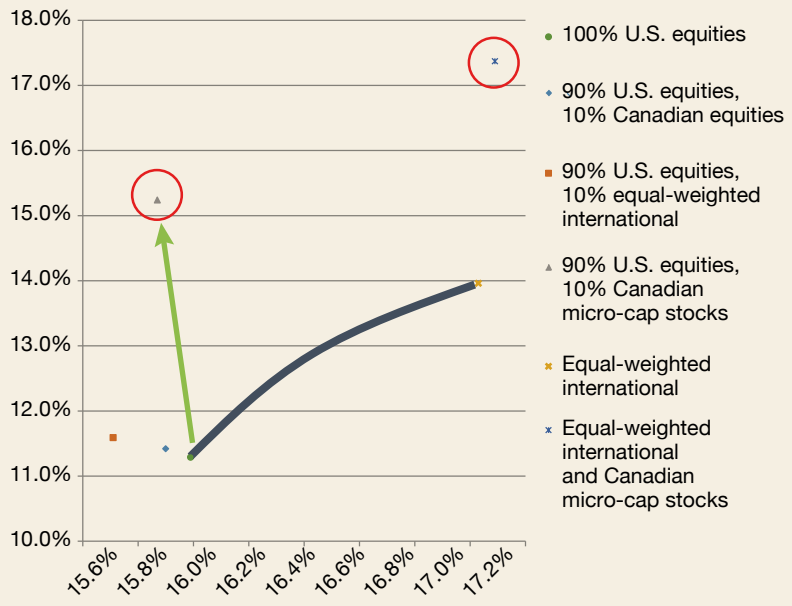


TABLE 7: COMPARISON OF INTERNATIONAL STOCK RETURNS WITH CANADIAN MARKET AND MICRO-CAP STOCK RETURNS

Comparison of U.S. dollar total returns across ten developed markets: Australia (AUS), Canada (CAN), France (FRA), Germany (GER), Hong Kong (HK), Italy (ITA), Japan (JAP), Netherlands (NET), United Kingdom (UK), and United States (US). Monthly data for 1973–2009 are from Datastream. Canadian micro-cap stocks (Can micro) comprise value-weighted returns of the decile of smallest stocks (P1, see table 1) converted to U.S. dollars. (A) displays correlations; (B) provides a comparison of returns (Return), standard deviations (SD), and Sharpe ratios (Sharpe) on a variety of portfolios for a U.S. investor including and excluding an investment in Canadian micro-cap stocks. The Sharpe ratio is measured as annualized portfolio returns in excess of U.S. Treasury-bill returns (from Ken French's website, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/) divided by annualized standard deviation of returns. (C), (D), and (E) are similar to (B) but from the perspective of U.K., German, and French investors, respectively.

A. Correlations

	AUS	CAN	FRA	GER	HK	ITA	JAP	NET	UK	US	CAN micro
AUS	1.000										
CAN	0.655	1.000									
FRA	0.512	0.558	1.000								
GER	0.456	0.515	0.700	1.000							
HK	0.407	0.415	0.371	0.389	1.000						
ITA	0.381	0.436	0.586	0.542	0.290	1.000					
JAP	0.364	0.353	0.433	0.413	0.310	0.366	1.000				
NET	0.554	0.675	0.742	0.792	0.445	0.544	0.480	1.000			
UK	0.556	0.590	0.626	0.559	0.431	0.481	0.415	0.718	1.000		
US	0.566	0.752	0.576	0.558	0.402	0.412	0.348	0.697	0.633	1.000	
CAN micro	**0.317**	**0.372**	**0.174**	**0.155**	**0.234**	**0.205**	**0.110**	**0.221**	**0.245**	**0.213**	**1.000**

B. Diversified Portfolios for a U.S. Investor

	Return	Std Dev	Sharpe
100% U.S. equities	11.29%	15.99%	0.345
90% U.S. equities, 10% Canadian equities	11.42%	15.90%	0.355
90% U.S. equities, 10% equal–weighted international	11.59%	15.71%	0.370
90% U.S. equities, 10% Canadian micro–cap stocks	15.24%	15.87%	0.596
Equal-weighted international	13.96%	17.03%	0.480
Equal-weighted international and Canadian micro–cap stocks	17.37%	17.09%	0.678

C. Diversified Portfolios for a U.K. Investor

	Return	Std Dev	Sharpe
100% U.K. equities	14.21%	22.40%	0.376
90% U.K. equities, 10% Canadian equities	14.04%	21.37%	0.387
90% U.K. equities, 10% equal-weighted international	14.21%	21.58%	0.391
90% U.K. equities, 10% Canadian micro-cap stocks	17.94%	21.62%	0.562

D. Diversified Portfolios for a German Investor

	Return	Std Dev	Sharpe
100% German equities	12.89%	20.68%	0.344
90% German equities, 10% Canadian equities	12.86%	19.69%	0.359
90% German equities, 10% equal-weighted international	13.03%	20.02%	0.362
90% German equities, 10% Canadian micro-cap stocks	16.72%	19.75%	0.554

E. Diversified Portfolios for a French Investor

	Return	Std Dev	Sharpe
100% French equities	15.88%	23.48%	0.430
90% French equities, 10% Canadian equities	15.55%	22.28%	0.438
90% French equities, 10% equal-weighted international	15.72%	22.59%	0.440
90% French equities, 10% Canadian micro-cap stocks	19.49%	22.29%	0.615

return is 11.29 percent and the annualized standard deviation of returns is 15.99 percent. Based on an annualized average one-month Treasury-bill return of 5.78 percent, the resulting Sharpe ratio is 0.345. By mixing a 90-percent U.S. equity investment with a 10-percent weight in Canadian micro-cap stocks, we find a slight improvement in the Sharpe ratio to 0.355. By mixing a 90-percent U.S. equity investment with a 10-percent weight equally distributed across the other nine developed markets, we find a further slight improvement in the Sharpe ratio to 0.370. When we replace the 10-percent international component with 10 percent from the Canadian micro-cap stock portfolio (converted to U.S. dollars), we find a much more substantial improvement in the Sharpe ratio to 0.596.

We also consider a more balanced approach by forming a portfolio equally weighted across the ten developed markets. As expected, the Sharpe ratio improves from the 100-percent U.S. equity measure of 0.345 to 0.480, but this is less of an improvement than with the 10-percent allocation to micro-cap Canadian stocks. Finally, if we allow for an equal weighting across the ten markets and include Canadian micro-cap stocks as well, we see a further improvement in the Sharpe ratio to 0.678, or almost double relative to the U.S.-only portfolio. Once again, for robustness we examine the correlations and the impact of adding this asset class to the mean-variance frontier. We find that its inclusion leads to an improvement in the mean-variance frontier and a positive weighting in the calculation of the mean-variance efficient portfolio. We repeat the analysis from the perspective of various European investors in tables 7C, 7D, and 7E with similar results.

Micro-Cap as a Unique Asset Class

Following Huberman and Kandel (1987), we use mean-variance spanning techniques to determine whether Canadian micro-cap stocks can be considered a separate asset class based on statistical tests. We also test whether a set of other assets can essentially replicate or "span" Canadian micro-cap stocks in terms of returns and risk characteristics (i.e., mean-variance); see Ferson et al. (1993) for tests of conditional mean-variance spanning. Results from monthly data for 1973–2009 are displayed in table 8. The first two regressions test whether Canadian micro-cap stocks are spanned by other Canadian decile portfolios. The first regression contains the five largest-size deciles as independent variables. The intercept term is significantly greater than zero and the spanning hypothesis is rejected. The second regression contains all the other nine larger-size deciles as independent variables. The intercept term is again significantly greater than zero and the spanning hypothesis is rejected. The P2 and P3 betas are significantly positive and the P10 beta is significantly negative, indicating a positive relationship between the micro-cap portfolio and the two next-largest portfolios but a negative relationship with the largest firms.

The final two regressions test whether Canadian micro-cap stocks are spanned by other MSCI country portfolios. The third regression contains nine MSCI country returns excluding Canada as independent variables. The intercept term is significantly greater than zero and the spanning hypothesis is rejected. The fourth regression contains ten MSCI country returns including Canada as independent variables. The intercept term is again significantly greater than zero and the spanning hypothesis is rejected. Both the Canadian index and U.S. index beta coefficients are positive but not significantly positive. Overall these results suggest that the Canadian micro-cap stock portfolio is a unique asset class that should be considered for diversification purposes, which is consistent with previous results that find the Canadian micro-cap stock portfolio increases the reward-risk characteristics for an international portfolio.

TABLE 8: MEAN-VARIANCE SPANNING TESTS FOR CANADIAN MICRO-CAP STOCKS

Results of mean-variance spanning tests of the returns, R_i, of Canadian micro-cap stocks comprising value-weighted returns of the decile of smallest stocks (P1, see table 1) from the CFRM database—the ordinary least squares (OLS) regression dependent variable (converted to U.S. dollars in regressions involving international stocks). We run the OLS regression:

$$R_i = \alpha_i + \sum_{k=1}^{n} \beta_{ik} I_k + \varepsilon_i$$

The set of independent variables, *I*, in different regressions include the various Canadian decile portfolios P2 through P10 and U.S. dollar MSCI total returns across ten developed markets: Australia (AUS), Canada (CAN), France (FRA), Germany (GER), Hong Kong (HK), Italy (ITA), Japan (JAP), Netherlands (NET), United Kingdom (UK), and United States (US); α_i is the estimated intercept of the regression, β_k is the estimated regression coefficient associated with each dependent variable *k*, and ε_i is the error term. Monthly data for the 1973–2009 period are from Datastream. ***, **, and * denote the 1-percent, 5-percent, and 10-percent significance levels, respectively. The F-statistic (F-stat) and p-value for the spanning test are displayed with the null hypothesis that the Canadian micro-cap stock portfolio, P1, is spanned by either other Canadian size portfolios or other MSCI country indexes (either including or excluding Canada), which is equivalent to the joint hypothesis that α equals zero and the sum of βs equal one.

Regression	α	βP2	βP3	βP4	βP5	βP6	βP7	βP8	βP9	P10		F-stat	p-value
1	0.031***					0.404*	0.873***	0.436**	0.022	–0.834***		34.63	0.000
2	0.024***	0.558***	0.460***	0.070	0.148	–0.081	0.149	0.069	–0.028	–0.430***		25.57	0.000
	α	βAUS	βCAN	βFRA	βGER	βHK	βITA	βJAP	βNET	βUK	βUS	F-stat	p-value
3	0.031***	0.228		–0.821**	–0.988***	–0.043	0.159	–0.333	0.664**	1.493***	0.491	22.30	0.000
4	0.035***	0.219	0.265	–0.877***	–1.009***	–0.044	0.146	–0.321	0.708**	1.451***	0.330	21.83	0.000

TABLE 9: INVESTABILITY OF CANADA SIZE PORTFOLIOS

Summary statistics of monthly value-weighted returns (Return) and standard deviations (SD) of portfolios, 1950–2009, as measured by market capitalization of equity as of December 31 of each year. Filters are used to eliminate stocks in the portfolios according to the turnover measured as the average trading volume in a given year divided by the total market capitalization.

Portfolio		P1 (small)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (big)
Unconstrained	Return	3.17%	1.74%	1.10%	1.05%	0.95%	0.87%	0.80%	0.93%	0.93%	0.90%
	SD	11.07%	6.87%	5.87%	5.67%	5.56%	5.32%	5.34%	5.29%	5.09%	4.70%
Turnover > 10%	Return	2.87%	1.63%	0.88%	0.98%	0.67%	0.87%	0.75%	0.85%	0.87%	0.88%
	SD	10.66%	7.70%	6.68%	6.58%	6.36%	6.06%	6.04%	5.58%	5.44%	4.51%
Turnover > 30%	Return	2.65%	1.45%	0.80%	0.87%	0.57%	0.78%	0.68%	0.78%	0.80%	0.84%
	SD	10.36%	7.25%	6.50%	6.38%	6.19%	5.93%	5.94%	5.49%	5.33%	4.45%
Turnover > 50%	Return	2.59%	1.35%	0.72%	0.82%	0.50%	0.74%	0.64%	0.74%	0.77%	0.81%
	SD	10.27%	7.14%	6.41%	6.29%	6.12%	5.88%	5.89%	5.45%	5.31%	4.42%

Investability and Realizability of Returns

So far this analysis follows the standard academic practice of assuming that investors can buy and sell the necessary stocks to rebalance portfolios on the day they do the rebalancing at zero cost relative to the closing stock prices on the day of rebalancing. This may be a reasonable assumption for the largest firms in our portfolios where it may be possible to buy or sell large positions with limited or no market impact, but this is not likely to be the case for smaller firms. Because one major goal of our analysis is to determine the value of investing in micro-cap stocks, investability and realizable returns are significant concerns. In our sample, the average trading volume (in number of shares) of the P1 portfolio is about one-tenth that of the P10 portfolio, so a lack of investability and its associated costs are potentially significant. To address this issue we perform a series of tests incorporating different constraints and trading costs to simulate what would happen during implementation of an investment strategy focusing on micro-cap stocks.

We consider two approaches to examine the possible impact of investability of the smallest-size portfolios. First, we examine the impact of filters related to the number of shares (as a percentage of the entire float) that trade in a given year. We consider filters of 10 percent, 30 percent, and 50 percent. For example, if in December the total trading volume in the past twelve months is less than 10 percent of the float, then that firm is deleted from any portfolio considerations for the subsequent year and the size portfolios are sorted on the remaining "investable" stocks. Results are presented in table 9. For each of the filters, we find that the small-size portfolio continues to outperform larger-size portfolios by a wide margin. With the 10-percent filter we find that the smallest-size portfolio has an average monthly return of 2.87 percent (40.40 percent annualized), which is slightly lower than the unconstrained return of 3.17 percent (45.43 percent annualized); the largest portfolio has an average monthly return of 0.88 percent (11.02 percent annualized), which is slightly lower than the average return for the unconstrained portfolio of 0.90 percent (11.35 percent annualized). As we move to the more-restrictive turnover filters, the average return continues to decrease, to 2.59 percent per month (35.87 percent annualized) for the smallest-size portfolio and 0.81 percent per month (10.02 percent annualized) for the largest-size portfolio using the 50-percent filter. Significant block holdings in the Canadian market result in an average turnover in the Canadian market that is lower than that in the U.S. market but more similar to that in many other countries; as a result, the 50-percent turnover filter is a very restrictive investability criteria in the Canadian context. Thus even with these constraints, the size effect in Canada remains robust.

> "Significant block holdings in the Canadian market result in an average turnover in the Canadian market that is lower than that in the U.S. market but more similar to that in many other countries."

Second, we perform simulations based on the CFMRC daily database counterpart of the CFMRC monthly database considered in the earlier analysis. Our daily data consist of the closing stock prices (i.e., the standing bid and ask prices at the close as well as the price at which the last transaction occurred), number of shares outstanding, the daily trading volume, and the average size of trades on each day. Due to data limitations we are restricted to the period 1995–2009. The stocks are sorted into deciles based on their market capitalization at the end of December of each year and these data are used to create value-weighted portfolios for each decile. We focus on portfolios consisting of the decile of smallest stocks (P1), the two deciles of smallest stocks (P1+P2), and the three deciles of smallest stocks (P1+P2+P3). For comparison purposes, the average monthly compound total return on the S&P/TSX Canadian market index was 0.79 percent during 1995–2009, or 9.96 percent on an annualized basis

TABLE 10: FURTHER INVESTIGATION OF THE INVESTABILITY OF CANADA SIZE PORTFOLIOS

Average monthly compound returns (Return) and standard deviations (SD) from investments in Canadian small stocks in the decile of smallest stock (P1), the two deciles of smallest stocks (P1+P2), and the three deciles of smallest stocks (P1+P2+P3) based on simulations over 1995–2009 using daily data for each stock. Portfolios are value-weighted. For annual rebalancing, a flat commission rate of $100 per trade is incorporated. (A) displays results based on various levels of initial investments in the portfolio ($10 million, $30 million, or $50 million) but with no restrictions placed on the maximum ownership position in any one stock and allowing for trading in up to 100 percent of the actual volume on the rebalancing day(s) in January each year. (B) displays results based on various levels of initial investments in the portfolio ($10 million, $30 million, or $50 million), with restrictions placed on the maximum ownership position of 30 percent in any one stock and allowing for trading in up to either 10 percent, 20 percent, or 30 percent of the actual volume on the rebalancing day(s) in January each year. For comparison, the average monthly compound total return on the S&P/TSX Canadian market index was 0.79 percent.

A. No ownership restrictions and trading allowed up to 100% of actual volume

Initial Portfolio Investment	Portfolio(s)	P1	P1+P2	P1+P2+P3
$10 million	Return	5.66%	3.06%	1.88%
	SD	42.36%	11.92%	8.47%
$30 million	Return	3.92%	3.38%	1.80%
	SD	26.86%	15.99%	8.27%
$50 million	Return	3.39%	3.02%	1.71%
	SD	23.27%	14.12%	8.09%

B. 30% maximum ownership restriction in any one stock and trading up to 10%, 20%, or 30% of actual volume

Initial Portfolio Investment	Maximum Trading Volume	Portfolio(s)	P1	P1+P2	P1+P2+P3
$10 million	10%	Return	3.23%	2.67%	1.54%
		SD	23.69%	13.35%	8.12%
	20%	Return	3.55%	3.13%	1.68%
		SD	24.24%	15.56%	8.15%
	30%	Return	3.83%	3.31%	1.78%
		SD	26.44%	15.61%	8.21%
$30 million	10%	Return	2.14%	1.99%	1.86%
		SD	15.31%	10.08%	10.80%
	20%	Return	2.39%	2.35%	2.21%
		SD	14.31%	10.96%	13.64%
	30%	Return	2.65%	2.53%	1.57%
		SD	16.69%	11.70%	8.10%
$50 million	10%	Return	1.80%	1.69%	1.58%
		SD	14.42%	9.52%	8.78%
	20%	Return	2.10%	2.01%	1.96%
		SD	13.33%	9.53%	11.45%
	30%	Return	2.22%	2.17%	2.18%
		SD	13.45%	9.97%	13.27%

and the average Treasury-bill yield (Cansim series v12176 and v121778) was 3.62 percent.

We investigate the impact of some basic costs and constraints faced by actual portfolio managers. We incorporate a flat commission rate of $100 per trade, we allow the investment managers to buy (and sell) different percentages up to 100 percent of the trading volume that had occurred on the rebalancing day and continue to transact up to that amount of the daily trading volume each day until the required position for the portfolio is attained. Managers also can purchase or sell up to a certain percentage of ownership and all transactions are at the corresponding bid and ask rates. This is done assuming initial investments in the portfolios in 1995 of $10 million, $30 million, or $50 million.

Table 10A displays average monthly compound returns and standard deviations for this relatively unrestricted investment strategy. Table 10A displays a comparison of different portfolios with a given initial investment. Consistent with our previous findings, the returns are best for portfolios focusing on the smallest stocks (i.e., P1), with subsequent declines in returns for P1+P2 and then P1+P2+P3. For example, for an initial investment of $10 million, the average monthly return for the P1 portfolio is 5.66 percent, for the P1+P2 portfolio is 3.06 percent, and for the P1+P2+P3 port-

folio is 1.88 percent. Given the high standard deviation of the P1 returns, the highest Sharpe ratio (not reported) in all cases is for the P1+P2 portfolio. As we increase the amount of the initial investment (i.e., within the columns), we find that returns decrease as the size of the investment increases. Larger initial investments require more time and effort to attain investments at the desired proportions, so the returns tend to be smaller as investors try to invest more money, especially when focusing on P1, where the time and cost to obtain the necessary investments would be more significant due to lower liquidity of shares. Changes in returns tend to be less dramatic for the P1+P2 portfolio as well as the P1+P2+P3 portfolio.

Taking the analysis a step further, table 10B displays results obtained when we incorporate additional constraints that investors may face. We continue to assume a flat commission rate on each trade, but we now restrict the maximum ownership position a manager may take on any stock to 30 percent. This constraint is to prevent investors from owning firms outright in this decile. We also limit trading of up to only 10 percent, 20 percent, or 30 percent of the actual volume on the rebalancing day or volume on subsequent days until the desired position has been obtained. This constraint is added to prevent the implementation of this trading strategy from substantially moving the market for these stocks and thus mitigates price impact effects.

We find that the returns, once again, generally decrease as the size of the initial investment increases (i.e., comparisons within the columns of table 10B for a given level of trading volume) for the P1 and P1+P2 portfolios, but the P1+P2+P3 portfolio has no pattern. We find that an increase in the percentage of the daily trading volume that the investor can utilize (i.e., within the columns for a given level of initial investment) increases the returns. This suggests that the ability to quickly get into and out of desired positions improves the returns from the strategy. The trade-off is that these larger trades could move the market, an effect that generally is assumed to be a non-issue in most studies yet could significantly affect the implementation of such trading strategies.

Although our monthly returns use closing prices and therefore do not correct for liquidity, subsequent analysis explicitly incorporates costs associated with liquidity. We find that liquidity concerns do not remove the returns to our investment strategy. We find that using the bid and ask prices rather than the closing prices decreases the returns to our strategy, but the returns remain statistically significant. The impact of bid-ask spreads and trading volumes is largest in periods of market stress when spreads widen and trading volumes fall. Because our calculations for the realizability of the returns use actual bid/ask prices to determine the prices at which the rebalancing transactions will occur and actual trading volumes to determine the maximum amount we can trade on a given day, these are explicitly incorporated into our returns. We see that this impact is highest in periods of market stress such as that experienced in 2001 and 2008.

Overall our analysis shows that a small-firm premium persists even when we consider different types of constraints faced by portfolio managers. However, from a return-to-risk perspective as captured by Sharpe ratios, the P1+P2 portfolio is superior. We find clear evidence of excess returns that can be realized by investors. Standard academic analysis of the returns from investing in different types of portfolios using monthly price and return data generally assume that all of the required positions can be obtained on the day of rebalancing with no market impact. Our results show that this overstates the actual returns available to such trading strategies, but the size of this overstatement depends on the size of the initial position and how the rebalancing transactions are performed. Nevertheless, even after incorporating realistic constraints with respect to the investability of these trading strategies, we continue to find that investors can generate significant returns by focusing on smaller-capitalization stocks. One must recognize, however, the trade-offs with respect to returns (i.e., the smallest-cap stocks have the highest unconstrained returns) and transaction costs/investability (i.e., the larger-cap stocks are more liquid and thus cheaper and easier to incorporate into a portfolio).

Summary and Conclusions

The goal of our analysis was to revisit the benefits of portfolio diversification (e.g., Markowitz 1952), in particular international diversification (e.g., Solnik 1974) and diversification across size or market capitalization (e.g., Banz 1981; Reinganum 1981) in the context of micro-cap stocks. We consider Canadian micro-cap stocks as a unique asset class. Consistent with existing research, we find a significant size effect in the Canadian market; however, we find that the size effect is persistent over time and does appear to include a risk premium related to changes in economic conditions, particularly around crisis periods. Our results are consistent with the general notion that small stocks have higher betas than large stocks, but the return differences during and subsequent to major market events suggest that during those periods small stocks are much more sensitive to risk than traditional risk measures such as beta would dictate. This provides evidence that supports the empirical application of the return differential between small and large stocks as a factor in the three-factor asset pricing model of Fama and French (1992, 1993) and its derivatives.

As a result of the excess returns that appear to be available from Canadian micro-cap stocks, we investigate the benefits of considering micro-cap stocks as part of an overall portfolio both domestically (i.e., from a purely Canadian perspective) and globally. We find clear evidence that both types of investors can benefit from diversification that includes a tilt toward Canadian micro-cap stocks. Because of the potential constraints limiting the ability to invest in the micro-cap size portfolio, we also examine the potential investability of the stocks in this portfolio. The limited average trading volume for stocks in this portfolio could diminish the potential benefits from such a diversification strategy, but such a strategy may be worth pursuing nonetheless. We provide an approach

for examining investability issues including transaction costs, ownership stake, and liquidity, which should be included in any empirical studies that focus on small stocks. JIC

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Acknowledgments

We wish to thank Sean Cleary, Harald Lohre, Randall Morck, Tatyana Sokolyk, Harry Turtle, and participants at the 2011 Northern Finance Association and European Financial Management 2012 Symposium on Asset Management for helpful comments and suggestions. The research assistance of James Milne is gratefully acknowledged. We also acknowledge the financial support from the Social Science and Humanities Research Council. All errors remain our own responsibilities.

Endnotes

1 Eun et al. (2008) report an average sample size of 938 Canadian stocks for the period 1980–1999. Over the same period, using a more extensive database, the average sample size is 543. We conjecture that Eun et al. (2008) did not account for dual class shares and may not have accounted for all of the non-common stocks. Conversely, L'Her at al. (2004) report an average sample size of 520 during the 1990s using the same database that we used, although it is unclear how they screened or accounted for dual class shares; this corresponds to our average sample size of 627 over the same period. The difference in sample sizes may be attributable to the additional screen by L'Her et al. (2004) that requires the availability of accounting data (e.g., book value of equity).

2 Based on an average Treasury-bill return over the period of 0.46 percent per month or 5.68 percent annually as reported in the CFMRC database.

3 The ten developed markets are: Australia, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, United Kingdom, and United States.

References

Atta-Mensah, J., and G. Tkacz. 1998. Predicting Canadian Recessions Using Financial Variables: A Probit Approach. Bank of Canada Working Paper 98-5.

Banz, R. 1981. The Relationship between Return and Market Value of Common Stocks. *Journal of Financial Economics* 9, no. 1 (March): 3–18.

Eun, C., W. Huang, and S. Lai. 2008. International Diversification with Large- and Small-Cap Stocks. *Journal of Financial and Quantitative Analysis* 43, no. 2 (June): 489–524.

Fama, E., and K. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47, no. 2 (June): 427–646.

———. 1993. Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics* 33, no. 1 (February): 3–56.

———. 2008. Dissecting Anomalies. *Journal of Finance* 63, no. 4 (August): 1,653–1,678.

———. 2012. Size, Value, and Momentum in International Stock Returns. *Journal of Financial Economics* 105, no. 3 (September): 457–472.

Ferson, W., S. Foerster, and D. Keim. 1993. General Tests of Latent Variable Models and Mean-Variance Spanning. *Journal of Finance* 48, no. 1 (March): 131–156.

Horowitz, J., T. Loughran, and N. E. Savin. 2000. Three Analyses of the Firm Size Premium. *Journal of Empirical Finance* 7, no. 2 (August): 143–153.

Huberman, G., and S. Kandel. 1987. Mean-Variance Spanning. *Journal of Finance* 42, no. 4 (September): 873–888.

Karolyi, G. A., and Y. Wu. 2012. The Role of Investability Restrictions on Size, Value, and Momentum in International Stock Returns (August 23). Working paper, Cornell University. http://forum.johnson.cornell.edu/workshop/FINANCE/Karolyi_Wu_The_Role_of_Investability_Restrictions_on_Size_Value_and_Momentum_in_International_Stock_Returns_082412.pdf.

Keim, D. 1983. Size-Related Anomalies and Stock Return Seasonality. *Journal of Financial Economics* 12, no. 1 (June): 13–32.

L'Her, J-F., T. Masmoudi, and J-M. Sure. 2004. Evidence to Support the Four-Factor Pricing Model from the Canadian Stock Market. *Journal of International Financial Markets, Institutions and Money* 14, no. 4 (October): 313–328.

Malkiel, B. 2004. Can Predictable Patterns in Market Returns be Exploited Using Real Money? *Journal of Portfolio Management* 30, no. 5: 131–141.

Markowitz, H. 1952. Portfolio Selection. *Journal of Finance* 7, no. 1 (March): 77–91.

Mittoo, U. 1992. Additional Evidence on Integration in the Canadian Stock Market. *Journal of Finance* 47, no. 5 (December): 2,035–2,054.

Reinganum, M. 1981. Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings Yields and Market Values. *Journal of Financial Economics* 9, no. 1 (March): 19–46.

Siegel, J. 1991. Does It Pay Stock Investors to Forecast the Business Cycle? *Journal of Portfolio Management* 18, no. 1 (fall): 27–34.

Solnik, B. 1974. Why Not Diversify Internationally Rather Than Domestically? *Financial Analysts Journal* 30, no. 4 (July/August): 48–54.

Switzer, L. 2010. The Behavior of Small Cap vs. Large Cap Stocks in Recessions and Recoveries: Empirical Evidence for the United States and Canada. *North American Journal of Economics and Finance* 21, no. 3 (December): 332–346.

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