PERFORMANCE OF CANADIAN HEDGE FUND

by

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Abstract

This paper conducts the performance analysis and attribution of Canadian hedge funds. Firstly, we compare the key statistics of Canadian hedge fund indices, global hedge fund indices and traditional market indices. Then we conclude that Canadian hedge funds have higher risk-adjusted returns than the worldwide market.

Next, we investigate the outperformance of Canadian hedge fund by utilising the linear regression model and critical risk factors. To specify risk factors into local and global factors, we follow the methodology of Klein, Purdy, Schweigert and Vedrashko (2015). We also use market and commodity timing variables in the analysis of local risk factors, while neither of them has the significant correlation with Canadian hedge fund returns except for the return of Fixed Income and Managed Feature sub-index.

Finally, we make further study of the performance of Canadian hedge funds in different periods, with the focus on the change of coefficients in the linear model. We find that the coefficients of risk factors change in different periods.

Keywords: Sharpe Ratio; Timing Variable; Fama and French multi-Factor Model; Linear Regression

Dedication

First and foremost, I would like to dedicate this research to my parents, Jim and Jane, for their love and support throughout my life. My family in Victoria also gives me a constant source of strength to chase my dream. In addition, I sincerely appreciate the world-class faculty in MSc Finance program for their support and help. Last but not least, I would like to tank my teammate Vincent.

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1: Literature review

The research of hedge fund has been increasing in recent decades. For example, Lamm (1999) reported large hedge fund has huge excess return compared with traditional asset class and investor should allocate 100% of their assets to hedge fund. According to Lett (2009), hedge funds have lower volatility with higher returns than global stock indices during the financial crisis. Also, Fung et al. (2002) found that hedge funds and relative subset funds have consistently delivered alpha.

However, the research relative to Canadian hedge funds is limited. The absence of much research on Canadian hedge fund can be partly explained by the short history of Canadian hedge fund and lack of data. Klein, Purdy, Schweigert and Vedrashko (2015) studied the Canadian hedge fund by building hedge fund index based on different strategies. They found that Canadian hedge fund outperformed global asset class. In addition, they investigated different risk factors, including market, commodity, and fixed income, to explain the return of Canadian hedge fund. Also, by using Henriksson–Merton model (1981) to identify the timing variable in market and commodity, they found that these two factors did not have high correlations with the performance of Canadian hedge fund. With a complete research process from performance analysis to regression analysis, we believe their paper provides a good framework to study the Canadian hedge fund.

However, the database of the precedent paper is from January 2003 from December 2011. We are curious to examine the performance of Canadian Hedge Funds in a more recent time period. Thus, we follow their framework to conduct the

performance of Canadian hedge fund from December 2006 to December 2016. At the same time, the time horizon has been expanded from 9 years to 11 years. In the following section, we identify that correlations between risk factors and Canadian hedge funds are very high with high R square, then we confirm that the model is valuable for investors. Thus, we believe our research is processed with sufficient data and sensible data, which can back up our findings and conclusion.

2: Data, Methodology, and Model

2.1 Data Sources

In our research, we choose Bull Wealth Canadian hedge fund index and Sub-Indices as our benchmarks with the support from Bull Wealth Management Group. BW hedge fund indices use a database of returns for over 300 distinct Canadian hedge funds, and the eligible funds have at least a 3-month track record of returns. The most important, they are managed by a Canadian-domiciled investment firm. Thus, BW Canadian hedge fund index and Sub-Indices demonstrate the performance of Canadian hedge funds well and provide sufficient data to conduct statistical analysis. Further, the methodology of BW hedge fund indices is more reasonable, because the components of indices are equally weighted, which means the volatility of the index can be equally diversified. In order to compare Canadian hedge funds performance with global hedge funds, we use the global hedge funds indices from Credits Suisse and Hedge Fund Research. Also, we collect the market data from Bloomberg terminal. And we obtain the Canadian market index from Wharton Research Data Services (WRDS). In order to conduct global risk factors analysis, we use the Carhart (1997) four-factor model. And we get the data of the market excess return (EXMKT), monthly premium of the book-to-market factor (HML), the monthly premium of the size factor (SMB), and the monthly premium on winners minus losers (UMD) from WRDS as well. For the bond and commodity indices, we download the data from DataStream.

2.2 Hedge Fund Indexes

In this paper, we apply monthly returns of 10 BW Hedge Fund Sub-indices and 1 Composite index from December 2006 to December 2016: Canadian Hedge Fund, Equity

Long/Short, Equity Market Neutral, Event Driven, Fixed Income, Global Macro, Multi Strategy, Equity Hedge Sub, Equity Directional, Managed Futures. For the global hedge fund index, we select monthly returns of hedge fund indexes from Credits Suisse including Composite, Multi-strategy, Equity Market Neutral, Fixed Income, Convertible Arbitrage, Event Driven, Equity Long/Short, Global Macro, Managed Futures. We also select HFRI Composite and sub-indices in our global hedge fund database.

2.3 Market index

Following Klein, Purdy, Schweigert and Vedrashko (2015), our study applies the following market index: S&P/TSX, S&P 500, MSCI EAFE, iShares Core Canadian Universe Bond Index ETF, and Barclays global aggregate bond.

2.4 Original Factors

Klein, Purdy, Schweigert and Vedrashko (2015), initially applied the following local factors as sensitively explainable variables for the 10 different strategies and 1 Composite index monthly returns: Canadian stock market (Market), Thomson Reuters Equal-Weight NYFE CRB Continuous Commodity Index (Commodity), iShares Canadian Government Bond Index ETF, and iShares Canadian Corporate Bond ETF, market timing and commodity timing. For the global risk factors, we follow Klein, Purdy, Schweigert and Vedrashko (2015) to apply the SMB, HML, UMD, US stock market and returns on Thomson Reuters Equal-Weight NYFE CRB Continuous Commodity Index (Commodity), iShares Global Govt Bond and iShares Global Corporate Bond.

2.5 Methodology and Model

The methodology to apply local and global risk factors to explain the Canadian hedge fund return is solely based on the linear regression model. Following the guidelines of Klein, Purdy, Schweigert and Vedrashko (2015), and Dimitrios, Moshfique, and Keith (2016), we use a 4-factors linear regression model in local risk factors and a 7-factor linear regression model in global risk factors to decompose the returns of different hedge fund indexes and obtain betas based on our inputs. In the regression analysis of local risk factors, we apply the Henriksson and Merton (1981) methodology to investigate market timing and commodity timing variables. Under this methodology, timing variable is a dummy variable, as a logical variable. If the actual return is higher than the risk-free return, timing variable will take 1, and the actual return contributes to the index return. On the contrary, the timing variable will take zero if the risk-free return beats the actual return. In this case, it does not make sense to invest in the hedge fund index since it cannot bring the positive return and investors would instead deposit the money in the bank; therefore, the market timing return is zero. The Regression equation is as follow:

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

3: Summary Statistics

As Table 1 presents, the average monthly return for the composite index was 0.74%, which was 9.12% annually. We also complete the t-test and find that the performance was statistically significant in our study period, the monthly standard deviation was only 2.14%, which was 7.40% annually. The maximum drawdown was 20.86% starting in July 2008. After 13 months, the index recovered to the previous high. Among the ten commonly used strategies, Event Driven had the highest average monthly return, which was 1.08%. Then Equity Directional Sub followed with the return of 0.91%. With the risk factors considered, we demonstrate the risk-adjusted return as Sharpe ratio, and Fixed Income was the highest, with the Sharpe ratio of 1.225.

Generally, Table 1 shows that all sub-indices had positive returns with a strong statistically significant base on the t-test. However, Equity Market Neutral and Global Macro performed weakly compared to other sub-indices. For Equity Market Neutral, it had not recovered from the low and needed a 0.97% increase to get to the previous high. For Global Macro, its Sharpe ratio was negative, which means it could not beat the risk-free return.

Compared with Klein, Purdy, Schweigert and Vedrashko (2015), the monthly return decreased in many strategies. For example, the return of the Complex index decreased from 0.96% to 0.74% and Market Neutral strategy had not recovered from its previous high. We need to complete deeper study to identify the reason why Canadian hedge fund return decreased in recent period.

Although we conclude that Canada hedge fund has a strong positive return in our study period, it does not apply to individual funds. If we consider risk and return for individual funds, the risk would appear different because of size effect, management skill or other factors. For example, people can always browse many popular business presses mentioning individual star funds, which have an extreme return in some period and significant loss in the other period. Besides, people still ignore the advantage of diversification, which is common knowledge in equities. However, we consider diversification as an essential part of the hedge fund. In Table 2, we summarise the matrix of correlations for ten strategies on our index list. Overall, the average correlation was 0.64, and this absolute value was much lower than 1. Thus, we conclude that the diversification works well when investing in these strategies and bring better risk-adjusted returns.

Table 1 Summary statistics for BW Canadian hedge fund indices

BW Hedge fund index	Average Monthly Return (%)	Standard deviation (%)	Median	Skew	Excess Kurtosis	3rd moment (%)	4th moment (%)	Sharpe ratio (annual)	Maximum drawdown (%)	Period of maximum drawdown (months)	Months to recovery /left to recover
Composite	0.74***	2.14	0.84	-0.94	2.66	-1.89	12.17	0.844	-20.86	4	12
Multistrategy	0.76***	2.33	0.84	-1.09	3.26	-2.51	17.73	0.810	-26.44	12	7
Equity Mkt Neutral	0.30***	0.95	0.37	-0.60	1.36	-0.36	1.24	0.216	-6.03	13	0.70%
Fixed Income	0.68***	1.28	0.62	-1.60	6.45	-1.49	10.52	1.225	-11.39	17	7
Event Driven	1.08***	3.23	0.90	-1.09	4.72	-4.07	49.18	0.965	-33.03	8	9
Equity Long/Short	0.83***	3.06	0.98	-1.05	3.01	-3.62	28.19	0.700	-30.04	8	14
Equity Hedge Sub	0.67***	1.86	0.69	-0.88	2.41	-1.43	8.31	0.823	-19.43	11	8
Equity Directional Sub	0.91***	3.97	1.22	-0.97	2.73	-4.94	43.09	0.613	-35.48	5	12
Global Macro	0.21***	2.53	0.18	0.18	2.70	0.47	17.26	-0.056	18.43	2	12
Managed Futures	0.65***	2.57	0.08	0.07	0.95	0.19	6.28	0.573	-14.60	2	7
ex-Equity Directional	0.67***	1.39	0.56	-0.65	2.11	-0.69	4.10	1.107	-8.62	7	12

The statistics in this table are monthly returns on the BW Canadian Composite hedge fund index and subindices from December 2006 to December 2016. Statistics are not annualized except for the Sharpe ratios 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

Table 2 Correlations between BW Canadian hedge fund subindices

	Multistrategy	Equity Market Neutral	Fixed Income	Event Driven	Equity Long/Short	Equity Hedge Sub	Equity Directional Sub	Global Macro	Managed Futures	ex-Equity Directional
Multistrategy	1									
Equity Market Neutral	0.395***	1								
Fixed Income	0.775***	0.297***	1							
Event Driven	0.822***	0.161**	0.691***	1						
Equity Long/Short	0.896***	0.377***	0.777***	0.863***	1					
Equity Hedge Sub	0.873***	0.407***	0.770***	0.788***	0.944***	1				
Equity Directional Sub	0.872***	0.359***	0.753***	0.856***	0.992***	0.901***	1			
Global Macro	0.000	0.090	0.004	-0.087	-0.080	-0.090	-0.076	1		
Managed Futures	0.214*	0.214**	0.134	0.134	0.185	0.163	0.195*	0.443***	1	
ex-Equity Directional	0.910***	0.489**	0.786***	0.823**	0.921***	0.917***	0.899***	0.113**	0.450***	1

This table reports correlations between monthly returns on the BW Canadian hedge fund subindices from December 2006 to December 2016. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided

**3.1 Comparison with global hedge fund indices**

Table 3 contains two panels to summarise the risk and return characteristics of the BW, CS and HFRI. To compare the BW index with the global market, Table 3 also reports the summary of statistics and correlations between hedge fund indices and traditional market indices. First, the BW Composite had the average monthly return of 0.74% during the research period, significantly outperformed the other two hedge fund indices and global market indices, such as S&P/TSX, S&P 500. Notably, the BW Composite had the highest Sharpe ratio with the variance into consideration, while the Canadian bond and Global bond had the negative Sharpe ratio. Second, the BW Composite was more stable than other two hedge fund indices, since its period of maximum drawdown is the shortest and recovered fastest from the low point.

We consider leverage, size effect, competition and regulation as four major factors to affect the Canadian hedge fund performance. According to the Canadian Association of Alternative Strategies & Assets (CAASA, 2018), global average leverage for hedge funds is 2x-2.5x, while Canadian hedge is typically lower leverage. Thus, Canadian hedge funds have a better risk control system when exposed to market drawdown. As figure 3.1 shows, hedge funds under C$100 million AUM are 50% of funds on the global scale. In Canada, 58% of hedge funds have AUM under C$100 million, which means Canadian hedge funds are more constrained and easier to work well because of the size effect.

Furthermore, the Canadian hedge fund industry has about 140 hedge fund managers compared with over thousands of long-only managers in Canada. We consider

that competition in the Canadian hedge fund industry is lower than the asset management industry. According to Klein, Purdy, Schweigert and Vedrashko (2015), the number of foreign funds in Canada is decreasing. This means there are better opportunities for Canadian hedge fund manager. We also consider regulation as a significant factor make Canadian hedge fund stand out the global market. According to CAASA, Canadian securities regulation limits investment eligibility to only 1% of the population.

Figure 3.1 Top 10 funds control 57% of Canadian hedge AUM
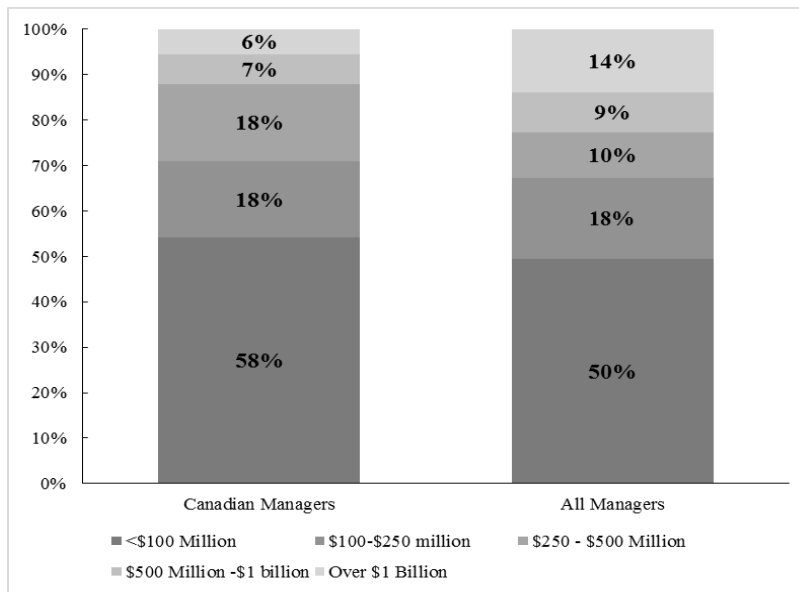
Source: CAASA, February 2018

In Panel B, the BW Composite shows strong correlations with other Canadian hedge fund indices and the traditional market indices, versus the low correlations with the fixed income, specialised in the bond market. The average correlation among the indices was 0.613, and it demonstrates a significant level of correlation. Then we use S&P/TSX, S&P 500 and fixed income as regression factors to track the hedge fund performance.

Table 3 Canadian and global hedge fund and capital market indices

Panel A. Summary statistics and distributional differences						
Index	Average Monthly Return (%)	Equal mean with BW z-stat	Standard deviation (%)	Equal variance with BW F-stat	Skew	Excess Kurtosis
BW Composite	0.74		2.07		-1.07	3.14
CS composite	0.43	1.79	1.60	1.74	-1.35	4.31
HFRI composite	0.24	0.65	1.53	1.91	-1.45	4.20
S&P/TSX	0.39	0.66	3.84	0.03	-1.41	5.10
S&P 500	0.48	0.39	4.13	0.26	-1.00	2.94
MSCI EAFE	0.39	0.50	5.14	0.17	-0.97	2.65
Canadian bond	0.06	2.86	1.09	3.77	0.05	1.20
Global bond	0.05	2.95	1.09	3.93	0.64	4.50

Table 3 (Continued)

Panel A. Summary statistics and distributional differences							
Index	3rd moment (%)	4th moment (%)	K-S stat.	Sharpe ratio (annual)	Max. drawdown (%)	Period of max. drawdown (months)	Months to recovery/ left to recover (months)
BW Composite	-2.05	1.35		0.869	-20.86	5	12
CS composite	-1.76	1.10	0.16	0.402	-19.68	14	20
HFRI composite	-1.77	0.98	0.20	-0.021	-22.20	16	19
S&P/TSX	-6.86	7.53	0.17	0.131	-44.89	9	23
S&P 500	-5.44	5.03	0.18	0.200	-52.53	16	36
MSCI EAFE	-7.31	6.88	0.24	0.102	-53.29	21	96
Canadian bond	-0.04	0.14	0.33	-0.596	-2.77	2	1
Global bond	-0.47	0.54	0.37	-0.640	-2.65	7	5

Table 3 (Continued)

Panel B. Correlations between hedge fund indices and traditional market indices								
	BW Composite	CS composite	HFRI composite	S&P/TSX	S&P 500	MSCI EAFE	Canadian bond	Global bond
BW Composite	1							
CS composite	0.882***	1						
HFRI composite	0.890***	0.965***	1					
S&P/TSX	0.871***	0.816***	0.812***	1				
S&P 500	0.648***	0.726***	0.710***	0.778***				
MSCI EAFE	0.743***	0.804***	0.797***	0.790***	1			
Canadian bond	-0.006	-0.014	-0.047	-0.015	-0.017	1		
Global bond	0.244*	0.283*	0.190*	0.268**	0.460***	0.463***	1	

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, iShares Core Canadian Universe Bond Index ETF, and Barclays global aggregate bond) and the BW 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 BW Composite index and the other indices. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided. MSCI EAFE, Morgan Stanley Capital International Europe, Australasia and Far East; S&P/TSX, S&P Toronto Stock Exchange.

3.2 Comparison with traditional asset class benchmark

Individuals have many stereotypes regarding the hedge fund characteristics, such as unregulated, volatile and risky. In the research, the standard deviation is a commonly used indicator to measure the risk. However, in the Panel A, the standard deviation of BW Composite was 2.07% on a monthly basis, while the standard deviations of S&P/TSX and MSCI EAFE were much higher, thus more volatility during the research period. Although standard deviation is a common indicator to evaluate the light level, it brings misunderstanding sometimes. According to Ranaldo and Favre (2003), the higher-moment approach is more appropriate for capturing the non-linear relation between hedge fund and market returns and accounting for the specific risk-return payoffs of each hedge fund investment strategy. The key result is that the use solely of the two-moment pricing model may be misleading and may wrongly indicate insufficient compensation for the investment risk. Therefore, we also provide 3rd moment and 4th moment to assess the actual risk exposures in Table 3. The Canadian hedge funds had lower 3rd moments and 4th moments, showing its return distribution was more concentrated with less extreme loss. Compared with the find of Klein, Purdy, Schweigert and Vedrashko (2015), BW hedge fund indices still outperform the global market after 2011. Thus, we conclude that the Canadian hedge fund outperforms the global market.

3.3 Canadian and global hedge fund sub-indices

Table 4 reports the statistics matrix of the BW Canadian hedge fund indices, CS and HFRI grouped as different strategies. Compared to the CS and HFRI, BW covers all strategy and shows strong market representativeness. Apart from the Global Macro

strategy, the BW had a significantly higher average monthly return compared to the CS and HFRI. Notably, the average monthly performance of the BW was timed higher than the other two indices. From the perspective of risk and violation, the standard deviations of these three indices were on the same level. Thus, the higher return would generally contribute to higher Sharpe ratio. Other than Global Macro, other BW indices had the positive Sharpe ratios, indicating the excess return among the market. Also, the Sharpe ratios of majority BW indices were higher, especially for the strategy of Equity Driven and Equity Long/Short. Besides, all BW sub-indices had recovered from the previous low, and the longest took two years. For the strategy of Equity Market Neutral, the CS still needed 0.10% more incensement after the 2008 financial crisis. And, the HFRI met higher stress of the drawdown and had just recovered approximately two-thirds to go back to the previous high.

Overall, the BW Canadian hedge fund index and sub-indices are good indicators on behalf of the Canadian hedge fund universe. From the perspective of average monthly return and risk-adjusted return, they significantly outperform other Canadian hedge fund indices, global hedge fund indices and traditional market indices. Thus, we conclude the Canadian hedge funds performed better than the worldwide market based on statistical analysis in the time window from December 2006 to December 2016.

Table 4 Distributional differences between Canadian and global hedge fund indices

Strategy	Hedge fund index	Average Monthly Return (%)	Equal mean with BW z-stat	Standard deviation (%)	Equal variance with BW F-stat	Skew	Excess Kurtosis
Multistrategy	BW	0.76		2.33		-1.09	3.26
	CS	0.23	1.53	1.95	1.44	-3.51	25.06
	HFRI	0.39	1.10	1.35	2.86	-2.88	17.24
Equity Market Neutral	BW	0.30		0.95		-0.60	1.36
	CS	-0.11	1.96	2.56	0.12	-3.76	28.32
	HFRI	0.23	1.02	0.76	1.44	-1.48	4.23
Fixed Income	BW	0.68		1.28		-1.60	6.45
	CS	0.31	1.54	1.84	0.46	-4.97	36.92
	HFRI	0.68	-0.54	0.84	-5.14	-0.78	3.46
Event Driven	BW	1.08		3.23		-1.09	4.72
	CS	0.25	2.08	2.13	2.33	-0.83	2.00
	HFRI	0.50	1.54	1.82	3.13	-1.30	4.00
Equity Long/Short	BW	0.83		3.06		-1.05	3.01
	CS	0.24	1.20	2.41	1.81	-1.52	4.39
	HFRI	0.38	0.76	2.36	1.81	-1.07	2.87
Global Macro	BW	0.21		2.53		0.18	2.70
	CS	0.03	0.86	2.30	1.10	-2.10	13.66
	HFRI	0.32	-0.11	1.36	3.25	0.23	-0.21
Managed Futures	BW	0.65		2.57		0.07	0.95
	CS	0.31	0.92	3.16	0.60	-0.04	-1.00
	HFRI	0.26	1.29	1.45	2.81	0.15	0.07
ex-Equity Directional	BW	0.67		1.39		-0.65	2.11
	CS	0.14	1.47	3.07	0.18	-4.68	32.55
	HFRI	0.37	0.70	2.43	0.26	-3.00	23.47

Table 4 (Continued)

Strategy	3rd moment (%)	4th moment (%)	Sharpe ratio (annual)	Max. drawdown (%)	Period of max. drawdown (months)	Months to recovery/left to recover (months)
Multistrategy	-2.51	17.73	0.810	26.44	12	7
	-9.60	95.75	-0.027	-35.79	14	23
			0.377	-35.79	19	13
Equity Market Neutral	-0.36	1.24	0.216	-6.03	13	0.10%
	-15.37	184.90	-0.486	-38.45	8	38.01%
			-0.064	-38.45	10	24
Fixed Income	-1.49	10.52	1.225	-11.39	17	7
	-12.38	124.66	0.121	-29.02	14	21
			1.878	-29.02	19	15
Event Driven	-4.07	49.18	0.965	-33.03	8	9
	-2.57	9.10	0.009	-22.35	16	12
			0.499	-22.35	16	12
Equity Long/Short	-3.62	28.19	0.700	-30.04	8	14
	-5.70	25.57	-0.008	-32.27	16	21
			0.205	-32.27	16	23
Global Macro	0.47	17.26	-0.056	18.43	2	12
	-7.32	72.08	-0.327	-30.07	8	14
			0.186	-30.07	8	5
Managed Futures	0.19	6.28	0.573	-14.60	2	7
	-0.20	-10.03	0.068	-17.77	4	17
			0.041	-17.77	7	12
ex-Equity Directional	-0.69	4.10	1.107	-8.62	7	12
	-25.11	306.19	-0.125	-47.88	14	13
			0.178	-47.88	13	9

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 subindices from 2006 to 2016. The statistics are for monthly data and are not annualized, except for the Sharpe ratio. The Sharpe ratio is based on a riskless rate o 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 betweenmthe BW and the global indices with the same strategy. Significance at the 10% (*), 5% (**), and 1% (***) levels is provided.

4: Regression Analysis and Timing Strategies of Canadian Hedge Funds

4.1 Local Risk Factors for Canadian hedge funds

In the previous section, we summarise the statistics tables for hedge fund indices and market indices to conduct their return and risk characteristics. By classifying indices into commonly used strategies, we could compare their risk-adjusted returns with different specialisations and analyse the value of the strategy.

In this section, we will identify the local and global risk factors to examine where the Canadian hedge fund returns come from. For the local elements, we believe that the market factor, especially for the S&P/TSX, commodity factor and fixed income factor had high correlations with risk exposures. Since the Fama and French Model does not have the related exposure to the Canadian currency, we keep the consistency and ignore the currency factor when doing the regression.

First, we run the regression at Stata & Matlab to identify the correlations among risk factors above. Second, we apply the risk factors to nonlinear functions, then to the multifactor model. Following the methodology of Henriksson and Merton (1981), we test market timing and expand our method to commodity variable to identify whether commodity timing effect hedge fund return.

Table 5 presents the regression result for the Canada hedge fund indices. In Panel A, the regression includes the Canadian market index, fixed income, and commodity indices. We obtain the Canadian market index from Wharton Research Data Services (WRDS) and bond and commodity indices from DataStream. For the fixed income, we

select iShares Canadian Government Bond Index ETF and iShares Canadian Corporate Bond ETF. For the commodity factor, we decide Thomson Reuters Equal-Weight New York Futures Exchange Commodity Research Bureau (NYFE CRB) as our commodity index. All the returns in Table 6 are excess Canadian risk-free rate.

In Table 5, the alpha for BW Composite is positive and statistically significant with 0.003% in monthly and 3.6% annualised. This result supersizes us. Compared with CS Composite index, the alpha for BW Composite is three times the CS. In Panel A, the Equity Market Neutral and Global Macro had very low Alpha compared to other strategies. Corporate bond had negative correlations with different strategies except for Global Macro and Managed Futures. We use R Square to evaluate the fitting degree. R Square of Equity Market Neutral and Managed Futures were less than 0.1, showing the factors above demonstrate these two strategies poorly.

After examining the local risk factors for the Canadian hedge fund, we consider that Canadian hedge funds are affected by timing, and we chose market timing and commodity timing to test our hypothesis. In Panel B of Table 5 describe timing is not involve to Canadian hedge fund return. We use Henriksson-Merton Marketing timing variable, which only captures hedge fund return if the risk-adjust return is positive. Our research discovers that not only BW composite, but also other sub-strategy indices have not significant marketing timing effect. Only fixed income and Equity hedge sub-strategy have significantly timing coefficients. However, we consider that this is not market timing, because the timing coefficient of the Fixed Income index is negative, indicating that hedge fund manager would have significant exposure to fixed income when the economy is weak.

In our study, only Managed Futures have positive significant statistic market timing coefficients, but when considering that Managed futures are mix investment strategies, which fund manager can invest both commodity future and fixed income. In our previous discussion, fixed have negative coefficients with marketing timing, which indicated the positive marketing timing coefficients should be explained by other factors. Since fixed income investment correlates with the equity market negatively, which means fixed income market will go down when equity market goes up. Thus, it is reasonable that fixed income strategy has negative coefficient with market timing factor. To sum up, we agree that market timing variable pays less role in Canadian hedge fund risk factors.

After we test market timing variable in our research, we continue to test whether commodity timing will affect Canadian hedge fund return because we involved commodity factor in our risk fact study for a Canadian hedge fund.

In Panel C of Table 5, BW composite and majority sub-strategies indices have no significant commodity timing effect. Managed future has significant positive coefficient. However, we consider the impact for the BW Composite index is small since managed future account around 10 to 15 % of BW Composite index. The commodity timing coefficient of BW composited is -0.029 with -0.54 t-statics even the R square for managed future increase dramatically from 0.08 to 0.18. Similarly, the Marketing timing factors, Fixed income strategy has negative coefficient with commodity timing factor since fixed income market also have negative coefficients with commodity market. Therefore, we concluded the timing variable in Market and Commodity have no significant effect on a Canadian hedge fund.

Many research studies also consider that hedge fund factor exposures change in different period. For example, Bollen and Whaley (2009), there is stranger evident for the changing factor exposure in a different period. Therefore, it is logically to break down our study period to two sub-period to study whether the coefficients of risk factors will change in different periods. In our database, the 2008 financial crisis is the most significant event in financial market, so we consider this event as the indicator to divide our database into two periods. The one reason that we end the first period in 2011 is because the 2008 financial crisis was widely believed to end in 2011. The other reason is because the database of the precedent paper ends in 2011. Therefore, we think it is a good way to compare our results to the precedent paper. Thus, we divide our study period into two sub-periods: December 2006 to December 2011 (during the financial crisis) and January 2012 to December 2016 (after the financial crisis).

In Panel D of Table 5, we select Equity Market Neutral strategy, Global Macro, Managed Future and Ex-Equity Directional strategy to the exam if risk factors will change in different period. The reason we chose the four strategies is many them have low R square and low Alpha. Expect for Managed futures; the Alpha is no significant difference in the rest of strategy in different periods. Also, we find the coefficients of the risk factors did change in a different period. For example, the market coefficient in Equity Market increased over twice from 0.005 to 0.012. Commodity timing coefficient also increases to 0.403 with a similar P value. Also, we also find that the adjusted R also square various in the different period. For instance, the R square of Global Macro increase from 0.21 to 0.435, but alpha turn to -0.003 drop from 0.005 during 2012 to 2016. For the managed future, the R square also increases from 0.262 to 0.431and Alpha

also increase to -0.01. Base on the Panel D of Table 5, we agree the idea that risk factor will change in different period.

In this section, we successfully identify the local risk factors may affect Canadian hedge fund return. We also complete the test for market timing and commodity timing variable and find that both have no significant coefficient with Canadian hedge fund return. Furthermore, we also break our period into the sample period and see that risk factor changes in the different period. In the next section, we will affect the global factors may affect Canadian Hedge fund.

Compared with Klein, Purdy, Schweigert and Vedrashko (2015), our results have higher positive alphas and higher R squares, which indicate that local risk factor model is more meaningful in the recent time period.

Table 5 Performance of Canadian hedge funds

	BW indices										
	Composite	Multi strategy	Equity Market Neutral	Fixed Income	Event Driven	Equity Long/Short	Equity Hedge Sub	Equity Directional Sub	Global Macro	Managed Futures	ex-Equity Directional
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Alpha	0.003***	0.003***	0.001	0.004***	0.006***	0.003**	0.002	0.003	0.001***	0.001	0.003***
	(3.34)	(3.34)	(1.01)	(5.08)	(3.58)	(2.44)	(2.33)	(1.83)	(0.57)	(0.48)	(4.26)
Market	0.368***	0.368***	0.02**	0.206***	0.456***	0.557***	0.357	0.683	0.056	-0.013	0.218**
	(11.58)	(11.58)	(0.66)	(8.24)	(7.57)	(12.65)	(12.00)	(11.32)	(0.78)	(-0.23)	(9.51)
Commodity	0.062***	0.062*	0.008	0.019	0.144***	0.082***	0.003	0.131	-0.073**	-0.001	0.028
	(2.66)	(2.66)	(0.01)	(1.04)	(3.29)	(2.54)	(0.15)	(2.98)	(-1.39)	(-0.03)	(1.66)
Government bond	0.389*	0.389***	0.144	0.211	0.954**	0.538**	0.265	0.664	-0.635**	-0.196	0.237***
	(2.76)	(2.76)	(0.14)	(1.90)	(3.57)	(2.76)	(2.01)	(2.48)	(-1.97)	(-0.75)	(0.24)
Corporate bond	-0.232	-0.232***	-0.045	-0.134	-0.651***	-0.455	-0.214	-0.589	1.51	0.574	-0.059***
	(-1.82)	(-1.82)	(-0.05)	(-1.33)	(-2.70)	(-2.58)	(-1.79)	(-2.44)	(5.20)	(2.43)	(-0.64)
Obs.	132	132	132	132	132	132	132	132	132	132	132
Adj. R^2	0.788	0.795	0.008	0.631	0.700	0.810	0.742	0.785	0.295	0.060	0.690

Table 5 (Continued)

Panel B. Performance of Canadian hedge funds with market timing

	BW indices										
	Composite	Multi strategy	Equity Market Neutral	Fixed Income	Event Driven	Equity Long/Short	Equity Hedge Sub	Equity Directional Sub	Global Macro	Managed Futures	ex-Equity Directional
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Alpha	0.004***	0.005***	0.002	0.006***	0.009***	0.005**	0.004	0.003	0.000	-0.003	0.004***
	(3.08)	(2.61)	(1.71)	(5.99)	(3.47)	(2.62)	(3.46)	(1.84)	(0.09)	(-1.03)	(3.83)
Market	0.396***	0.438***	0.053	0.267***	0.522***	0.602***	0.413	0.722	0.034	-0.095*	0.241***
	(9.89)	(7.36)	(1.37)	(8.82)	(6.91)	(10.87)	(11.27)	(9.47)	(0.38)	(-1.29)	(8.36)
Market timing	-0.081	-0.129	-0.096	-0.181***	-0.196	-0.132	-0.166	-0.113	0.065	0.243**	-0.068***
	(-1.12)	(-1.20)	(-1.38)	(-3.29)	(-1.43)	(-1.32)	(-2.51)	(-0.82)	(0.39)	(1.82)	(-1.30)
Commodity	0.059***	0.043*	0.005**	0.014	0.139***	0.078***	-0.001	0.128	-0.072**	0.006***	0.026
	(2.55)	(1.25)	(0.22)	(0.79)	(3.16)	(2.42)	(-0.06)	(2.90)	(-1.34)	(0.13)	(1.54)
Government bond	-0.271**	-0.191***	-0.091	-0.219	-0.744***	-0.517**	-0.293	-0.643	1.541**	0.689***	-0.091***
	(-2.06)	(-0.98)	(-0.72)	(-2.20)	(-2.99)	(-2.84)	(-2.42)	(-2.56)	(5.11)	(2.85)	(-0.96)
Corporate bond	0.417	0.344***	0.178	0.275	1.023***	0.585	0.324	0.704	-0.657	-0.281	0.260***
	(2.92)	(1.62)	(1.29)	(2.53)	(3.79)	(2.96)	(2.47)	(2.58)	(-2.00)	(-1.07)	(2.53)
Obs.	132	132	132	132	132	132	132	132	132	132	132
Adj. R²	0.788	0.625	0.015	0.648	0.705	0.812	0.753	0.787	0.290	0.079	0.699

Table 5 (Continued)

Panel C. Performance of Canadian hedge funds with commodity index timing

	BW indices										
	Composite	Multi strategy	Equity Market Neutral	Fixed Income	Event Driven	Equity Long/Short	Equity Hedge Sub	Equity Directional Sub	Global Macro	Managed Futures	ex-Equity Directional
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Alpha	0.004***	0.005***	0.001	0.006***	0.009***	0.005***	0.004	0.005	0.001**	-0.007	0.003***
	(2.55)	(2.41)	(0.47)	(5.72)	(3.28)	(2.51)	(2.69)	(1.93)	(0.20)	(-2.93)	(2.60)
Market	0.365***	0.384***	0.022	0.190***	0.439***	0.545***	0.347	0.670	0.060	0.039	0.219*
	(11.15)	(7.92)	(0.70)	(7.66)	(7.13)	(12.10)	(11.44)	(10.83)	(0.80)	(0.69)	(9.27)
Commodity	0.074***	0.081	0.002	0.072*	0.199***	0.120***	0.036	0.174	-0.084*	-0.168**	0.025
	(2.27)	(1.67)	(0.08)	(2.91)	(3.25)	(2.68)	(1.20)	(2.82)	(-1.14)	(-2.98)	(1.07)
Commodity timing	-0.029	-0.080	0.012	-0.125*	-0.130	-0.091	-0.077	-0.099	0.026	0.393	0.006
	(-0.54)	(-1.01)	(0.23)	(-3.06)	(-1.29)	(-1.23)	(-1.55)	(-0.98)	(0.21)	(4.24)	(0.15)
Government bond	-0.234**	-0.136***	-0.044	-0.143	-0.661***	-0.462**	-0.220	-0.597	1.512**	0.604***	-0.058***
	(-1.83)	(-0.72)	(-0.36)	(-1.48)	(-2.75)	(-2.62)	(-1.85)	(-2.47)	(5.19)	(2.74)	(-0.63)
Corporate bond	0.394	0.312***	0.142	0.232*	0.975***	0.553	0.278	0.680	-0.639	-0.260	0.236***
	(2.78)	(1.48)	(1.04)	(2.16)	(3.66)	(2.83)	(2.12)	(2.53)	(-1.98)	(-1.06)	(2.30)
Obs.	132	132	132	132	132	132	132	132	132	132	132
Adj. R^2	0.789	0.624	0.000	0.644	0.704	0.811	0.746	0.788	0.289	0.180	0.690

Table 5 (Continued)

	Equity Market Neutral		Global Macro		Managed Futures		ex-Equity Directional	
Panel D. Structural breaks for Canadian hedge funds with commodity index timing			**BW indices**					
	12/2006-12/2011	1/2012-12/2016	12/2006-12/2011	1/2012-12/2016	12/2006-12/2011	1/2012-12/2016	12/2006-12/2011	1/2012-12/2016
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Alpha	-0.001	0.002	0.005	-0.003**	-0.005	-0.01	0.003***	0.002**
	-0.26	1.48	1.44	-0.59	-1.89	-2.77	1.84	2.20
Market	0.005**	0.012	-0.031	0.148	-0.045	0.06	0.185	0.247*
	0.11	0.24	-0.42	0.90	-0.79	0.55	5.09	7.64
Commodity	0.017*	-0.001	0.050*	-0.209	-0.033	-0.328	0.068	-0.015
	0.34	0.24	0.63	-1.63	-0.55	-3.84	1.79	7.64
Commodity timing	0.04	0.002	-0.069	0.024	0.347	0.403***	-0.010	-0.019
	0.52	1.48	-0.57	0.09	3.78	2.36	-0.18	-0.38
Government bond	-0.052	-0.147***	1.026***	2.863**	0.323*	1.613**	-0.110*	-0.005***
	-0.29	-0.71	3.71	4.04	1.53	3.40	-0.82	-0.04
Corporate bond	0.098	0.341	-0.331***	-2.258	-0.004	-1.688***	0.239	0.194***
	0.54	1.28	-1.18	-2.48	-0.02	-2.77	1.76	1.08
Obs.	72	60	72	60	72	60	72	60
Adj. R^2	0.060	0.004	0.210	0.435	0.262	0.431	0.721	0.634
Break month	12/2011		12/2011		12/2011		12/2011	

Panel A provides regression results of monthly excess returns on the BW Canadian composite hedge fund indices and subindices on the excess return on the Canadian stock market (Market) and returns on Thomson Reuters Equal-Weight NYFE CRB Continuous Commodity Index (Commodity), iShares Canadian Government Bond Index ETF, and iShares Canadian Corporate Bond ETF from 2006 to 2016. 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 Market*I(Market>0). Regressions in panel C include the same variables as in panel A and the Commodity. Timing variable defined as Commodity*I(Commodity>0). If a structural break in coefficients is found for a subindex 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.

4.2 Global Risk Factors for Canadian hedge funds

This section is our last step for our regression analysis; we compare the return and risk of Canadian hedge fund and Global hedge fund. We run the regressions to exam the Canadian hedge fund and Global hedge fund based on the same series of global risk factors. The reason to use the same risk factors is to sustain the benchmark on the same level. Thus, we could compare the results more sensible. In the hedge fund industry, many of the components are private equities, and there is a limit of public disclosure, so it is not easy to specialize different asset classes to different risk factors. We choose to use the US Fama–French 5-factor model and momentum (Carhart 1997) factors as an appropriate benchmark. The commodity factor is the same as in Table 6. However, we do not have access to the databases of Bank of America Merrill Lynch Global Government (Government Bond) and Broad Corporate (Corporate Bond) indices. Thus, we use ETFs from BlackRock Global Government Bond Fund as Government Bond indices and Corporate Bond indices. Although the ETF indices could roughly simulate the global fixed-income factor, they still cannot precisely replicate the situation and trend development. We cannot deny there exist system errors. All the indices and ETFs returns are nets of the US risk-free rate.

In Panel A of Table 6, we report the statistics results and a significant level of the BW indices under the different global risk factors. Alpha has substantial correlations with many sub-indices except for Equity Directional, Global Macro and Managed Futures. The same as Table 6 Panel A, Event Driven had a very high Alpha of 0.005, while Global Macro had the lowest Alpha of 0.000. The UMD factor had a very low correlation with the BW sub-indices, especially for the strategy of Composite and Equity Long/Short,

since the absolute value of the p-value was too small and far less than 2. The SMB factor was a little bit better, but it still explained the strategy of Equity Market Neutral, Fixed Income, Global Macro and Managed Future poorly. Notably, for the two perspectives of fixed-income factors, Government bond and Corporate bond had the opposite correlation with the BW indices. The Government bond was negatively related with the sub-indices except for Global Macro, and the Corporate bond was positively correlated with all BW indices. Among the seven global risk factors, the Commodity explains the Canadian hedge the best, since many of the strategies had very high P-values with it, showing strong correlations. Compared to Table 5, the R Square of Equity Market Neutral had increased a lot, although its correlation was much lower than other strategies. The Equity Long/Short had the highest Adjusted R Square of 0.780, followed by the Equity Directional Sub of 0.756. Thus, those demonstrate the high correlation for the global factor model.

In Panel B, we summarise the statistics matrix of global risk factors for the CS indices. Compared to the CS indices, BW indices could be explained better by the variables of global risk factors. From the perspective of return, CS indices had very low Alphas and some strategies, such as Equity Market Neutral, Event Driven, Equity Long/Short, Global Macro and Managed Futures, even had the negative Alphas. Compared with BW Composite, then Alpha of CS Composite was three times lower, but the R Square was similar. When looking at SMB and UMD in CS index, we find there are not significant coefficients in many strategies. For example, SMB was significantly small in CS composite while the P value of BW Composite was over than 2. UMD in CS index still less significantly. CS Composite still significantly affect by commodity factor.

To sum up, the global risk factors play an essential role in Canadian Hedge fund return, especial for Fama–French factors and commodity factor. In the next logical step, we will study the global risk factor in a different period to identify whether global risk factor change in different period.

Compared with Klein, Purdy, Schweigert and Vedrashko (2015), our research has similar result. We also found that the R square decrease in different time period. We consider that global risk factor model is less meaningful in recent time period.

In Panel C of Table 6, we summaries statistics for BW Sub-indices and CS sub-indices in different time periods. We selected 2011 as our breakdown point because we want to identify if the global risk factor effect will change after the financial crisis. According to our study, global risk factor did change in different period. In our study, we find that the R Squares in our regression model are decreasing in our index and sub-indexes. From 2006 to 2011, the R Square was 0.79 and fell to 0.52 from 2011 to 2016. This situation is not only happening in BW indices but also in the CS index. Equity Market Neutral R Square decrease from 0.327 to 0.095 in the different period. The reason for decreasing R Square possible can be an example by the lower correlation between global risk factors and Canada hedge fund. We also think that currency factor maybe is another factor need to involve in our further research. We also find that the BW indices have higher alpha than CS indices, for example, BW composite alpha is 0.003 while CS composite is 0.001, which also indicated Canadian hedge fund outperformance global hedge fund. Therefore, not only the historical data but also regression analysis proved Canadian hedge fund outperformance global market.

Table 6 Performance of Canadian global hedge fund indices relative to global risk factors

Panel A. Canadian hedge fund indices and global risk factors

	BW indices										
	Composite	Multi strategy	Equity Market Neutral	Fixed Income	Event Driven	Equity Long/Short	Equity Hedge Sub	Equity Directional Sub	Global Macro	Managed Futures	ex-Equity Directional
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Alpha	0.003***	0.004***	0.003	0.005***	0.005***	0.002**	0.002	0.002	0.000***	0.001**	0.003***
	(2.66)	(2.31)	(3.02)	(6.54)	(2.73)	(1.62)	(1.85)	(1.03)	(0.00)	(0.54)	(3.92)
Market	0.131***	0.093**	0.001	0.055**	0.043***	0.237***	0.211	0.266	-0.139**	-0.042	0.073
	(3.65)	(1.84)	(0.04)	(2.46)	(0.67)	(4.89)	(6.78)	(4.02)	(-1.70)	(-0.72)	(2.82)
SMB	0.142***	0.139	0.051	0.042	0.279*	0.202***	0.068	0.296	0.111	-0.087	0.070
	(2.88)	(2.00)	(1.31)	(1.36)	(3.16)	(3.03)	(1.60)	(3.26)	(0.99)	(-1.07)	(1.97)
HML	-0.139	-0.169	-0.078	-0.020*	-0.136	-0.187	-0.135	-0.223	-0.111	-0.048	-0.099
	(-3.30)	(-2.85)	(-2.33)	(-0.75)	(-1.80)	(-3.28)	(-3.68)	(-2.86)	(-1.15)	(-0.69)	(-3.26)
UMD	-0.001**	-0.026	0.062***	0.014**	-0.116**	-0.001**	0.03	-0.017	0.017	0.051	0.008*
	(-0.04)	(-0.79)	(3.31)	(0.95)	(-2.74)	(-0.02)	(1.48)	(-0.39)	(0.32)	(1.31)	(0.45)
Commodity	0.131***	0.110***	0.004***	0.057	0.254***	0.180***	0.059	0.264	-0.079**	0.003***	0.069**
	(5.21)	(3.12)	(0.19)	(3.60)	(5.65)	(5.32)	(2.73)	(5.71)	(-1.39)	(0.08)	(3.81)
Government bond	-0.460**	-0.587***	-0.221	-0.319***	-0.672**	-0.767**	-0.366	-0.903	0.731**	0.461**	-0.202***
	(-2.47)	(-2.24)	(-1.50)	(-2.73)	(-2.01)	(-3.05)	(-2.26)	(-2.62)	(1.72)	(1.50)	(-1.50)
Corporate bond	0.490**	0.638***	0.182	0.415***	0.751**	0.666**	0.342	0.787	0.294	0.011	0.315***
	(4.42)	(4.10)	(2.08)	(5.97)	(3.79)	(4.45)	(3.56)	(3.85)	(1.17)	(0.06)	(3.93)
Obs.	110	110	110	110	110	110	110	110	110	110	110
Adj. R^2	0.741	0.582	0.187	0.696	0.669	0.780	0.732	0.756	0.172	0.080	0.632

Table 6 (Continued)

	CS indices									HFRI Composite
Panel B. Canadian hedge fund indices and global risk factors										
	Composite	Multi strategy	Equity Market Neutral	Fixed Income	Convertible Arbitrage	Event Driven	Equity Long/Short	Global Macro	Managed Futures	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Alpha	0.001***	0.000***	-0.004	0.003	0.000	-0.001***	-0.002	-0.002***	-0.003	-0.001**
	(1.21)	(0.07)	(-1.48)	(1.85)	(0.07)	(-0.47)	(-2.18)	(-0.92)	(-1.07)	(-0.62)
Market	0.172***	0.107***	0.203*	0.003	0.004	0.256***	0.417***	-0.010	0.116	0.173***
	(5.86)	(2.06)	(2.50)	(0.08)	(0.05)	(5.18)	(11.98)	(-0.15)	(1.29)	(6.40)
SMB	0.015	-0.118	0.033	0.009	0.100	0.118	-0.020	-0.046	-0.130	0.011**
	(0.38)	(-1.66)	(0.30)	(0.14)	(0.98)	(1.74)	(-0.42)	(-0.49)	(-1.06)	(0.29)
HML	-0.104	-0.121	0.191	-0.032	-0.271	-0.067	-0.202	-0.179	-0.100	-0.128
	(-3.00)	(-1.98)	(1.99)	(-0.60)	(-3.11)	(-1.16)	(-4.93)	(-2.23)	(-0.94)	(-4.01)
UMD	0.024*	0.056	0.053	-0.025	-0.078	0.068**	0.044	-0.004	0.161*	0.026
	(0.02)	(1.65)	(0.99)	(-0.82)	(-1.61)	(2.11)	(1.95)	(-0.09)	(2.73)	(1.46)
Commodity	0.075***	0.068***	0.090	0.106***	0.140***	0.092***	-0.011	0.208***	0.093***	0.048***
	(3.68)	(1.87)	(1.57)	(3.31)	(2.71)	(2.66)	(-0.45)	(4.37)	(1.49)	(2.53)
Government bond	-0.221***	-0.663***	-0.250	-0.505***	-0.941***	-0.436***	-0.752	0.555	2.152***	-0.439***
	(-1.45)	(-2.45)	(-0.59)	(-2.12)	(-2.45)	(-1.70)	(-4.16)	(0.12)	(4.61)	(-3.12)
Corporate bond	0.357***	0.714***	0.228	0.760***	1.405***	0.273***	0.574	0.397	-0.436**	0.374***
	(3.95)	(4.45)	(0.91)	(5.36)	(6.15)	(1.79)	(5.34)	(0.06)	(-1.57)	(4.48)
Obs.	110	110	110	110	110	110	110	110	110	110
Adj. R^2	0.726	0.454	0.302	0.565	0.602	0.600	0.837	0.375	0.254	0.732

Table 6 (Continued)

	Composite		Multistrategy		Managed Futures	
Panel C. Structural breaks for Canadian and global hedge fund indices estimated on global risk factors						
	BW indices					
	12/2006- 12/2011	1/2012- 12/2016	12/2006- 12/2011	1/2012- 12/2016	12/2006- 12/2011	1/2012- 12/2016
	(1)	(2)	(3)	(4)	(5)	(6)
Alpha	0.002**	0.002	0.001	0.004***	0.004*	-0.002
	(1.13)	(1.31)	(0.24)	(2.69)	(1.89)	(-0.94)
Market	0.078***	0.174*	0.021***	0.137	-0.067	-0.051
	(1.23)	(3.92)	(0.22)	(0.82)	(-0.98)	(-0.60)
SMB	0.224**	0.096	0.299	0.051	-0.138*	-0.051
	(2.52)	(1.78)	(2.26)	(-1.32)	(-1.44)	(-0.49)
HML	-0.146*	-0.085	-0.208	-0.095	0.011	-0.037
	(-2.10)	(-1.35)	(-2.01)	(-0.02)	(0.14)	(-0.31)
UMD	-0.022***	-0.029	-0.078***	-0.001	-0.005	0.04
	(-0.66)	(-0.62)	(-1.58)	(0.69)	(-0.14)	(0.44)
Commodity	0.191***	0.054***	0.213***	0.026***	0.141***	-0.166***
	(4.59)	(1.63)	(3.44)	(-1.07)	(3.14)	(-2.57)
Government bond	-0.389	-0.303***	-0.273***	-0.379***	0.539**	1.340**
	(-1.23)	(-0.98)	(-0.58)	(1.57)	(1.58)	(2.24)
Corporate bond	0.427	0.431**	0.492**	0.405***	-0.175	-0.681
	(2.62)	(1.92)	(2.02)	(2.42)	(-0.99)	(-1.57)
Obs.	50	60	50	60	50	60
Adj. R^2	0.797	0.52	0.65	0.266	0.164	0.35

Table 6 (Continued)

Panel C. Structural breaks for Canadian and global hedge fund indices estimated on global risk factors

	CS indices					
	Equity Market Neutral		Fixed Income		Convertible Arbitrage	
	12/2006-12/2011	1/2012-12/2016	12/2006-12/2011	1/2012-12/2016	12/2006-12/2011	1/2012-12/2016
	(7)	(8)	(9)	(10)	(11)	(12)
Alpha	-0.006***	0.001	0.000	0.003***	-0.006	0.003***
	(-1.13)	(0.78)	(-0.05)	(4.61)	(-1.41)	(2.35)
Market	0.162**	0.059**	-0.009	0.027	0.108	-0.013
	(0.97)	(0.95)	(-0.10)	(1.17)	(0.76)	(-0.33)
SMB	0.161	-0.043	0.073	-0.014	0.273	-0.031
	(0.69)	(-0.58)	(0.56)	(-0.52)	(1.38)	(-0.65)
HML	0.319**	-0.134	-0.11	0.038**	-0.567**	-0.073***
	(1.74)	(-1.52)	(-1.08)	(1.19)	(-3.68)	(-1.33)
UMD	0.022	0.017	-0.072	0.028	-0.101	-0.124
	(0.25)	(0.25)	(-1.48)	(1.16)	(-1.37)	(-3.02)
Commodity	0.148	0.081	0.211	0.022*	0.230***	0.059
	(1.35)	(1.74)	(3.44)	(1.32)	(2.49)	(2.02)
Government bond	-0.281	-0.526	0.148	-0.492***	0.524***	-0.287***
	(-0.34)	(-1.22)	(0.32)	(-3.12)	(0.75)	(-1.06)
Corporate bond	0.095	0.301	0.55	0.476***	1.096***	0.302***
	(0.22)	(0.96)	(2.29)	(4.16)	(3.03)	(1.53)
Obs.	50	60	50	60	50	60
Adj. R^2	0.327	0.0951	0.615	0.372	0.695	0.362

Panel A reports regression results of monthly excess returns from 2006 to 2016 for the BW Canadian hedge fund composite indices and subindices on the SMB, HML, and UMD factors (Fama and French 1992 and Carhart 1997) for the US stock market and returns on Thomson Reuters Equal-Weight NYFE CRB Continuous Commodity Index (*Commodity*), iShares Global Govt Bond and iShares Global Corporate Bond . The returns onall indices are in excess of the US risk-free rate. Panel B reports regression results of monthly excess returns for the global hedge fund indices: the Credit Suisse (CS) Composite and subindices and Hedge Fund Research Inc. (HFRI) Composite index from 2006 to 2016. If a structural break in coefficients is found for a subindex 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. HML, High Minus Low; SMB, Small Minus Big; UMD, Up Minus Down.

5: Conclusion

Since hedge funds have become an increasingly popular asset class since 1990 (Malkiel, 2004), it is reasonable to continue studying hedge fund to provide better investment solution to the investor. This paper follows the framework of Klein, Purdy, Schweigert and Vedrashko (2015) to investigate the return and risk in Canadian hedge fund. In our study, we discover that Canadian hedge funds still overperform the global market after 2011. The return and risk characteristics of Canadian hedge funds are different from non-Canadian hedge fund.

We also find that market timing and commodity timing factors have less effect on Canadian hedge fund return. Lastly, we believe the way of Klein, Purdy, Schweigert and Vedrashko (2015) to identify local and global factors is valuable since many R Squares are very high in the section of regression analysis, which demonstrates the highly statistical correlations.

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