

The Canadian Hedge Fund Industry: Performance and Market Timing

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Abstract

We analyze the risk and return characteristics of Canadian hedge funds based on a comprehensive database we compiled. We find that Canadian hedge funds have higher risk-adjusted performance and different distributional characteristics relative to the global hedge fund indices. We investigate market timing by Canadian hedge funds and find that they do not time the Canadian or global stock and bond markets, but hedge funds in the Managed Futures strategy group time the commodity market. These results are robust to parameter instability and structural changes in the model. We also illustrate the impact of using local and global risk factors to analyze the performance of local investment firms.

JEL Classification: G11, G12, G23

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There is a large body of academic literature which analyzes the risk and return characteristics of the hedge fund industry. One of the main topics of this research has been identifying factors that can explain hedge fund performance and provide insights into hedge fund investment strategies (Lo, 2010). Our paper contributes to the currently small literature on the performance of international hedge funds and reports geographical differentiation in the performance of investment strategies by hedge funds.

We find that Canadian hedge funds tend to outperform their global peers (i.e., hedge funds from all over the world) in the corresponding strategy categories. Next, we follow the literature on hedge funds' non-linear exposure to risk factors and study option-like features of Canadian hedge fund strategies, such as market timing (Fung and Hsieh, 1997a). While measuring hedge funds' timing ability is an important question by itself, hedge fund performance is measured more reliably if it is adjusted for timing strategies since Jensen's alphas can be negatively biased in the presence of market timing (e.g., Grinblatt and Titman, 1989). Since the resource sector is the key sector for Canadian capital markets, we conjecture that Canadian hedge funds are relatively strongly exposed to the commodity market and can also attempt to time this market. We find little evidence of stock, corporate bond, and government bond market timing strategies for Canadian hedge funds.

We suggest three possible sources of the outperformance of Canadian hedge funds. The Canadian hedge funds can be exploiting the relative inefficiency of the Canadian markets. It has been reported in the literature that Canadian financial markets are less efficient than the U.S. ones, where the majority of global hedge funds are located, in terms of the lower informativeness of trading (Eun and Sabherwal, 2003), higher transaction costs (Tannous and Zhang, 2008), and weaker investor protection (King and Segal, 2003). Our findings of superior performance of Canadian hedge funds and commodity market timing can also be driven in part by the Canadian

hedge funds having a local information advantage by being in Canada.¹ Their advantage is further boosted by a relative lack of large foreign hedge funds investing in Canada and lower competition among Canadian hedge funds themselves due to their relatively small number.

This study represents the first comprehensive overview of the risk and return characteristics of the Canadian hedge fund industry. In contrast to the literature on U.S. and global hedge funds, very little research has yet been conducted on the Canadian hedge fund industry. Capital markets in Canada have typically been slower to develop than in other industrialized countries, and the hedge fund industry appears to be no exception to this general rule. Unlike the global hedge fund industry, which has been well developed since the 1990s, the Canadian industry has shown signs of growth only after the start of the millennium. According to Gregoriou (2004), there were only nine hedge funds in Canada that had five year performance figures at the end of 2002. This contrasts sharply with the thousands of hedge funds which were operating successfully around the globe at that time.

The absence of academic studies of the Canadian hedge fund industry can be partially explained by the short history of the domestic market, but another obstacle is that there is no single reliable source of data on which to conduct a reasonable analysis. Return information on indices of Canadian hedge funds has been available from two organizations, Scotia Capital (SC) and CanadianHedgeWatch (CHW), although neither of these indices has been analyzed in detailed studies. In this study, we introduce a new database of approximately 200 different Canadian hedge funds which we have compiled. The dataset is used to create what we call the KPSV Composite index and its sub-indices for eight investment strategy categories in Canada. Our approach to constructing the indices alleviates the survivorship bias problem in a sense that currently dead or

¹ The impact of geographical proximity on investment performance was reported by Teo (2009) for hedge funds investing in the Asian markets, as well as Coval and Moskowitz (2001) for mutual funds, Ivkovic and Weisbenner (2005) for individual investors, and Baik, Kang, and Kim (2010) for various types of institutional investors. Since the geographical focus category for Canada is not present in the global hedge fund databases, foreign hedge funds investing in Canada cannot be identified. This prevents us from testing the local bias hypothesis by comparing local and global hedge funds investing in Canada, in contrast to Teo (2009) where both local and foreign samples with the Asian geographical focus are populated and compared.

nonreporting funds are not dropped from the index, so that their performance is reflected in the index during the period when these funds were reporting.² In addition to being more comprehensive than the SC and CHW datasets, our database includes only those Canadian-domiciled hedge funds whose managers are located in Canada. This makes our dataset a better tool for studying the distinct features of Canadian hedge fund industry than the alternative indices. It also resolves the problem than none of the existing hedge fund databases lists Canada as the funds' geographical focus.

Using data from 2003 to 2011, we compare and contrast the risk and return characteristics of the Canadian hedge fund sector with those of the existing Canadian hedge fund indices and the global hedge fund industry more generally. We also compare these characteristics with those of commonly-used equity and bond indices in order to put the true risk of Canadian hedge funds into perspective. We find that the range of risk and returns for individual hedge funds varies widely, but there are significant gains to diversification by taking a portfolio approach to hedge fund investing. We also find that the risk and return characteristics of the Canadian hedge funds in our database are on average different than what is reported by the SC and CHW Canadian hedge fund indices. This can be partially due to our database arguably being better representative of the Canadian hedge fund industry. A notable pattern among individual hedge fund strategy sectors is that Canadian hedge funds tend to outperform global hedge funds in terms of average returns and Sharpe ratios across all strategy sectors.

In addition to the univariate measures of Canadian hedge fund performance, this study is the first to report the exposures of Canadian hedge funds to the Canadian and global risk factors. The importance of using country-specific risk factors has been recognized in the literature (Griffin, 2002). We demonstrate the advantages of using country-specific factors to examine the

² Major hedge fund data sets used in the literature, e.g., TASS, exclude such hedge funds from their indices (Malkiel and Saha, 2005; Fung and Hsieh, 2000), thereby generating additional survivorship bias.

performance of hedge fund indices. Our model estimating the risk-adjusted returns of hedge fund indices and strategy sub-indices also includes the commodity risk factor, which has been shown to influence hedge fund returns in the literature. Consistent with the place of the resource industry in the Canadian economy, we find that the commodity risk factor plays a prominent role in explaining Canadian hedge fund performance compared to the performance of the global hedge funds.

We also consider whether Canadian hedge funds time the stock, bond, or commodity markets. Since the resource sector is the key sector for the Canadian capital markets, we conjecture that Canadian hedge funds time this market. We find evidence of commodity market timing for the Canadian hedge funds in the Managed Futures strategy sector and no commodity market timing by global hedge funds in any strategy groups. An explanation for these findings can be that hedge fund managers in Canada must have deeper understanding and expertise in investing in the resource industry sector than their global peers on average. Neither Canadian nor global hedge funds time the stock or bond markets, with an exception of two Canadian sub-indices that show timing of the Canadian government bond market.³

The abnormal returns (Jensen's alphas) obtained using the multivariate analysis based on global risk factors corroborate the univariate result that Canadian hedge funds outperform global hedge funds on average. The alphas for Canadian hedge funds in almost all strategy categories are greater than those for the global hedge funds. These alphas are due to asset selection skills for all hedge fund categories except Managed Futures, whose alpha is due to market timing of the commodity market. The robustness of these index-level results is verified by the regression results for the individual hedge funds.

A relevant question is whether the recent financial and economic crisis or surge in commodity prices could have caused variation in the hedge funds' exposures to risk factors. We

³ Fung and Hsieh (2001) use lookback straddles to model option-like return features of hedge funds. Fung, Xu, and Yau (2002) and Do, Faff, and Wickramanayake (2005) do not find stock market timing for global hedge funds and Australian hedge funds, respectively. Chen and Liang (2007) find stock market timing for the "market timers" subset of global hedge funds. Chen (2007) is currently the only study of hedge fund timing in investment categories other than the equity market.

find structural breaks in factor loadings for various Canadian and global indices. Using this information, we show that outperformance and factor sensitivities of these strategy sectors are concentrated only within subperiods either before or after the breaks. Overall, we show that our findings about commodity market timing and superior performance for Canadian hedge funds are robust to structural breaks in the regressions.

The outline of this paper is as follows. We start with a brief review of the relevant literature on hedge funds in Section I. In Section II, we describe how we compiled the data for this study. Section III tests the performance of hedge funds in our database relative to the two existing Canadian hedge fund indices, the global hedge fund indices and traditional asset class benchmarks. Section IV reports the results of multivariate analysis of Canadian and global hedge fund returns. In Section V, we present a brief conclusion.

I. Literature Review

The early literature on hedge funds generally finds evidence of them outperforming traditional asset classes. For example, Lamm (1999) reported large excess returns on hedge funds for the period he considered. Based on this finding, he concluded investors should make allocations to hedge funds of up to 100% of their portfolios. Such outperformance has continued to be reported in a number of more recent studies. Fung et al. (2008) find a subset of funds-of-funds that consistently delivers alpha. Lett (2009) reports that hedge funds achieved higher returns with less volatility than global stock indices during 2008 and early 2009.

Other studies disagree, claiming the outperformance is because of biases in the data, such as survivorship bias (e.g., Malkiel and Saha, 2005; Amin and Kat, 2003a; Ackermann, McEnally and Ravenscraft 1999). Fung and Hsieh (2009) provide an update to their previous studies (Fung and Hsieh (1997b, 2000)) and discuss the survivorship bias and other biases in hedge fund performance estimation. It is important to note that the dataset we compiled and the indices based

on it address and alleviate the survivorship bias problem because hedge funds whose reporting was discontinued are kept in the index. The incubation bias is also reduced in our sample because most hedge funds used in our analysis have a track record prior to 2003, the first year of our sample. The confidence in the quality of our returns data is further improved due to a significant institutional investor participation (Fung and Hsieh, 2006)—more than 40% of hedge fund investments in Canada were held by institutional investors, typically pension funds, already in 2004 (McGovern and Ostoich, 2005).

There has also been considerable literature on explaining hedge fund performance through factor analysis. For example, Fung and Hsieh (2002) study the relationship between a hedge fund manager's returns and the returns on the assets which they are trading. Agarwal and Naik (2004) explain nonlinearities in hedge fund risk exposure using a multifactor model of excess returns on fixed income and equity securities and options.

The above-mentioned studies have almost exclusively analyzed the global hedge fund industry as a whole. A small number of studies have examined regional hedge fund markets, but the literature is not extensive, presumably because of the lack of reliable data. For example, Ineichen (2004) studies European hedge funds and reports that the performance characteristics are generally the same as for the global indices. In contrast, Hakamada, Takahashi, and Yamamoto (2007) study Asia-Pacific hedge funds and find their distributional characteristics are somewhat different. Steri, Giorgino, and Viviani (2009) show that Italian hedge funds achieve comparable Sharpe ratios, but lower returns than traditional asset classes. Do, Faff, and Wickramanayake (2005) study Australian hedge funds and find that they outperform market benchmarks. They also test the market timing ability of Australian hedge fund managers using Australian-based Fama-French factors and find no evidence of it. Do, Faff, and Veeraraghavan (2010) investigate performance persistence in Australian hedge funds. Teo (2009) considers Asian-focused hedge and finds pervasive evidence of a local information advantage, particularly for funds that invest in illiquid

and emerging market securities. Eling and Faust (2010) find that hedge funds outperform mutual funds in emerging markets.

Gregoriou (2004) analyzes Canadian hedge funds and proposes a modified Sharpe ratio that helps address the issue of non-normal returns. His study reported that fifty hedge funds were operating in Canada in 2002, but that only nine of those funds had monthly performance figures spanning the entire 1998 to 2002 time period he considered. To our knowledge, Gregoriou (2004) is the only published study on the Canadian hedge fund market. Given the passage of time and the tremendous growth of the Canadian hedge fund industry, we believe the time has come for a more comprehensive study, which is conducted in this paper.

II. Data

Our database covers a period of 168 months from January 1998 to December 2011 and now contains information on approximately two hundred active and inactive Canadian hedge funds. A fund qualifies as Canadian if the actual investment management team is based in Canada. Funds offered by a Canadian-based institution, but for which the investment manager is based elsewhere, such as New York or London, do not qualify for classification as a Canadian hedge fund.⁴ In general, the funds included in our database focus their efforts on Canadian securities, though they may also invest in securities from other countries, if this is consistent with their trading strategy.

In order to identify hedge funds for possible inclusion in our database we started with funds listed on Hedgefund.net. This database is US-based and provides information on a large number of global and Canadian hedge funds, which made it the main source of our returns data. However, unlike the global universe, where most funds report to a database such as Lipper or Hedge Fund Research, many Canadian funds do not report to Hedgefund.net, which required us to extend our

⁴ For example, some asset management companies offer funds under their banner for which the advisor or manager is based in the United States. None of these funds have been included in our database of Canadian hedge funds.

search in a number of ways. We found a number of hedge funds on Fundata, a Canadian-based database that provides information on mutual funds and a subset of hedge funds in Canada. Several Canadian prime brokers also provide capital introduction services to their prime brokerage clients. We have relationships with a number of these institutions who provided us with information on such funds. Another source used was the two providers of Canadian indices, Scotia Capital and CanadianHedgeWatch, which list the constituents of their indices. Word of mouth also provides a useful source of fund data. For all such hedge funds not in Hedgefunds.net, we collected performance data directly from the individual funds. Fortunately, many Canadian managers provide performance information on their website without requiring a password to access it. Fund managers not actively looking to raise additional capital are in some cases reluctant to share performance information; only a small handful of managers refused to provide performance data and were excluded from our analysis. Although our search is not likely to be complete in all respects, we do believe it is representative of the Canadian industry.

Our initial list contained over 300 different Canadian hedge funds that were in existence during the period January 2003 to December 2011. This time period is sufficiently representative of the economic cycle as it includes both the economic expansion and recession periods. We did not apply any filters to the data, such as the length of track record, assets under management or return-based criteria. Many funds offered multiple share classes of the same fund and may offer an offshore domiciled version in addition to the Canadian domiciled version. Where the only difference between classes is the fees charged and/or minimum investment amount, only the class with the longest time series of returns was retained. Offshore versions of Canadian domiciled funds have been removed, unless there is a demonstrated difference between the two funds. After removing these duplicate funds we were left with a sample of 198 funds, which we used to create the KPSV Composite Index of Canadian hedge funds.

These funds were then grouped into the commonly-used set of trading strategies which are

analogous to the industry sectors of major stock market indices. These consist of Equity Long/Short, Equity Market Neutral, Fixed Income Arbitrage, Convertible Arbitrage, Global Macro, Event Driven, Managed Futures and Multistrategy. We verified each fund's self-classification and re-categorized some funds because the strategy description provided by the manager did not match the stated strategy. For example, some managers classified themselves as Multistrategy when they were merely running different versions of trading models within the same broad strategy sector.

Table 1 provides information on the number of funds at the end of each year from 1998 to 2011. The small number of funds before 2002 is consistent with the number reported in Gregoriou (2004). At the beginning of 2003, our index starts with 68 funds. By mid-2006 the number of active funds peaked at 174 before declining to 165 by the year end. There are 163 active funds in the database at the end of the sample period in 2011.

The indices we created from our data on individual funds are an equal weighting of the monthly performance of all the funds assigned to that index. The monthly returns are net of all fees. The individual funds did not need to have a minimum number of months of history before being included; a fund was included from its inception or January 2003, whichever came last. We chose this date to start our indices because it is the same as the inception dates for both the CanadianHedgeWatch and Scotia Capital indices. Earlier data is relatively scarce and may be more exposed to the incubation bias.

Besides a positive effect of high institutional participation on the quality of our data mentioned in the previous section, the quality of Canadian hedge fund return data benefits from increased transparency, reporting, and compliance requirements of the Canadian hedge industry relative to hedge funds in countries where hedge funds are less monitored. In Canada, hedge funds sold pursuant to a prospectus (a small portion of all hedge funds) are subject to continuous disclosure requirements which include specified disclosures in the prospectus, and annual and semi-annual filing of financial statements and management reports on fund performance.

Prospectus exempt funds are required to deliver annual audited financial statements within 90 days after the fund's year end. Financial statements must include a statement of investment portfolio for the current period and statements of net assets, as well as operations and changes in equity for the current and comparative periods. All fund managers must disclose, on a quarterly basis, NAV errors of the funds (PricewaterhouseCoopers, 2010).

III. Analysis of the Performance of Canadian Hedge Funds

A. Summary Statistics

Table 2 presents summary statistics on our Composite index and sub-indices of Canadian hedge funds. Besides the distributional statistics, it also provides statistics on draw downs and months to recovery which are also commonly reported in studies of hedge fund returns.

This table shows that the returns are strongly positive (and statistically significant based on both t-tests and Wilcoxon rank-sum tests that accommodate the non-normality of returns⁵) for the period we study. The arithmetic mean monthly return is 0.96% for the entire universe, which is 11.5% annually. The monthly standard deviation is only 2.59% (8.97% annualized), which gives the annual Sharpe ratio of 0.954. The largest drawdown was 23.2% starting in July, 2008 and took 13 months to recover. The summary statistics show that returns for the various sub-indices were also strong during this period. All mean returns are positive and statistically significant based on the nonparametric signed-rank tests.

It is important to recognize that the statistics in Table 2 have been calculated on the basis of taking a portfolio approach. If the risk and return are considered for individual funds instead, the risks would appear much larger. For example, the average standard deviation of all of the funds

⁵ The non-parametric tests throughout this study are necessary because deviations from a normal distribution are evident from the columns reporting distributional moments in this and other univariate tables.

in our index, when considered individually, is 4.6% in contrast to 2.6% for the equally-weighted portfolio of these funds, i.e., the Composite index. We also note that a small number of individual funds contained in this portfolio provided returns in some months that appear extreme when considered on their own. For example, the highest and lowest single month returns for the funds in our database are 103.8% and -48.52%, respectively.

This information is consistent with frequent reports in the popular business press that highlight an individual fund that has experienced such extreme returns. Clearly, this type of analysis ignores the benefits of diversification which are available to investors who take a portfolio approach. The benefits of this approach are common knowledge when investing in equities; this point is often ignored when discussing risk and return in the hedge fund industry. Table 3 presents a matrix of correlations for the eight strategy sub-indices in our Canadian fund universe. The overall average correlation is 0.55, which implies there are likely to be good gains from diversification across strategy sectors.

B. Comparison with Other Canadian Hedge Fund Indices

This section compares the risk and return characteristics of our Composite index and sub-indices with those of the two Canadian hedge fund index providers, Scotia Capital and CanadianHedgeWatch.

CanadianHedgeWatch (CHW) offers an Equity Hedge index, a Notes index, a Fund of Funds index, and a Composite index, all of which are asset-weighted. The composite index includes funds of funds and principal protected notes, which can explain the differences in its performance from our index. We also note that many of the managers of the funds and portfolios referenced by the various notes, which represent over 30% of the funds in this index, are actually not based in Canada and, in fact, are off-shore managers. In addition, the CHW index is heavily weighted towards the Equity Long/Short fund type which makes up approximately 90% of the

benchmark weight. This is much higher than the generally held view that only approximately 50% of the hedge funds in Canada are Equity Long/Short strategies. For these reasons we believe the CanadianHedgeWatch index is less representative of the Canadian hedge fund industry in general.

Scotia Capital publishes equal-weighted and asset-weighted versions of its hedge fund index, and we use the equal-weighted one. It does not publish sub-indices, but its index does include at least one fund from each major hedge fund strategy category. To be included in the benchmark, a fund must have at least \$15 million (CAD) in assets under management, and have at least 12 months of track-record. These indices include (as of June, 2009) 34 funds managed by 24 different companies. Approximately 60% of the managers run Equity Long/Short strategies. The Scotia Capital indices include funds from Canadian-domiciled managers only. While these indices appear to be more consistent with the apparent make up of the Canadian hedge fund space than the CanadianHedgeWatch Index, we note that our database contains a larger number of funds which may, therefore, be more indicative of the Canadian hedge fund industry.

Table 4 reports summary statistics for these Canadian hedge fund indices, as well as for our overall Composite index and the Equity Long/Short sub-index. Since the SC and CHW indices are available to us from January 2005, all results in this table are based on the 2005-2011 period. We note distinct differences between the various Canadian hedge fund benchmarks; the CanadianHedgeWatch Composite Index in particular seems somewhat out of place. Although the measures of risk (volatility and higher moments) reported in Table 4 for the various indices are very similar, the average returns are much lower for the CHW Composite Index (0.15%) than for our KPSV Composite (0.75%) and SC CDN HFI (0.48%).

Table 4 also reports the results of several statistical tests for the performance differences between our KPSV Composite index and the other two Composite indices, as well as between the KPSV Equity Long/Short sub-index and the CHW Equity index. First, we conduct paired t-tests (untabulated) that find that the mean of the KPSV Composite index is significantly higher than the

means of the other two indices; the same is true for the sub-indices. The reported z-statistics of the non-parametric Wilcoxon paired signed-rank tests indicate significant differences between the locations (medians) of the distributions of the KPSV indices and those of the other corresponding Canadian indices.⁶

Second, we test the differences between the variances of the KPSV and the other Canadian indices. We use the Brown and Forsythe (1974) test (the trimmed mean method), which is robust to non-normality and is superior to several other nonparametric tests when the distribution is leptokurtic. The F-statistics for this test reported in Table 4 fail to reject the null that the variances of the KPSV index and the other Canadian indices are equal. The same conclusion is reached based on the traditional F-test for the homogeneity of variances, which we do not report for brevity. We also conduct the Kolmogorov-Smirnov tests (untabulated) also cannot reject the null that the three families of indices come from the same population of funds.

The overall results of statistical tests in Table 4 imply that when the location, spread, and shape of the distributions are considered, the three families of Canadian hedge fund indices are similar, but the indices differ when one focuses on the performance of the indices. The combination of higher returns and similar standard deviations of the KPSV indices is consistent with significantly higher Sharpe ratios for the KPSV indices relative to the other two index families, as reported in Table 4. Notably, the Sharpe ratio of the KPSV Equity Long/Short sub-index is approximately ten times greater than the Sharpe ratio of the CHW Equity Hedge sub-index (0.826 vs. 0.082).

C. Comparison to Global Hedge Fund Indices

In the first three lines of Panel A in Table 5, we compare the risk and return characteristics

⁶ The signed-rank test requires an assumption that the distribution of differences between two samples in question is symmetric. Although all the hedge fund indices in Table 4 are negatively skewed, the skewness of the series consisting of differences between monthly values of each pair of indices is small.

of the KPSV Composite index and two popular global hedge funds indices published by Credit Suisse (Credit Suisse Hedge Fund Index, known in the literature as the “Dow Jones Credit Suisse” until 2013 and "Credit Suisse/Tremont" prior to that, which is constructed from the TASS database) and Hedge Fund Research, Inc. The CS index is asset-weighted, while the HFR indices are equally-weighted.

Both the Wilcoxon signed-rank two-sided z-statistics shown in Table 5, Panel A and t-statistics (untabulated) indicate that Canadian hedge funds outperformed the global hedge fund benchmarks in terms of monthly returns during the sample period. We also check whether Canadian hedge funds’ outperformance is limited to the period of the global recession, when the Canadian economy fared relatively well. The KPSV Composite’s mean and median are statistically greater than those of the global composite indices before the economic crisis (not reported in the table) as well.

To test the null hypothesis of the equality of variances between the KPSV sub-index and the two global sub-indices within each investment strategy, we use the Brown and Forsythe (1974) test. The standard deviations of the KPSV Canadian indices are higher than those of their global counterparts. Skeweness and kurtosis are similar among the indices and indicate negatively skewed, leptokurtic hedge fund returns. While most summary statistics are similar for the Canadian and global hedge fund indices, the KPSV Composite index displays superior returns, which translates into a noticeably improved Sharpe ratio versus the global hedge fund counterparts. In addition to the parametric distributional measures, the Kolmogorov-Smirnov test finds distributional differences between the KPSV Canadian Composite and the two global hedge fund benchmarks, CS and HFRI composite indices, as reported in Panel A of Table 5.

We believe the outperformance of Canadian hedge funds is mainly attributable to the relative inefficiency of the Canadian financial markets, lower competition among hedge funds in Canada, and the funds’ geographical proximity to the market they invest in. Canadian hedge fund

managers arguably have a local information advantage by being in Canada and trading primarily in their own markets. As compared to global security markets, Canadian markets are also characterized by a relative information inefficiency and lack of international investors. Very few U.S. or global hedge funds have exposure to Canada, whose market is just too small for multi-billion dollar funds to allocate an amount of capital that will have a meaningful impact on their overall performance. The few foreign funds that did have significant exposure to Canada are no longer around. This means there are better opportunities for Canadian managers as compared to markets in which local investors are not as dominant. The next section sheds light at the relative performance of hedge funds and their local and global asset benchmarks.

D. Comparison to Traditional Asset Class Benchmarks

We present summary statistics for major global equity and bond benchmarks and compare them to our KPSV Composite index in the last five lines of Panel A in Table 5. The traditional equity benchmarks suffered badly during the recent financial crisis. The statistics for the KPSV Canadian and the two global hedge fund indices dominate the traditional benchmarks in virtually all measures. Of particular note is the significantly reduced magnitude of the maximum drawdowns for the hedge fund indices as compared to global equities; the global equity index in 2011 is yet to recover from its decline.

A common misperception about hedge funds is that they are risky, even riskier than equities. There are some hedge funds that take a lot of risk, either through leverage, unhedged trading or very concentrated positions. However, if the definition of risk being used is volatility, the majority of hedge funds are less volatile than equities. Table 5, Panel A reports that the standard deviations of all equity indices are significantly higher than the standard deviation of the KPSV Composite index. Over the period considered, our Composite index of Canadian hedge funds outperformed Canadian equities on a risk-adjusted basis. The Sharpe ratio of the KPSV Composite index of

Canadian hedge funds is twice as large as, the Sharpe ratio for the S&P/TSX Composite. The comparison of Canadian hedge funds to US and global equities and bonds is even more favorable.

Since standard deviation is only one measure of risk, the skew and kurtosis are also reported in Table 5, Panel A. As typically reported in other studies, the kurtosis for the hedge fund indices has been higher than that for the equity indices. This is often interpreted as evidence of extreme returns. As discussed in Brulhart and Klein (2005), however, kurtosis can be misleading because it is actually the ratio of the fourth statistical moments to the corresponding power of the standard deviation. The fourth moment reported in Table 5 supports this approach to the assessment of relative tail risks—the fourth moment of the hedge fund returns is approximately half of the fourth moment of the equity indices.

The two-sample Kolmogorov-Smirnov test results reported in Table 5, Panel A show that the distribution of the KPSV Composite hedge fund index is different from the other asset classes, with a curious exception of the S&P 500 U.S. index. This motivates us to consider correlations between the hedge fund returns and the traditional asset classes in Panel B of Table 5. The KPSV and global hedge fund returns are strongly correlated with one another, with correlations above 90%. The KPSV Composite index shows a higher correlation with Canadian equities than with U.S. equities, implying the Canadian funds' investment strategies are focused on Canada. This finding also makes the Kolmogorov-Smirnov test result indicating similarity between the KPSV Composite and S&P500 distributions inconsequential.

For the KPSV sub-indices, not shown in this panel for brevity, the highest correlations with the TSX are exhibited by the Equity Long/Short index at 88% and Multistrategy index at 82%. The Global Macro and Managed Futures sub-indices have the lowest correlations with Canadian equities at 21% and 19%, respectively, which are significant only at the 10% level.

E. Canadian and Global Hedge Fund Sub-indices

Table 6 compares the distributions of KPSV Canadian hedge fund sub-indices with the global (CS and HFRI) hedge fund sub-indices in the eight investment strategies. The Canadian hedge funds tend to have 2-3 times higher returns than their global counterparts in practically all investment strategy groups. On the other hand, they also tend to have significantly higher variances. The Sharpe ratio combines these two performance measures and, as Table 6 shows, all Canadian hedge fund strategies clearly outperform their global counterparts (except for the mixed results in the Fixed Income strategy). All but one of the KPSV Canadian hedge fund sub-indices also outperform the corresponding global benchmarks in Table 5 based on their Sharpe ratios.

The side-to-side analysis of Canadian and global hedge fund sub-indices raises a natural question about how strongly they are correlated for each strategy. We find (untabulated) that the highest correlation is between Canadian and global hedge funds in the Equity Long/Short strategy (over 90%), while the lowest correlations are in the Equity Market Neutral (9%), Global Macro (42%), and Managed Futures (54%) categories. The remaining sub-indices have correlations around 70%-80%.⁷

IV. Multivariate Analysis and Timing Strategies of Canadian Hedge Funds

A. Canadian Hedge Funds and Local Risk Factors

Having completed the univariate analysis of hedge fund index performance, we proceed by estimating the risk-adjusted returns of Canadian and global hedge fund indices. We use the market model that produces Jensen's alphas as a metric of relative portfolio performance of different hedge fund indices and strategy sub-indices. Consistent with the hedge fund literature, the model also includes bond and commodity risk factors. To avoid collinearity problems, we do not include the Canadian currency risk factor in the model because of its strong correlation with

⁷ We also compute cross-correlations among the global (HFRI and CS) sub-indices and find their structure to be similar to that of the KPSV Canadian hedge fund sub-indices in Table 3. The cross-correlations tend to be somewhat higher for the global indices, implying better diversification opportunities among the Canadian hedge fund strategy groups.

the commodity index. Since the Fama and French (1992) factors are not available for the Canadian market during our sample period, we estimate a model with the U.S. Fama-French and global risk factors separately in the next subsection.

To test whether the Canadian hedge funds time the stock, bond, or commodity markets, we add non-linear functions of risk factors to the multifactor model. One implementation of this approach is the Henriksson and Merton (1981) test of market timing, which is one of the most frequently used measures of timing performance (Goetzmann et al., 2000). It has been extensively applied to test the market timing performance of mutual funds, and, more recently, Chen (2007) and Chen and Liang (2007) used it to test the market timing ability of hedge funds. The intuition of the test is that a market timing fund adjusts its market exposure to make it high (low) when the market rises (falls). The fund can be thought as holding two securities: the market and a put on the market. We extend this approach to testing the timing of other risk factors, namely, bond and commodity factors, besides the market factor. To test whether the fund times factor i , we analyze the coefficient γ on the “timing variable” in the following regression model:

$$r_{p,t} = \alpha + \beta_i r_{i,t} + \gamma r_{i,t} \times I(r_{i,t} > 0) + \sum_{j \neq i} \beta_j r_{j,t} + \varepsilon_t \quad (1)$$

where β 's are the measures of the fund's exposures to risk factors, and $I(\cdot)$ is the indicator function. For robustness, we also use the Treynor and Mazuy (1966) market timing model, where the indicator function is replaced by $r_{i,t}$, thereby making the factor loading vary proportionately to the factor. A positive γ generally indicates the hedge funds' timing of the stock, bond, or commodity market.

The regression results for the Canadian hedge fund indices on Canadian factors are in Table 7. In Panel A, the Canadian hedge fund returns are regressed on the Canadian market index, fixed income, and commodity indices. The Canadian market index is obtained from the Canadian Financial Markets Research Center, and bond and commodity indices are from Datastream. We use ScotiaMcLeod DEX Government Bond Universe and DEX Corporate Bond Universe indices

as the Canadian fixed income factors. The commodity risk factor is measured by returns on the Thomson Reuters Equal-Weight NYFE CRB continuous commodity index, which is comprised of equally-weighted futures prices of seventeen commodities⁸ and itself trades on the ICE Futures Exchange. All index returns in this table are in excess of the Canadian risk-free rate.

First, the alpha of the KPSV Composite index is positive and statistically significant, at annualized 4.8%. In the untabulated results, we find that the alphas of the other two Canadian composite indices, Scotia Capital and CanadianHedgeWatch, estimated over the shorter sample period when the indices are available (2005-2011) are insignificant or negative significant, while the KPSV alpha is positive significant during that period as well. This can be attributed to compositional differences between the KPSV index and the other two Canadian indices, where the KPSV index is more representative of the Canadian hedge fund universe. Second, the market factor is significant for the composite index with the beta of 0.435. The exposure to the stock and bond markets varies across fund strategy subgroups. Importantly, the KPSV composite hedge fund index and almost all of its sub-indices have a positive and significant relation with the commodity risk factor.

Next, we test whether Canadian hedge funds time the stock, bond, and commodity markets. Panel B of Table 7 shows that Canadian hedge funds do not engage in timing the Canadian stock market. The Henriksson-Merton Market Timing variable, which captures the funds' stock market timing performance, is not significant for the composite indices and virtually all strategy sub-indices. The KPSV Fixed Income and Convertible Arbitrage indices have significant but negative market timing coefficients, which does not indicate market timing. The negative timing coefficients show a strong exposure of these hedge funds' bond portfolios to economic downturns. The Managed Futures index is the only one with a positive market timing coefficient. However,

⁸ The current index includes energy (crude oil, heating oil, natural gas), grains and oilseed (corn, soybeans, wheat), industrials (copper, cotton), livestock (live cattle, live hogs), precious metals (gold, platinum, silver), and softs (cocoa, coffee, orange juice, sugar). The Dow Jones UBS Commodity Total Return Index produces similar results in all regressions.

since these funds' portfolios consist of fixed income securities or commodity futures, their market betas should be interpreted differently from an equity beta. The Managed Futures funds capture the commodity market upside and appear to be hedged against commodity market downturns, which are highly correlated with the stock market in Canada. The absence of market timing based on the Henriksson-Merton model is supported by the Treynor-Mazuy model (untabulated).

Since Panel A of Table 7 shows that Canadian hedge funds are exposed to the commodity risk factor, the next logical step is to test whether they attempt to time the commodity market. In Panel C of Table 7, we introduce the commodity timing variable defined as in equation (1). This variable is significant only for the KPSV Managed Futures index. Hedge funds in the Managed Futures group constitute around 10%–15% of all funds in the sample, which is unlikely to be sufficient to make the overall index indicate commodity market timing. Similarly, Chen (2007) found no commodity timing for global hedge funds other than in the Managed Futures subsector. The untabulated results of the Treynor-Mazuy model corroborate the evidence of commodity timing by Canadian hedge funds in the Managed Futures sub-index. Another important finding in Panel C is that the alpha of the Managed Futures index is reduced from annualized 7.2% in Panel A to zero (it becomes statistically insignificant) in Panel C due to accounting for the commodity market timing in the latter. This indicates that these hedge funds concentrate on the commodity timing strategy and commodity market trend following rather than on the selection of individual investments.

We also tested whether the hedge funds in this sub-index use commodity derivatives providing a direct access to the commodity market or stocks of firms in the commodity sector for commodity timing. In place of the Thomson Reuters Equal-Weight NYFE CRB index, we used the Dow Jones Canada Oil & Gas and Dow Jones Canada Basic Resource *equity* indices and found that not only the timing coefficient but also the coefficient on these indices are insignificant. This implies that the hedge funds in the Managed Futures sub-index likely trade in the commodity

market directly.

In addition to examining stock market and commodity timing, we applied the Henriksson-Merton and Treynor-Mazuy methods to test the timing of Canadian government and corporate bonds by Canadian hedge funds. In the untabulated results, we find that hedge funds in the KPSV Multistrategy and Convertible Arbitrage sub-indices time the Canadian government bond market.

B. Parameter Stability and Structural Breaks

Pesaran and Timmermann (2002) and Fung and Hsieh (2004) show that evaluating directional forecasting ability of fund managers yields unreliable results if there is instability in the return-generating process. For example, Fung and Hsieh find structural breaks in hedge fund model parameters around 1998 using the OLS-CUSUM method. Bollen and Whalley (2009) also show plentiful evidence that hedge funds' factor exposures change over time. They use a weighted average of Wald test statistics calculated for each possible month of structural change.⁹ Although a uniformly most powerful test for all possible structural changes that can be present in the parameters of hedge fund return models is impossible to identify, a recent study by Bai and Perron (2006) shows that in general, the power of the multiple change approach is practically as high as the best power that can be achieved with the test that accounts for the correct number of breaks.

Based on the result in Bai and Perron (2006), we adopt the approach that allows finding multiple dates of structural breaks using the Schwartz's BIC¹⁰ and note that the F-test for a single break is equivalent to this multiple breaks test if there is actually a single structural break in the parameters. Indeed, whenever our multiple break test detects a single break, the reported break

⁹ This test, also known as avg-F, was derived by Andrews and Ploberger (1994), and simulations in Andrews, Lee, and Ploberger (1996) show that it performs well in finite samples for a single break alternative, while OLS-CUSUM's performance is described as poor overall relative to F-test approaches. Additionally, avg-F and a similar exp-F test were shown to perform better for small and large shifts in parameters, respectively. These tests were applied to hedge fund models to test for a single shift in parameters, but hedge fund returns can have multiple structural changes that are difficult to detect and whose dates are impossible to determine with a test for a single change. Bai and Perron (1998) extend the F-test approach to a more general technique for multiple dates of parameter shifts.

¹⁰ To select the optimal linear model, Bai and Perron (2003) provide an algorithm which finds the number of break points that minimizes the BIC. We follow the implementation of finding the break dates as described in Zeileis et al. (2003).

date coincides with the date that maximizes the F-statistic over all possible break dates (the *sup-F* approach). If the multiple break test finds two break points, the F-test approach always supports the presence of a structural break but, by design, reports only one break date that is typically between the two break dates.

We test for structural breaks in the coefficients of the commodity timing model of Panel C of Table 7 and report the results corrected for the breaks in Panel D. We find one structural break in the KPSV Equity Market Neutral and Managed Futures sub-indices and two break dates in the Convertible Arbitrage and Global Macro sub-indices. The break dates are identical for the models without timing and with stock market timing. The break dates for Equity Market Neutral and Convertible Arbitrage must be related to the beginning of the financial crisis, while the dates for the Global Macro and, more closely, Managed Futures coincide with the beginning of the surge in commodity prices (“the commodity bubble”).

Since the sample sizes between two break dates are too small for meaningful regression analysis, we report regression results for the subsamples before the first break date and after the last break date for each index. Several findings in Panel D deserve attention. The positive alphas of three of the four indices are unaffected relative to their estimates ignoring structural breaks in Panel C; the Global Macro sub-index was an exception and had a positive alpha only after August 2006. The Equity Market Neutral hedge funds actually allowed themselves to be exposed to the market before September 2008 when had a positive market beta. Convertible Arbitrage funds have a much stronger correlation with the bond markets after October 2008 than before the crisis. Finally, commodity market timing by Managed Futures hedge funds was taking place only during the commodity bubble starting in 2005.

C. Performance of Canadian and Global Hedge Funds Relative to Global Risk Factors

As the final step of our multivariate analysis, we compare the performance of Canadian

hedge funds to that of global hedge funds. We regress both Canadian and global hedge fund returns on global risk factors, which allows us to compare the performance of these hedge funds relative to the same benchmark. Since the lack of public disclosure makes linking hedge fund style factors to specific asset markets difficult, the U.S. Fama-French and momentum (Carhart, 1997) factors serve as an appropriate unifying benchmark for hedge funds domiciled in different countries. Goetzmann et al. (2000) find that complementing the market model with the Fama-French factors reduces the measurement bias in market timing models. The global fixed income factors are Bank of America Merrill Lynch Global Government (Government Bond) and Broad Corporate (Corporate Bond) indices obtained from Datastream. The commodity factor is the same as in Table 7. All index returns are net of the U.S. risk-free rate.

Table 8, Panel A reports estimation results for the Canadian hedge funds on global risk factors. The statistical and economic significance of alphas for the KPSV Composite and strategy sub-indices persists regardless of whether the Canadian or U.S. risk factors are used. Given the economic proximity between the U.S. and Canada, the market betas for the U.S. market index are still significant, albeit 2-3 times smaller than those for the Canadian market index in Table 7, Panel A. The lack of significance for HML and, to a lesser extent, SMB for Canadian funds is not too surprising given that these factors are also not significant for over 80% of individual hedge funds in the U.S. (Bollen and Whaley, 2009).

Just as with the Canadian bond markets, we find a strong relation between Canadian hedge fund portfolios and the global bond markets: hedge fund returns are positively (negatively) correlated with the global corporate (government) bond market returns. The commodity market's strong link to the performance of Canadian hedge funds after controlling for global risk factors is consistent with Table 7. Finally, the results show that the adjusted R^2 are higher if Canadian hedge fund indices are regressed on the Canadian risk factors in Table 7 than on the global risk factors in Table 8, despite the presence of additional significant explanatory variables in Table 8. These

results illustrate an advantage of using local risk factors to explain country-specific investment returns.

Next, Panel B of Table 8 reports multifactor regression results for the global hedge fund indices, which can be directly compared to the results for Canadian indices in Table 8, Panel A because they are estimated on the same global risk factors. To save space, we report the results for the Credit Suisse and HFRI Composite indices and only the CS sub-indices. The annualized alpha of the KPSV Canadian composite index in Table 8, Panel A is 5.31%, which is more than twice as large as the alphas of the CS and HFRI global composite indices, equal to 2.38% and 1.86%, respectively. These differences are strongly statistically significant according to chi-squared tests, conducted separately. While all but one of the KPSV sub-indices exhibit abnormal returns in Panel A, only three CS sub-indices (Multistrategy, Event Driven, and Global Macro) have positive alphas in Panel B. The pairwise comparisons of Canadian and global alphas for each sub-index produce significant chi-squared statistics. These findings of the multivariate analysis in Table 8 are consistent with the univariate results in Table 5 and support our general conclusion that Canadian hedge funds tend to have better performance on average than global hedge funds. In agreement with our conjecture about the role of commodities for the Canadian hedge fund industry, the two to three times greater coefficients on the commodity variable in Panel A relative to Panel B (these differences are statistically significant) imply that the Canadian hedge funds are much more exposed to the commodity market than the global hedge funds.

In Panel C of Table 8, we report the regressions results for Canadian and global indices for which we found structural breaks. The KPSV Composite and KPSV Multistrategy regressions have one structural break in 2008. By comparing these results in columns (1) – (4) in Panel C with columns (1) and (2) in Panel A of Table 8, we discover that the positive alpha of the KPSV Composite index is present only in the pre-break period. The remaining columns of Panel C cover the global indices. We find that the three sub-indices actually yield positive alphas in certain

periods (before the crisis for the Market Neutral and after the crisis for the other two indices), in contrast to their non-significant alphas in the full sample in Panel B.

The findings of different alphas during different subperiods suggest that our conclusion from Panels A and B that Canadian indices have higher alphas than global indices needs to be revisited. We estimate the alphas for the CS indices corresponding to the three KPSV indices in columns (1) – (5) of Panel C on the time subsamples specified in those columns. The chi-squared tests find that the KPSV alphas which are statistically significant in columns (1) and (4) of Panel 8.C remain greater than the corresponding alphas for the global Composite and Multistrategy sub-indices, consistent with Panels A and B. We perform the same exercise by estimating alphas for the KPSV Equity Market Neutral, KPSV Fixed Income, and KPSV Convertible Arbitrage sub-indices on the same subsamples as for the global sub-indices in columns (6) - (11) of Panel C. The chi-squared tests comparing the KPSV and corresponding global alphas show that the global Equity Market Neutral sub-index has a higher alpha than its KPSV counterpart in the subsample of column (6), the Fixed Income alphas are not statistically different, and the KPSV Convertible Arbitrage alpha exceeds the CS Convertible Arbitrage alpha of column (11). To summarize, accounting for structural breaks does not change our conclusion that most KPSV Canadian hedge fund indices outperform their global counterparts.

In a separate set of untabulated tests, we estimate the equity, bond, and commodity market timing models with global risk factors and initially find no evidence of timing strategies by Canadian and global hedge funds, including the KPSV Managed Futures sub-index. However, once we utilize the results of structural break tests (whose dates were actually unaffected by the addition of a timing variable), the Managed Futures sub-index acquires a significant (at 5%) commodity timing coefficient on the subsample after September 2005, and the alpha of that regression becomes insignificant, which implies that the commodity timing model fully captures the investment strategies of this hedge fund class. Thus, we find commodity market timing for

KPSV Managed Futures hedge funds in both the global and Canadian factor regressions once we have accounted for structural breaks.

D. Individual Hedge Fund Data

We use data on individual hedge funds in the KPSV index to verify the robustness of our conclusions. In order to have meaningful regression analysis, we consider only those hedge funds that have at least 36 months of returns, which preserves more than half of the sample, or 152 funds, having six years of returns on average. The cross-sectional distribution of their returns is shown in column (1) of Table 9. The average and median of the mean returns of individual hedge funds are somewhat lower compared to these characteristics for the composite index in Table 2. This could be due to a more complete sample of hedge funds included in the Composite index. Around 30% of individual hedge funds have statistically significant positive mean returns, and none have statistically significant negative returns. The best and worst performing funds cannot be considered outliers because the distribution tails approach them smoothly; dropping the best hedge fund makes virtually no difference for the overall statistics.

The average alphas estimated based on individual hedge funds in columns (2) and (3) of Table 9 are positive, albeit slightly lower than those for the index returns in Tables 7-8. Between 18% and 21% of hedge funds (depending on whether we use Canadian or U.S. factors) have positive and statistically significant alphas, and there are only several funds with negative significant alphas. Column (4) of Table 9 provides a benchmark for the Canadian funds against the hedge fund universe, for which we use all hedge funds in the TASS database (both active and inactive, with at least 36 months of returns during the sample period).¹¹ The percentage of hedge funds with positive alphas is the same in both cases, but the percentage of underperforming hedge

¹¹ We cannot use the results for the hedge fund universe in the prior literature because our sample period is more recent and includes the financial crisis, which should negatively affect the average performance.

funds is somewhat lower in Canada. The mean and median of individual alphas are higher for Canadian hedge funds.¹² We also report the Canadian factor model alphas for the subindices in columns (5) - (8) and note that regressions on the U.S. factors make the alphas marginally greater (untabulated). Finally, the remaining columns of Table 9 show that the commodity market timing finding is consistent with that for the indices—the timing is present only for the futures subindex.

We also investigate a possibility of incubation and backfill biases in the returns, which is expected to be small *a priori* because most funds existed prior to the beginning of our sample period. We re-calculate the results in Table 9, columns (1)-(8), after deleting the first 12 months of observations for each fund. We note that this may reduce average performance measures by effectively giving more weight to the observations during the financial crisis. The median return declines from 0.62% to 0.45%, while the share of funds with positive significant returns stays virtually unchanged, at 25%. The effect on the alphas is also small—the median declines by a quarter, and the percentage of positive alphas is only slightly lower. The number of negative individual alphas remains between 0 and 1.

V. Conclusion

Given the growth in the Canadian hedge fund industry since the start of the millennium, we believe it is timely to study the risk and return of the entire Canadian hedge fund industry, as well as the representativeness of the Canadian sources of hedge fund index data. This paper analyzes the risk and return of Canadian hedge funds based on a new, comprehensive database of approximately 200 different Canadian hedge funds covering the period from January 2003 to December 2011. We report the statistical features of hedge fund returns based on the indices generated by our dataset and contrast them with the features of Canadian indices. We also find that Canadian hedge funds have different statistical and performance characteristics than non-Canadian

¹² Winsorizing the TASS hedge fund returns or dropping the best and worst hedge funds strengthens our conclusions.

hedge funds.

Our multivariate analysis shows that investment strategies of Canadian hedge funds include timing the commodity markets. This is consistent with the prominent role of the resource industry sector in the Canadian economy. We also show in the multivariate setting that Canadian hedge funds overall and in individual strategy groups exhibit higher abnormal returns than the hedge funds in the hedge fund universe. Due to their distinct features and superior performance, Canadian hedge funds can be a good diversification instrument for both Canadian and foreign investors. To explore this rigorously, a theoretical foundation beyond the mean-variance portfolio optimization is needed. Another vector of future studies of Canadian hedge funds can focus on collecting and utilizing data on individual hedge fund characteristics.

References

- Ackerman, C., R. McEnally, and D. Ravenscraft, (1999), "The Performance of Hedge Funds: Risk, Return and Incentives," *Journal of Finance*, 54, 833-74.
- Agarwal, Vikas and Narayan Naik, (2004), "Risks and Portfolio Decisions Involving Hedge Funds," *Review of Financial Studies*, 17(1), 63-98.
- Amin, G. S. and H. M. Kat, (2003a), "Welcome to the Dark Side: Hedge Fund Attrition and Survivorship Bias Over the Period 1994-2001," *The Journal of Alternative Investments*, 6, 57-73.
- Andrews, D. W. K., I. Lee, and W. Ploberger (1996). "Optimal changepoint tests for normal linear regression." *Journal of Econometrics* 70(1), 9–38.
- Andrews, D. W. K. and W. Ploberger, 1994. "Optimal tests when a nuisance parameter is present only under the alternative." *Econometrica* 62, 1383-1414.
- Bai, J., and P. Perron, (1998), "Estimating and testing linear models with multiple structural changes," *Econometrica* 66, 47-78.
- Bai, J., and P. Perron, (2003), "Computation and analysis of multiple structural change models," *Journal of Applied Econometrics*, 18, 1-22.
- Bai, J., and P. Perron, (2006), "Multiple Structural Change Models: A Simulation Analysis," in D. Corbae, S. N. Durlauf, and B. E. Hansen, eds., *Econometric Theory and Practice: Frontiers of Analysis and Applied Research*, Cambridge: Cambridge University Press, 212–237.
- Baik, Bok, Jun-Koo Kang, and Jin-Mo Kim, 2010, "Local institutional investors, information asymmetries, and equity returns," *Journal of Financial Economics* 97, 81–106.
- Bollen, Nicolas and Robert E. Whaley, (2009), "Hedge Fund Risk Dynamics: Implications for Performance Appraisal," *Journal of Finance*, 64: 985–1035.
- Brown, M. B., and A. B. Forsythe, (1974), "Robust tests for the equality of variances," *Journal of the American Statistical Association*, 69, 364–367.
- Brulhart, Todd, and Peter Klein, (2005), "Are extreme hedge fund returns problematic?" *working paper*, Simon Fraser University; 2005 AIMA Canada research award winner.
- Carhart, Mark, (1997), "On Persistence in Mutual Fund Performance," *Journal of Finance*, 52 (1), 57-82.
- Chen, Y., (2007), "Timing Ability in the Focus Market of Hedge Funds." *Journal of Investment Management*, 5, 66–98.
- Chen, Y. and Liang, B. (2007). "Do Market Timing Hedge Funds Time the Market?" *Journal of Financial and Quantitative Analysis*, 42 (4), 827–856.
- Coval, Joshua D., and Tobias J. Moskowitz, 2001, "The geography of investment: Informed

trading and asset prices,” *Journal of Political Economy* 109, 811–841.

Do, Viet, Robert Faff and Madhu Veeraraghavan, (2010), “Performance persistence in hedge funds: Australian evidence,” *Journal of International Financial Markets, Institutions and Money*, 20 (4), 346-362.

Do, Viet, Robert Faff and J. Wickramanayake, (2005), “An Empirical Analysis of Hedge Fund Performance: The Case of Australian Hedge Funds Industry,” *Journal of Multinational Financial Management*, 15(4-5), 377-93.

Eun, C. S. and S. Sabherwal (2003), “Cross-Border Listings and Price Discovery: Evidence from US-Listed Canadian Stocks”, *Journal of Finance*, 53 (2), 549–575.

Eling, Martin, and Roger Faust, (2010), “The performance of hedge funds and mutual funds in emerging markets.” *Journal of Banking and Finance*, 34 (3), 1993–2009.

Fama, Eugene, and Kenneth French, (1992), “The Cross-Section of Expected Stock Returns,” *Journal of Finance*, 427-465.

Fung, Hung-Gay, Xiaoqing Eleanor Xu, and Jot Yau (2002). “Global Hedge Funds: Risk, Return, and Market Timing.” *Financial Analysts Journal* 58 (6), 19–30.

Fung, William, and David A. Hsieh, (1997a) "Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds," *Review of Financial Studies*, 10, 275-302.

Fung, William, and David A. Hsieh, (1997b), “Survivorship Bias and Investment Style in the Returns of CTAs,” *Journal of Portfolio Management*, 24(1), 179-92.

Fung, William, and David A. Hsieh, (2000), “Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases,” *Journal of Financial and Quantitative Analysis*, 35(3), 291-307.

Fung, William, and David A. Hsieh, (2002), “Asset-Based Style Factors for Hedge Returns,” *Financial Analysts Journal*, 58(5), 16-27.

Fung, William, and David A. Hsieh, (2004) “Hedge Fund Benchmarks: A Risk-Based Approach,” *Financial Analysts Journal*, Vol. 60, No. 5, 65-80.

Fung, William and David A. Hsieh, (2006). “Hedge funds: an industry in its adolescence.” *Federal Reserve Bank of Atlanta Economic Review* 91 (4), 1–34.

Fung, William, and David A. Hsieh, (2009), “Measurement Biases in Hedge Fund Performance Data: An Update,” *Financial Analysts Journal*, 65(3), 36-38.

Fung, William, David A. Hsieh, Narayan Y. Naik, and Tarun Ramadorai, (2008), “Hedge Funds: Performance, Risk, and Capital Formation,” *Journal of Finance*, 63, 1777-1803.

Gregoriou, Greg N., (2004), “Performance of Canadian Hedge Funds Using a Modified Sharpe Ratio,” *Derivatives Use, Trading & Regulation*, 10(2), 149-155.

- Goetzmann, W., J. Ingersoll, and Z. Ivkovich. (2000), "Monthly Measurement of Daily Timers," *Journal of Financial and Quantitative Analysis*, 35, 257–290.
- Griffin, J., (2002), "Are the Fama and French factors global or country specific?" *Review of Financial Studies*, 15(3), 783-803.
- Hakamada, Takeshi, Akihiko Takahashi and Kyo Yamamoto, (2007), "Selection and Performance of Asia-Pacific Hedge Funds," *The Journal of Alternative Investments*, 10, 7-29.
- Henriksson, R., and R. Merton, (1981), "On Market Timing and Investment Performance II. Statistical Procedures for Evaluating Forecasting Skills," *Journal of Business*, 54, 513–533.
- Ineichen, Alexander M., (2004), "European Hedge Funds," *The Journal of Portfolio Management*, 30(4), 254-267.
- Ivkovic, Zoran, and Scott Weisbenner, 2005, "Local does as local is: Information content of the geography of individual investors' common stock investments," *Journal of Finance* 60, 267–306.
- King, Michael R., and Dan Segal, (2003), "Corporate Governance, International Cross Listing And Home Bias," *Canadian Investment Review*, 16 (4), 8-18.
- Lamm Jr., R. M., (1999), "Portfolios of Alternative Assets: Why Not 100% Hedge Funds," *The Journal of Investing*, 8, 87-97.
- Lett, Tristram, (2009), "The Inefficient Frontier," *Canadian Investment Review*, 22 (2), 33-34.
- Lo, Andrew, (2010), "Hedge Funds - An Analytic Perspective," Princeton University Press.
- Malkiel, Burton G., and Atanu Saha, (2005), "Hedge Funds: Risk and Return," *Financial Analysts Journal*, 61(6), 80-88.
- Merton, Robert C., (1981), "On Market Timing and Investment Performance Part I: An Equilibrium Theory of Value for Market Forecasts." *Journal of Business*, 54, 363-406.
- McGovern, Jim, and Gary Ostoich. (2005), "Hedge Fund Industry in Canada." Senate of Canada Briefing, AIMA Canada.
- Pesaran, M. Hashem and Allan Timmermann (2002). "Market timing and return prediction under model instability," *Journal of Empirical Finance*, 9(5) 495-510.
- PricewaterhouseCoopers (2010), "Hedge funds. Regulation and Taxation." <http://www.pwcassetmanagement.com/hfwp/m/regulationTaxation.aspx?uid=8&>.
- Steri, Roberto, Marco Giorgino, and Diego Viviani, (2009), "The Italian Hedge Funds Industry: An Empirical Analysis of Performance and Persistence," *Journal of Multinational Financial Management*, 19 (1), 75-91.
- Tannous, G.F. and Y. Zhang, (2008) "Cross-listing and Trading on the Domestic Market: Evidence from Canada-US Partial Holidays," *Journal of Business Finance & Accounting*, 35 (9) & (10), 1245-1275.

Teo, Melvyn, (2009), “The Geography of Hedge Funds,” *The Review of Financial Studies*, 22 (9), 3531-3561.

Treynor, J. and Mazuy, K. (1966). “Can Mutual Funds Outguess the Market?” *Harvard Business Review* 44, 131–136.

Zeileis, A., C. Kleiber, W. Kramer, and K. Hornik. (2003), “Testing and dating of structural changes in practice,” *Computational Statistics & Data Analysis* 44(1–2), 109–123.

Table 1
Canadian Hedge Funds between 1998 and 2011

This table provides the number of live Canadian hedge funds in our entire database for each strategy sector at the end of the calendar years as indicated.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
All Strategies	12	18	27	39	56	68	95	116	144	165	149	155	165	163
Multistrategy	3	3	5	6	6	6	8	8	8	9	9	9	13	11
Equity Market Neutral	0	1	2	3	5	9	11	17	18	22	21	18	18	17
Fixed Income	1	1	1	1	3	3	4	6	6	8	5	8	13	14
Convertible Arbitrage	1	1	1	1	2	2	3	3	3	3	3	3	3	3
Event Driven	1	2	2	3	4	4	5	5	6	7	7	9	11	12
Equity Long/Short	5	7	13	18	25	32	49	58	75	86	75	80	83	86
Global Macro	0	0	0	2	2	2	3	5	8	9	6	7	6	5
Managed Futures	1	3	3	5	9	10	12	14	20	21	23	21	18	15

Table 2
Summary Statistics for KPSV Canadian Hedge Fund Indices

The statistics in this table are for monthly returns on the KPSV Canadian Composite hedge fund index and sub-indices from 2003 to 2011. Statistics are not annualized except for the Sharpe ratio as indicated. The Sharpe ratio is based on a riskless rate of 3%. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided for the signed-rank tests of median returns.

Hedge Fund Index	Average Monthly Return (%)	Standard Deviation (%)	Median	Skewness	Excess Kurtosis	3rd Moment (%)	4th Moment (%)	Sharpe Ratio (annual)	Maximum Drawdown (%)	Period of Maximum Drawdown	Months to Recovery / Left to Recover
KPSV Composite	0.96***	2.59	1.31	-1.17	5.43	-2.73	3.96	0.954	-23.20	5 months	13 months
KPSV Multistrategy	1.11***	3.17	1.59	-1.14	6.07	-3.31	4.98	0.788	-31.04	14 months	8 months
KPSV Equity Mkt Neutral	0.30***	1.11	0.42	-1.03	5.81	-1.12	1.72	0.832	-7.27	14 months	-7.27%
KPSV Fixed Income	0.69***	1.70	0.88	-2.44	15.92	-2.28	3.39	0.381	-15.66	18 months	11 months
KPSV Convertible Arb.	1.29***	4.13	1.37	-3.22	18.88	-6.10	8.61	0.706	-46.88	4 months	17 months
KPSV Event Driven	1.66***	4.39	1.85	-0.98	6.80	-4.35	7.09	1.308	-38.83	9 months	9 months
KPSV Equity Long/Short	1.08***	3.58	1.69	-1.09	4.96	-3.68	5.35	0.826	-30.48	8 months	12 months
KPSV Global Macro	1.17***	3.03	1.15	0.84	9.07	2.85	5.26	1.706	-11.51	2 months	4 months
KPSV Managed Futures	0.89***	2.64	0.65	-0.22	4.63	-1.59	3.87	1.337	-12.39	2 months	5 months

Table 3
Correlations between KPSV Canadian Hedge Fund Sub-indices

This table reports correlations between monthly returns on the KPSV Canadian hedge fund sub-indices from 2003 to 2011. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

	Multistrategy	Equity Market Neutral	Fixed Income	Convertible Arbitrage	Event Driven	Equity Long/Short	Global Macro	Managed Futures
Multistrategy	1							
Equity Market Neutral	0.566***	1						
Fixed Income	0.713***	0.353***	1					
Convertible Arbitrage	0.601***	0.260**	0.614***	1				
Event Driven	0.825***	0.357***	0.686***	0.656***	1			
Equity Long/Short	0.901***	0.550***	0.704***	0.564***	0.841***	1		
Global Macro	0.263**	0.216*	0.262**	0.181	0.311**	0.225*	1	
Managed Futures	0.221*	0.311**	0.221*	0.031	0.170	0.210*	0.535***	1

Table 4
Distributional Differences between Canadian Hedge Fund Indices

The table shows summary statistics for monthly returns on the KPSV Composite, KPSV Equity Long/Short, Scotia equally-weighted (SC CDN HFI (EW)), and CanadianHedgeWatch (CHW) hedge fund composite indices and KPSV and CHW sub-indices from January 2005 to December 2011. Statistics are not annualized, except for the Sharpe ratio. The Sharpe ratio is based on a riskless rate of 3%. z-statistics and F-statistics are for the Wilcoxon paired signed-rank and Brown and Forsythe (1974) tests of, respectively, the equality of medians and variances between KPSV Composite and SC CDN HFI Composite, KPSV Composite and CHW Composite, and KPSV Equity Long/Short and CHW Equity Hedge sub-indices. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

Hedge Fund Index	Average Monthly Return (%)	Equal Median with KPSV z-stat.	Standard Deviation (%)	Equal Variance with KPSV F-stat.	Skew	Excess Kurtosis	3rd Moment (%)	4th Moment (%)	Sharpe Ratio (annual)	Maximum Draw-down (%)	Period of Maximum Drawdown	Months to Recovery / Left to Recover
KPSV Composite	0.75		2.71		-1.16	5.25	-2.85	4.10	0.635	-23.20	5 months	13 mos
SC CDN HFI Composite	0.48	2.01**	2.86	0.15	-1.05	5.05	-2.90	4.28	0.282	-26.51	6 months	21 mos
CHW Composite	0.15	5.53***	2.90	0.57	-1.04	4.27	-2.93	4.17	-0.125	-31.56	14 months	19.79%
KPSV Equity Long/Short	1.14		3.73		-1.19	5.11	-3.95	5.61	0.826	-30.48	8 months	12 mos
CHW Equity Hedge	0.33	3.34***	3.49	0.16	-0.89	3.97	-3.35	4.93	0.082	-34.53	16 months	20.01%

Table 5
Canadian and Global Hedge Fund and Capital Market Indices

The table reports summary statistics in Panel A and correlations in Panel B for monthly returns for indices for traditional asset classes (S&P/TSX, S&P 500, MSCI EAFE, DEX Universe Canadian Bond, and Barclays Global Aggregate Bond) and the KPSV Canadian, Credit Suisse (CS), and Hedge Fund Research Inc. (HFRI) Composite hedge fund indices from 2003 to 2011. The annualized Sharpe ratio is based on a riskless rate of 3%. z-statistics and F-statistics are for the Wilcoxon signed-rank and Brown and Forsythe (1974) tests of, respectively, the equality of medians and variances between the KPSV Composite index and the other indices. K-S statistics is the statistics for the Kolmogorov-Smirnov two-sample test for the equality of distributions between the KPSV Composite index and the other indices. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

Panel A. Summary Statistics and Distributional Differences

Index	Average Monthly Return (%)	Equal median with KPSV z-stat.	Std Dev (%)	Equal variance with KPSV F-stat.	Skew	Excess Kurtosis	3rd moment (%)	4th moment (%)	K-S stat.	Sharpe ratio (annual)	Max. Draw-down (%)	Period of Max Draw-down (months)	Months to Recovery / Left to Recover
KPSV Composite	0.96		2.59		-1.17	5.43	-2.73	3.96		0.95	-23.20	5 mos	13 mos
CS Composite	0.57	3.49***	1.76	10.11***	-1.41	6.65	-1.97	2.82	0.25***	0.63	-19.68	14 mos	20 mos
HFRI Composite	0.56	4.01***	1.92	5.26**	-1.03	5.28	-1.94	2.91	0.21**	0.56	-21.42	16 mos	19 mos
S&P/TSX	0.84	-0.61	4.19	15.44***	-1.18	6.24	-4.42	6.62	0.21**	0.49	-43.35	9 mos	23 mos
S&P 500	0.60	0.58	4.38	13.69***	-0.73	5.00	-3.95	6.56	0.14	0.27	-50.95	16 mos	36 mos
MSCI EAFE	0.22	1.15	4.32	15.90***	-0.85	4.68	-4.08	6.35	0.17*	-0.03	-53.29	21 mos	39.78%
Canadian Bond	0.51	3.09***	1.03	38.31***	-0.22	3.14	-0.63	1.37	0.35***	0.88	-2.77	2 mos	1 mo
Global Bond	-0.01	12.8***	0.83	52.84***	-0.05	3.54	-0.30	1.14	0.51***	-1.07	-2.65	7 mos	5 mos

Panel B. Correlations between Hedge Fund Indices and Traditional Market Indices

	KPSV Composite	CS Composite	HFRI Composite	S&P/TSX	S&P 500	MSCI EAFE	Canadian Bond	Global Bond
KPSV Composite	1							
CS Composite	0.915***	1						
HFRI Composite	0.935***	0.959***	1					
S&P/TSX	0.872***	0.833***	0.888***	1				
S&P 500	0.678***	0.732***	0.812***	0.805***	1			
MSCI EAFE	0.720***	0.740***	0.839***	0.797***	0.882***	1		
DEX Canadian Bond	-0.052	-0.021	-0.044	-0.042	-0.025	-0.037	1	
Barclays Global Bond	-0.119	-0.088	-0.105	-0.085	-0.048	-0.125	0.807***	1

Table 6. Distributional Differences between Canadian and Global Hedge Fund Indices

The statistics in this table are for monthly returns on the KPSV Canadian, Credit Suisse (CS) and Hedge Fund Research Inc. (HFRI) global hedge fund strategy sub-indices from 2003 to 2011. The statistics are for monthly data and are not annualized, except for the Sharpe ratio. The Sharpe ratio is based on a riskless rate of 3%. z-statistics and F-statistics are for the Wilcoxon signed-rank and Brown and Forsythe (1974) tests of, respectively, the equality of medians and variances between the KPSV and the global indices with the same strategy. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

Strategy	Hedge Fund Index	Average Monthly Return (%)	Equal median with KPSV z-stat.	Std Dev (%)	Equal variance with KPSV F-stat.	Skew	Excess Kurtosis	3rd Moment (%)	4th Moment (%)	Sharpe Ratio (annual)	Max. Draw-down (%)	Period of Max. Draw-down (months)	Months to Recovery / Left to Recover
Multistrategy	KPSV	1.11		3.17		-1.14	6.07	-3.31	4.98	0.79	-31.04	14 mos	8 mos
	CS	0.65	3.24***	2.07	20.90***	-1.15	5.13	-2.16	3.11	0.67	-24.72	14 mos	23 mos
	HFRI	0.42	3.56***	1.53	32.91**	-2.62	15.89	-2.11	3.06	0.38	-21.48	19 mos	13 mos
Equity Market Neutral	KPSV	0.30		1.11		-1.03	5.81	-1.12	1.72	0.83	-6.28	10 mos	-6.28%
	CS	0.06	-0.83	4.12	0.93	-9.05	92.31	-8.59	12.78	-0.16	-45.10	8 mos	-38.01%
	HFRI	0.20	1.33	0.84	4.69**	-1.44	6.26	-0.95	1.33	-0.22	-9.16	10 mos	-6.29%
Fixed Income	KPSV	0.69		1.70		-2.44	15.92	-2.28	3.39	0.38	-15.66	18 mos	11 mos
	CS	0.33	2.34**	2.04	0.24	-4.13	27.79	-3.28	4.69	0.14	-29.02	14 mos	21 mos
	HFRI	0.53	1.93*	1.92	0.03	-2.31	13.68	-2.54	3.70	0.50	-28.11	19 mos	15 mos
Convertible Arbitrage	KPSV	1.29		4.13		-3.22	18.88	-6.10	8.61	0.71	-46.88	4 mos	17 mos
	CS	0.42	4.66***	2.47	3.10*	-2.48	15.73	-3.35	4.93	0.24	-32.88	14 mos	13 mos
	HFRI	0.40	4.41***	2.79	2.00	-2.20	17.56	-3.62	5.70	0.19	-35.32	13 mos	9 mos
Event Driven	KPSV	1.66		4.39		-0.98	6.80	-4.35	7.09	1.31	-38.83	9 mos	9 mos
	CS	0.66	3.49***	1.87	31.87***	-1.30	5.31	-2.04	2.84	0.75	-19.15	16 mos	12 mos
	HFRI	0.67	3.44***	2.02	25.99**	-1.29	6.37	-2.20	3.21	0.72	-24.79	16 mos	13 mos
Equity Long/Short	KPSV	1.08		3.58		-1.09	4.96	-3.68	5.35	0.83	-30.48	8 mos	12 mos
	CS	0.58	3.26***	2.35	8.94***	-0.92	4.50	-2.29	3.42	0.49	-22.00	16 mos	21 mos
	HFRI	0.49	3.95***	2.58	6.53**	-1.00	5.24	-2.58	3.90	0.32	-30.60	16 mos	23 mos
Global Macro	KPSV	1.17		3.03		0.84	9.07	2.85	5.26	1.71	-11.51	2 mos	4 mos
	CS	0.82	1.57	1.61	13.74***	-1.21	7.89	-1.71	2.69	1.24	-13.92	6 mos	14 mos
	HFRI	0.58	2.53**	1.56	11.35***	0.30	3.20	1.04	2.08	0.74	-5.86	8 mos	-5.86%
Managed Futures	KPSV	0.89		2.64		-0.22	4.63	-1.59	3.87	1.34	-12.39	2 mos	5 mos
	CS	0.52	1.18	3.35	13.69***	-0.01	2.02	-0.59	3.99	0.28	-14.94	4 mos	17 mos
	HFRI	0.77	0.23	2.34	0.02	0.18	2.87	1.32	3.05	0.77	-6.23	7 mos	-6.03%

Table 7
Performance of Canadian Hedge Funds

Panel A provides regression results of monthly excess returns on the KPSV Canadian composite hedge fund indices and sub-indices on the excess return on the Canadian stock market (*Market*) and returns on Thomson Reuters Equal-Weight NYFE CRB Continuous Commodity Index (*Commodity*), DEX Government Bond Universe Index (*Government Bond*), and DEX Corporate Bond Universe Index (*Corporate Bond*) from 2003 to 2011. The returns on all indices are in excess of the Canadian risk-free rate. Regressions in Panel B include the same variables as in Panel A and the *Market Timing* variable defined as $\text{Market} * I(\text{Market} > 0)$. Regressions in Panel C include the same variables as in Panel A and the *Commodity Timing* variable defined as $\text{Commodity} * I(\text{Commodity} > 0)$. If a structural break in coefficients is found for a sub-index regression in Panel C, Panel D reports the structural break month and regression results on the subsamples before and after it. t-statistics in parentheses are computed using robust standard errors. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

Panel A. Performance of Canadian Hedge Funds without Timing Variables

	KPSV Indices								
	Composite	Multi-strategy	Equity Market Neutral	Fixed Income	Convert. Arbitrage	Event Driven	Equity Long/Short	Global Macro	Managed Futures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
alpha	0.004*** (3.93)	0.006*** (3.28)	0.000 (0.04)	0.004*** (2.84)	0.009*** (2.65)	0.010*** (4.56)	0.004** (2.54)	0.009*** (3.40)	0.006** (2.45)
Market	0.435*** (12.80)	0.506*** (9.89)	0.063 (1.53)	0.243*** (5.20)	0.299** (2.13)	0.598*** (8.91)	0.643*** (13.73)	0.051 (0.68)	0.006 (0.09)
Commodity	0.120*** (4.83)	0.081* (1.94)	0.071** (2.13)	0.030 (0.84)	0.149 (1.52)	0.185*** (2.91)	0.118*** (3.30)	0.182** (2.51)	0.203*** (3.59)
Government Bond	-0.333* (-1.83)	-0.749*** (-3.10)	-0.012 (-0.09)	-0.061 (-0.27)	-1.616*** (-2.80)	-1.191** (-2.54)	-0.580** (-2.16)	0.940** (2.55)	0.804** (2.38)
Corporate Bond	0.281 (1.32)	0.979*** (3.21)	-0.112 (-0.72)	0.395 (1.56)	2.427*** (4.73)	1.494*** (3.00)	0.293 (0.92)	-0.225 (-0.68)	-0.328 (-1.09)
Obs.	108	108	108	108	107	108	108	108	108
Adj. R ²	0.831	0.744	0.216	0.534	0.459	0.713	0.829	0.145	0.146

Panel B. Performance of Canadian Hedge Funds with Market Timing

	KPSV Indices								
	Composite	Multi-strategy	Equity Market Neutral	Fixed Income	Convert. Arbitrage	Event Driven	Equity Long/Short	Global Macro	Managed Futures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
alpha	0.006*** (3.44)	0.007*** (3.31)	0.002 (0.90)	0.010*** (5.48)	0.028*** (7.08)	0.014*** (4.05)	0.006** (2.38)	0.008 (1.60)	-0.001 (-0.19)
Market	0.485*** (8.92)	0.546*** (8.27)	0.104 (1.39)	0.414*** (6.11)	0.782*** (3.68)	0.705*** (8.45)	0.695*** (8.86)	0.032 (0.35)	-0.160* (-1.81)
Market Timing	-0.114 (-1.26)	-0.090 (-0.89)	-0.092 (-0.87)	-0.389*** (-3.65)	-1.098*** (-4.00)	-0.243 (-1.57)	-0.119 (-0.93)	0.043 (0.20)	0.378** (2.23)
Commodity	0.116*** (4.76)	0.077* (1.86)	0.068** (2.08)	0.016 (0.55)	0.107 (1.12)	0.176*** (2.68)	0.113*** (3.21)	0.183** (2.61)	0.216*** (3.96)
Government Bond	-0.371** (-2.31)	-0.779*** (-3.24)	-0.042 (-0.34)	-0.190 (-1.05)	-1.972*** (-4.33)	-1.272*** (-2.83)	-0.620** (-2.58)	0.954** (2.44)	0.929*** (2.63)
Corporate Bond	0.301 (1.56)	0.995*** (3.33)	-0.096 (-0.61)	0.462** (2.32)	2.620*** (6.32)	1.536*** (3.19)	0.314 (1.06)	-0.232 (-0.73)	-0.393 (-1.33)
Obs.	108	108	108	108	107	108	108	108	108
Adj. R ²	0.832	0.743	0.221	0.620	0.578	0.715	0.830	0.137	0.173

Panel C. Performance of Canadian Hedge Funds with Commodity Index Timing

	KPSV Indices								
	Composite	Multi-strategy	Equity Market Neutral	Fixed Income	Convert. Arbitrage	Event Driven	Equity Long/Short	Global Macro	Managed Futures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
alpha	0.006*** (3.89)	0.008*** (3.67)	0.001 (0.60)	0.007*** (3.72)	0.016*** (3.60)	0.014*** (3.73)	0.006*** (2.74)	0.009** (2.21)	0.001 (0.34)
Market	0.418*** (11.95)	0.490*** (9.11)	0.056 (1.37)	0.212*** (5.16)	0.236* (1.87)	0.564*** (8.54)	0.621*** (12.68)	0.047 (0.58)	0.047 (0.72)
Commodity	0.178*** (3.80)	0.140 (1.60)	0.096 (1.50)	0.138* (1.93)	0.371 (1.66)	0.305*** (3.11)	0.193*** (2.64)	0.194* (1.79)	0.060 (0.67)
Commodity Timing	-0.102 (-1.57)	-0.104 (-1.00)	-0.044 (-0.57)	-0.190* (-1.98)	-0.392 (-1.37)	-0.212 (-1.20)	-0.132 (-1.33)	-0.022 (-0.14)	0.252** (2.04)
Government Bond	-0.345** (-2.13)	-0.761*** (-3.31)	-0.017 (-0.13)	-0.083 (-0.41)	-1.662*** (-3.12)	-1.216*** (-2.82)	-0.595** (-2.48)	0.937** (2.50)	0.833*** (2.66)
Corporate Bond	0.278 (1.42)	0.976*** (3.31)	-0.114 (-0.73)	0.389* (1.74)	2.415*** (5.35)	1.488*** (3.25)	0.289 (0.98)	-0.226 (-0.67)	-0.320 (-1.18)
Obs.	108	108	108	108	107	108	108	108	108
Adj. R ²	0.833	0.744	0.212	0.560	0.476	0.716	0.831	0.136	0.160

Panel D. Structural Breaks for Canadian Hedge Funds with Commodity Index Timing

	KPSV Indices							
	Equity Market Neutral		Convertible Arbitrage		Global Macro		Managed Futures	
	1/2003 - 8/2008 (1)	10/2008 - 12/2011 (2)	1/2003 - 6/2007 (3)	11/2008 - 12/2011 (4)	1/2003 - 3/2005 (5)	9/2006 - 11/2011 (6)	1/2003 - 5/2005 (7)	7/2005 - 12/2011 (8)
Alpha	0.000 (0.22)	0.000 (0.17)	0.014*** (2.78)	0.015** (2.42)	0.003 (0.47)	0.007** (2.11)	0.001 (0.11)	-0.003 (-1.20)
Market	0.139** (2.33)	-0.024 (-0.69)	0.083 (0.75)	0.324* (1.98)	0.389 (1.69)	0.080 (1.14)	-0.072 (-0.26)	0.068 (1.46)
Commodity	0.182* (1.74)	0.061 (1.39)	-0.001 (-0.00)	-0.054 (-0.31)	0.489* (2.07)	0.075 (0.82)	0.316 (0.76)	-0.026 (-0.44)
Commodity Timing	-0.128 (-0.98)	-0.017 (-0.32)	-0.156 (-0.48)	-0.159 (-0.76)	-0.086 (-0.21)	-0.027 (-0.18)	0.828 (1.17)	0.271*** (3.40)
Government Bond	0.692 (1.34)	-0.265*** (-2.94)	-1.761* (-1.73)	-1.816*** (-3.10)	7.336*** (4.92)	0.746** (2.51)	4.726* (2.02)	0.269** (2.03)
Corporate Bond	-0.985 (-1.64)	0.100 (0.68)	1.724 (1.55)	2.404*** (5.28)	-6.155*** (-3.51)	0.060 (0.17)	-2.764 (-0.92)	-0.504*** (-2.86)
Obs.	68	39	54	38	27	64	29	78
Adj. R ²	0.291	0.176	0.001	0.502	0.702	0.202	0.615	0.225
Break month	9/2008		7/2007, 10/2008		4/2005, 8/2006		6/2005	

Table 8

Performance of Canadian Global Hedge Fund Indices Relative to Global Risk Factors

Panel A reports regression results of monthly excess returns from 2003 to 2011 for the KPSV Canadian hedge fund composite indices and sub-indices on Fama and French (1992) and Carhart (1997) factors for the U.S. stock market and returns on Thomson Reuters Equal-Weight NYFE CRB Continuous Commodity Index (*Commodity*), Bank of America Merrill Lynch Global Government (*Government Bond*) and Broad Corporate (*Corporate Bond*) indices. The returns on all indices are in excess of the U.S. risk-free rate. Panel B reports regression results of monthly excess returns for the global hedge fund indices: the Credit Suisse (CS) Composite and sub-indices and Hedge Fund Research Inc. (HFRI) Composite index from 2003 to 2011. If a structural break in coefficients is found for a sub-index regression in Panels A or B, Panel C reports the structural break month and regression results on the subsamples before and after it. Robust t-statistics are in parentheses. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

Panel A. Canadian Hedge Fund Indices and Global Risk Factors

	KPSV Indices								
	Composite (1)	Multi- strategy (2)	Equity Market Neutral (3)	Fixed Income (4)	Convert. Arbitrage (5)	Event Driven (6)	Equity Long/Short (7)	Global Macro (8)	Managed Futures (9)
alpha	0.004*** (3.46)	0.006*** (2.94)	0.001 (0.85)	0.003*** (2.96)	0.009*** (2.76)	0.010*** (3.56)	0.004** (2.52)	0.007*** (2.63)	0.005** (2.21)
Market	0.199*** (4.05)	0.180** (2.11)	-0.006 (-0.17)	0.086** (2.06)	0.003 (0.03)	0.268*** (2.97)	0.326*** (5.07)	-0.149** (-1.98)	-0.047 (-0.65)
SMB	0.175*** (2.63)	0.129 (1.12)	0.035 (0.73)	0.076 (1.64)	0.070 (0.58)	0.224* (1.91)	0.271*** (3.02)	0.115 (0.84)	0.023 (0.17)
HML	0.018 (0.27)	0.005 (0.05)	0.026 (0.55)	0.087* (1.72)	0.010 (0.06)	-0.100 (-0.75)	-0.006 (-0.07)	0.202 (1.58)	0.165 (1.60)
UMD	0.057** (2.13)	0.023 (0.59)	0.063*** (2.97)	0.069** (2.15)	-0.113* (-1.73)	-0.110** (-2.33)	0.083** (2.33)	0.005 (0.10)	0.050 (1.03)
Commodity	0.249*** (7.76)	0.260*** (4.41)	0.092*** (3.57)	0.034 (1.28)	0.234** (2.53)	0.407*** (5.24)	0.319*** (7.26)	0.138** (2.21)	0.181*** (2.92)
Government Bond	-0.278** (-2.27)	-0.534*** (-2.94)	-0.116 (-1.31)	-0.344*** (-2.70)	-1.239*** (-3.24)	-0.550** (-2.26)	-0.416** (-2.46)	0.493** (2.51)	0.377** (2.17)
Corporate Bond	0.329** (2.44)	0.601*** (3.03)	0.112 (0.98)	0.625*** (3.85)	1.442*** (2.71)	0.583** (2.38)	0.381** (1.99)	0.153 (0.58)	-0.147 (-0.60)
Obs.	108	108	108	108	107	108	108	108	108
Adj. R ²	0.741	0.571	0.241	0.580	0.460	0.646	0.749	0.230	0.134

Panel B. Global Hedge Fund Indices and Global Risk Factors

	CS Indices									HFRI Composite
	Composite	Multi- strategy	Equity Market Neutral	Fixed Income	Convert. Arbitrage	Event Driven	Equity Long/Short	Global Macro	Managed Futures	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
alpha	0.002** (2.29)	0.003*** (2.66)	-0.003 (-0.67)	0.001 (0.56)	0.001 (0.97)	0.003*** (2.97)	0.001 (1.22)	0.005*** (3.87)	0.000 (0.08)	0.002** (2.17)
Market	0.179*** (5.81)	0.127*** (3.81)	0.269* (1.73)	0.028 (0.62)	-0.003 (-0.06)	0.184*** (4.97)	0.338*** (9.88)	-0.011 (-0.24)	0.112 (1.06)	0.232*** (7.94)
SMB	0.027 (0.69)	0.013 (0.27)	0.027 (0.26)	-0.064 (-1.29)	0.046 (0.76)	0.061 (1.24)	0.061 (1.28)	-0.004 (-0.07)	0.043 (0.33)	0.085** (2.28)
HML	-0.037 (-0.80)	-0.065 (-1.09)	0.216 (1.16)	0.065 (1.40)	-0.067 (-0.77)	0.016 (0.33)	-0.099** (-1.99)	-0.070 (-1.30)	-0.086 (-0.69)	-0.051 (-1.47)
UMD	0.033* (1.82)	0.009 (0.40)	-0.091 (-0.81)	-0.037 (-0.91)	-0.039 (-1.34)	0.052** (2.28)	0.074*** (3.74)	0.005 (0.19)	0.092* (1.68)	0.015 (0.97)
Commodity	0.121*** (6.17)	0.098*** (4.28)	0.152 (1.54)	0.107*** (2.81)	0.107*** (3.04)	0.093*** (3.09)	0.106*** (3.82)	0.183*** (5.73)	0.226*** (2.94)	0.115*** (5.54)
Government Bond	-0.252*** (-3.10)	-0.508*** (-5.64)	0.089 (0.48)	-0.757*** (-4.72)	-1.079*** (-7.48)	-0.381*** (-3.27)	-0.211** (-2.11)	0.023 (0.17)	0.925*** (3.28)	-0.250*** (-3.45)
Corporate Bond	0.348*** (3.64)	0.566*** (5.64)	-0.488 (-0.88)	0.890*** (4.33)	1.323*** (7.70)	0.418*** (3.09)	0.336*** (2.82)	0.195 (1.18)	-0.722** (-2.18)	0.314*** (3.93)
Obs.	108	108	108	108	108	108	108	108	108	108
Adj. R ²	0.768	0.711	0.125	0.622	0.723	0.691	0.825	0.484	0.171	0.849

Panel C. Structural Breaks for Canadian and Global Hedge Fund Indices Estimated on Global Risk Factors

	KPSV Indices					CS Indices					
	Composite		Multistrategy		Managed Futures	Equity Market Neutral		Fixed Income		Convertible Arbitrage	
	1/2003 - 8/2008 (1)	10/2008 - 12/2011 (2)	1/2003 - 8/2008 (3)	10/2008 - 12/2011 (4)	9/2005 - 12/2011 (5)	1/2003 - 10/2007 (6)	4/2009 - 12/2011 (7)	1/2003 - 12/2007 (8)	4/2009 - 12/2011 (9)	1/2003 - 1/2009 (10)	3/2009 - 12/2011 (11)
alpha	0.004** (2.53)	0.002 (1.18)	0.002 (0.66)	0.009*** (3.82)	0.003* (1.75)	0.003*** (3.72)	-0.003 (-1.43)	0.001 (0.37)	0.009*** (7.74)	-0.000 (-0.18)	0.008*** (5.56)
Market	0.398*** (7.72)	0.138* (1.77)	0.506*** (5.38)	-0.004 (-0.03)	0.053 (1.04)	0.049** (2.19)	0.181** (2.43)	0.054 (1.20)	-0.072 (-1.18)	-0.014 (-0.25)	-0.034 (-0.51)
SMB	0.152** (2.18)	0.074 (0.97)	0.109 (0.76)	-0.058 (-0.55)	-0.085 (-1.15)	-0.026 (-0.73)	-0.013 (-0.12)	-0.010 (-0.17)	-0.074 (-1.14)	0.117 (1.51)	-0.059 (-0.72)
HML	0.164* (1.81)	0.020 (0.26)	0.110 (0.63)	0.187 (1.46)	0.036 (0.54)	0.086** (2.22)	-0.050 (-0.64)	0.111 (1.39)	0.146** (2.29)	-0.185** (-2.14)	0.256*** (3.30)
UMD	0.167*** (4.66)	-0.023 (-0.89)	0.223*** (3.84)	-0.076 (-1.36)	0.030 (0.90)	0.017 (0.72)	0.012 (0.58)	-0.025 (-0.58)	0.003 (0.23)	-0.058 (-1.37)	0.007 (0.35)
Commodity	0.254*** (6.53)	0.238*** (4.07)	0.292*** (4.24)	0.265*** (3.23)	0.141*** (3.79)	0.030 (1.26)	0.004 (0.09)	0.036 (1.02)	0.049* (1.77)	0.137*** (3.37)	0.054 (1.15)
Government Bond	-0.020 (-0.09)	-0.488*** (-4.31)	-0.264 (-0.67)	-0.950*** (-4.31)	0.330*** (2.52)	0.065 (0.41)	0.092 (0.54)	-0.094 (-0.35)	-0.426*** (-3.71)	-1.180*** (-7.23)	-0.812*** (-6.47)
Corporate Bond	0.226 (0.81)	0.367** (2.67)	0.539 (1.16)	0.846*** (2.87)	-0.352** (-2.23)	-0.006 (-0.03)	0.280 (1.59)	0.225 (0.70)	0.612*** (4.76)	1.449*** (8.14)	1.052*** (6.20)
Obs.	68	39	68	39	76	58	33	58	33	73	34
Adj. R ²	0.742	0.853	0.592	0.749	0.196	0.136	0.673	0.131	0.584	0.770	0.758
Break month	9/2008		9/2008		5/2004, 9/2005	11/2007, 3/2009		11/2007, 3/2009		2/2009	

Table 9
Performance measures based on individual fund returns

This table reports the distribution of performance measures of individual hedge funds that have at least 36 months of return data available between 2003 and 2011. Column (1) is the distribution of mean returns (in %) calculated for each Canadian hedge fund. Columns (2) and (3) are the distributions of monthly alphas for Canadian hedge funds based on the models using the Canadian and U.S. factors, respectively, without timing variables. Column (4) reports the alphas for all hedge funds in the TASS database regressed on the U.S. factors. Columns (5) – (8) report alphas for the Canadian hedge funds grouped by the subindices that include at least 10 hedge funds; the regressions are estimated on the Canadian factors without timing variables. Columns (9) – (13) report the commodity market timing coefficients for the Canadian hedge funds; the regressions are estimated using the Canadian factors. The last two rows report the percentage of hedge funds that have statistically significant positive and negative robust t-statistics for the alphas and commodity timing coefficients.

Distribution measure	Mean returns, all CDN funds (1)	Alpha (%)							Commodity timing coefficient				
		All CDN funds, CDN factors (2)	All CDN funds, US factors (3)	All funds, US factors (4)	Equity Market Neutral (5)	Event Driven (6)	Equity Long/Short (7)	Managed Futures (8)	All CDN funds (9)	Equity Market Neutral (10)	Event Driven (11)	Equity Long/Short (12)	Managed Futures (13)
Max value	4.19	3.61	2.64	302.84	0.47	2.47	3.34	3.61	3.520	0.169	0.280	0.503	3.520
95 th	1.88	1.55	1.57	1.05	0.47	2.47	1.55	3.61	0.462	0.169	0.280	0.373	3.520
75 th	1.08	0.55	0.58	0.47	0.05	0.94	0.55	0.90	0.090	-0.015	0.005	0.030	0.710
Median	0.62	0.20	0.22	0.08	-0.05	0.54	0.20	0.26	-0.116	-0.068	-0.272	-0.191	0.183
25 th	0.25	-0.07	-0.06	-0.15	-0.17	0.47	-0.06	-0.07	-0.341	-0.135	-0.540	-0.454	0.013
5 th	-0.22	-0.70	-0.59	-0.68	-0.35	0.18	-0.96	-1.38	-0.748	-0.344	-0.748	-0.799	-0.130
Min value	-1.36	-2.01	-2.08	-14.96	-0.35	0.18	-2.01	-1.38	-1.308	-0.344	-0.748	-1.308	-0.130
Mean	0.71	0.29	0.29	0.19	-0.03	0.78	0.24	0.46					
Obs.	152	152	152	10531	18	11	85	19	152	18	11	85	19
Positive significant	30%	18%	21%	21%	6%	55%	13%	16%	5%	0%	0%	1%	26%
Negative significant	0%	2%	3%	6%	0%	0%	2%	5%	14%	6%	45%	16%	0%