# INTERPRETATIONS ON EXTREME RETURNS IN THE CANADIAN HEDGE FUND MARKET

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# ABSTRACT

Inspired by the award winning paper, *Are Extreme Returns on Hedge Fund Portfolios Problematic for Investors* (Brulhart and Klein, 2006) we analyzed the nature of extreme returns in the Canadian hedge fund market. Although much has been written on this topic for US and global hedge funds, no one has studied the nature of extreme returns in the still developing Canadian hedge fund market before. We find that the hedge fund returns are generally more favourable than that of major equity and bond indices from the perspective of mean-variance measures. As in Brulhart and Klein (2006), the standard measures of skewness and kurtosis can provide misleading insight, or lead to incorrect conclusion about higher order risks. In his paper, we interpret the extreme return in two perspectives by considering the moments of higher order as well as the magnitude and duration of drawdown period. Last but not the least, we conduct a comparison of de-levered returns on the various indices and find that investors should be surprised by the results but in a pleasant way.



**Keywords: Hedge Fund, Hedge Fund Index, Extreme Returns, Skewness, Kurtosis, Drawdown Statistics**

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# 1: INTRODUCTION

Hedge funds have been considered as an investment tool which has a low degree of exposure to broad market movement while achieving superior returns. Many studies have been done on the risk/return characteristics of hedge funds and traditional investments, showing that hedge funds investment superiors traditional investments including bond and equity in many ways. These have led to an increasing popularity of the hedge fund asset class. However, highly publicized failures of a small number of hedge funds, such as Askin's Granite Fund in 1994, Long Term Capital Management in 1998 and Amaranth in 2006, some hedge fund investors are probably going to step back and take a second thought on the extreme returns on hedge funds.

The issue of extreme returns is an important one in the hedge fund industry. The award winning paper, *Are Extreme Returns on Hedge Fund Portfolio Problematic for Investors* by Brulhart and Klein (2006) discussed the issue of extreme returns in the US hedge fund market and found that they are not problematic. This finding arouses our interest to explore the mystery of extreme returns in the Canadian hedge fund market that no one has looked at before.

Comparing to the US and European market, the Canadian hedge fund market is more recent. Also, the time series of Canadian hedge fund market has been too short. Investors pay less concern on Canadian hedge fund market. As a result, the Canadian hedge fund

market is less efficient and relatively uncrowded that many investment opportunities exist there. Thanks to KCS Fund Strategies Inc. that we have the private database that has up to 12 years data of 154 different Canadian hedge funds. We are going to have a look at the impacts of extreme returns in the profitable Canadian hedge fund market using the database.

The outline of the paper is as follows. Chapter 2 reviews briefly about the literatures on extreme returns. Chapter 3 describes the methodologies including the moments of higher order, the transformation of the moments of higher order as well as the drawdown statistics. Chapter 4 classifies 154 different Canadian hedge funds into several groups according to different hedge fund strategies. The performance comparisons are done between different hedge fund sub-indices and Canadian equity and bond indices, namely TSX index and DEX index.

# 2: LITERATURE REVIEW

The top five of the most commonly used hedge fund strategies in the Canadian hedge fund market are the Equity L/S strategy, the Managed Futures strategy, Equity Market Neutral strategy, Multi-Strategy and Event Driven strategy. The description of each strategy is as follows:

**Equity L/S strategy** usually constructs a portfolio that includes long holdings of equities and short sales of stock or stock index options. The empirical research indicates low leverage ratio is utilized to the equity hedge strategy. The position of equity hedge may be anywhere from net long position to net short position, depending on the market conditions. This is the most commonly used strategy in the Canadian hedge fund market.

**Managed Futures** hedge funds, or Commodity Trading Advisors (CTAs), can access both financial and non-financial (commodity) markets. The funds may take long or short futures, options, and forward positions in any of those markets.

**Equity Market Neutral** strategy seeks to exploit differences in stock prices by using the long and short strategies in stocks within the same sector, industry, market capitalization, country, etc. The objective of the strategy is to create a hedge against market factors.

**Multi-Strategy** managers engage in a variety of investment strategies including convertible bond arbitrage, equity long/short, statistical arbitrage and merger arbitrage and so on, to purse positive returns regardless of the direction of movements in the markets. Many benefits can be obtained by adopting Multi-Strategy. The diversification helps to reduce volatility, smooth return streams and decrease asset-class and single-strategy risks.

**Event Driven** strategy is one of hedge fund strategies in which the managers take significant positions in a certain number of companies with 'special situations' (Investopedia.com, 2008). These special situations include distressed stocks, takeovers, big news stories, mergers, and the like.

There are many reviews on the strategies and performance measurement during the past years. Gehin (2004) made an extensive survey on hedge fund performance. The paper discussed various biases associated with the hedge fund database as well as the overestimation effect of the hedge fund index due to these biases. In addition, the paper mentioned that the traditional performance measures are not suitable to evaluate hedge fund risk-return profile. Many studies in the paper provide some insights to the topic of this thesis.

The extreme returns of hedge funds are constantly blamed for the biases associated with the fund database. One of the obvious reasons is that the fund database kicks out the underperformed fund that no longer operating as discussed in Brown, Goetzmann,

Ibbotson, Ross (1992). This is recognized as survivorship bias. Survivorship bias is one of the main reasons that cause the overestimation of hedge fund index. The consequence is that the hedge fund indices appear to be more attractive than equity and bond indices. Another notorious bias is the selection bias. Due to the limited information in hedge fund industry, the index constructed from the selected database tends to be different from other databases. Bollen and Pool (2007) found that in the hedge fund industry is that monthly returns are more likely to be marginally positive than zero or marginally negative, and fund managers have an incentive to misreport monthly returns in this way in order to attract investors, which brings in bias to database.

Studies were conducted to estimate the true magnitude of the hedge fund index overestimation during the past years. However, there is no common consensus reached on this issue. Liang (2000) mentioned that the overestimation is over 2% per year. In addition, he also noted that the bias is determined by the studied time horizon and the reference index. The reason why hedge funds stopped reporting is the funds reach their target sizes so that there is no need to attract new clients any more. Hence, Ackermann, McEnally and Ravenscraft (1999) revealed their study to show that the bias could be just as low as 0.16%. However, some researchers are still challenging these results due to the "selection bias" of the hedge fund database. Malkiel and Saha (2005) constructed a database that was relatively free of bias and reported that the returns of hedge funds are overstated by 4.4% per year. We think this study could be a representative of this class of research among the literatures.

In the issue of portfolio allocation, mean return and standard deviation are the fundamental philosophy. However, the mean value and standard deviation are not sufficient to catch the real characteristics of investment returns when the return distribution is not symmetrical. In the paper, Brooks and Kat (2001) suggested that the mean-variance usually underestimate the true volatility of hedge fund returns such that the Sharpe ratio measurement is not an appropriate one. The investors are confused by the different fund rankings provided by traditional allocation tools such as Sharpe ratio, the Treynor ratio and Jensen's alpha. The Sortino ratio developed by Frank A. Sortino measures the return to the real risk – the downside volatility. It seems to be useful because it works well under asymmetric return distribution. However, just like Sharpe ratio, Treynor ratio and Jensen's alpha, it does not consider the moments of higher order. Recently, Osipovs(2007) pointed out that the Sharpe ratio results show a positive correlation with the ranking provided by other more sophisticated performance measures.

Many researchers found out that we must take the moments of higher order into consideration to obtain better explanations of hedge fund returns. Amin and Kat (2002), Malkiel and Saha (2005) etc., suggested that negative skewness and large kurtosis of hedge fund returns should be considered as the hidden risks. Another related study by Fung and Hsieh (1999) is that the hedge fund performance looks very attracted due to the high mean return and low standard deviation. However, the negative skewness and high kurtosis need to be considered in the risk and return profiles of hedge funds. Moreover, Liang and Park (2006) confirmed that the consideration of higher moments such as

skewness and kurtosis is helpful when explaining the cross-sectional variation in expected returns of hedge fund.

Drawdown statistics is easy to understand by most of normal investors. However, there are some research issues of drawdown statistics. Lhabitant (2004) pointed out some latent concerns of this measure. The maximum drawdown of hedge funds depends on the history of time series and the frequency of the measurement interval. Perell ́o (2007) also proved that the Gaussian results for the studied downside risk measures are still important. We are going to talk about this issue in detail later in Chapter 3.

When it comes to the question whether negative skewness and high kurtosis of hedge funds look bad to investors, Brulhart and Klein (2006) published an award winning paper that had a deep insight to the real magnitude of hedge fund returns. They compared the performance of indices, two equity indices (S&P 500 TR and Nasdaq), a bond index (Merrill Lynch U.S. Domestic Master Index) and two hedge fund database, under the same time horizon. The research results revealed that most of hedge fund indices are not severe as we ever thought, comparing to the two equity indices. The drawdown statistics also suggests that hedge funds have smaller magnitude of drawdown than that of equity indices. In addition, the drawdown tends to recover quickly in a couple of months.

As reviewed above, we can see that there are many researches conducted on the U.S. hedge fund market. The interesting thing is only few studies have been done on the

Canadian hedge fund market, which is close to the US market geographically. The most complete research on the Canadian hedge fund industry was done by the Alternative Investment Management Association (AIMA), which covered the hedge fund market in Canada, hedge fund strategies, the risk/return characteristics of hedge funds. The latest AIMA report, which published in 2005, revealed that the Canadian hedge fund market had been paid with relatively less concerns; the most commonly used strategies is Equity Long/Short strategy; the risk/return characteristics of hedge fund strategies differ substantially from each other, and from traditional bond and equity market.

According to a report by Barry Cohen (2008), the structure of Canadian hedge fund can be best compared to a pyramid with a wide base. At the top of the pyramid, relatively few multi-billion dollar firms control majority of hedge fund assets. A small number of mid-sized players that run assets ranging from C$100 million to C$600 million in the middle bulge. The pyramid suddenly broadens out to encompass the majority of hedge fund shops which are managing assets ranging from only a few million dollars to as much as C$100 million.

Barry (2008) also talked about some point of view on the Canadian hedge fund market by Alex Logie, the managing partner at Crane Capital Associates. Canadian funds are much stronger on the long side than the short side because the managers have recently come out of long shops and so do not have a lot of experience of having been short. In addition, the rising tide in Canadian equity markets has meant that unless you are uncommonly

brilliant, you will dampen the volatility by being short and therefore cost yourself some returns.

Lastly, Greg N. Gregorious (2003) is also an important one of the few papers on Canadian hedge fund market. In the paper, Gregorious introduced a modified Sharpe ratio to Canadian hedge fund performance. The modified Sharpe ratio recommends MVaR (Marginal Value at Risk) for measuring the extreme negative returns, which takes the third and the fourth moment into consideration.

We believe Brulhart and Klein (2006) made a breakthrough on the explanations of hedge fund extreme returns. They applied the novel method to decompose skewness and kurtosis of hedge funds, which made the performance comparisons between equity, bond, and hedge fund indices possible. Here, we are going to apply similar methodologies as Brulhart and Klein (2006) to explore the mystery of extreme return on Canadian hedge fund market.

# 3: RESEARCH METHODOLOGIES

In this chapter, we list a lot of traditional measurements of hedge fund performance. Due to the nature of hedge fund, the returns and risks, in some cases, are distorted somehow. We classify the Canadian hedge fund data into a few groups according to different hedge fund strategies. The mean value and standard deviation are computed for each group. In the cases of non-normal return distributions, we take the moments of higher order into account in further analysis on the true risk-return performance.

## 3.1 Obtaining Data on Hedge Fund Returns

The operation of hedge fund is naturally different from other funds, say mutual fund. Usually, the public investors are not able to obtain enough information to evaluate the performance of hedge funds. There are many reasons behind the story. Here are the most important ones as discussed in Lhabitant (2004): First, onshore hedge funds are privately organized investment vehicles. The fund managers have no incentive to disclose the past performance to investors. Second, due to the regulations, the fund managers are not allowed to advertise in any sense. As a result, the managers cannot attract potential public investors by disclosing the hedge fund performances that are usually favourable to investors comparing to other investment tools. People should not be surprised by the fact that many very successful hedge fund managers never disclose the fund performance. Third, the disclosure of performance is usually associated with investment strategies which are highly confidential. A fund would be in deep trouble if its executive strategies were exposed. Long Term Capital Management has already provided us a lesson in 1998.

## 3.2 The Construction of Indices

As reviewed in the previous chapter, the hedge fund indices may be biased and subjective. Lhabitant (2004) believed that the following two are the main reasons for the problem: first, the data mining process is problematic. The negative impacts of biases can be eradicated, but at the cost of expensive computation. Second, the managers manipulate the hedge fund prices such that the data does not reflect the true value of the fund.

In U.S., there are at least fourteen financial institutions constructing hedge fund indices from their selected databases. The problem is that the fund rankings measured by different institutions can be very different even to hedge funds under same strategy. These serious biases associated with the hedge fund index make investors confused.

The classifications of hedge fund databases are very different from each financial institution. Among all classifications, we personally think the one provided by Morgan Stanley Capital Indices (MSCI) is the most comprehensive one. The classification standard is shown in Table [1].

One of the objectives of this thesis is to construct the hedge fund sub-indices for the Canadian hedge fund market. The comparisons can be made between different sub-indices first and then between sub-indices and the Canada equity and bond indices.

During the construction of sub-indices, the weighting to each hedge fund is apparently important. Our research indicates that there is only one hedge fund index provider that systematically uses capitalization-weighted indices.

Some possible reasons are discussed as followed. First, the hedge fund indices are not in their mature stage yet. The common example is Dow Jones Industrial Average (DJIA) index that is one of the popular equity indices. DJIA is an equal-weighted index. Some people believe the hedge fund indices can be adjusted as a capitalization-weighted index.

Second, the determination of assets under each hedge fund is a tough mission. The assets managed under each hedge fund include onshore and offshore-organized vehicles. It could be very hard to obtain the complete information. In addition, another key factor is that the leverage utilized in the operation of hedge funds. Even worse, the managers usually adjust the leverage ratio quickly according to market conditions.

Last but not the least, some people claimed that the capitalization-weighted method could distort the real performance of hedge fund. Nevertheless, the equal-weighted method is not substantially better than the capitalization-weighted method.

## 3.3 The Moments of Higher Order

In the traditional world of investment performance analysis, the mean value and variance are efficient when measuring the investment performance. The two primary performance measurement methods, CAPM (Capital Asset Pricing Model) based measures and Market-Timing measures, are the most commonly used ones in equity returns analysis. In

general, the investors have positive preference to mean value and negative preference to variance. This is easy to understand, as the investors would like to maximize the returns given a fixed risk level, or minimize the risks given a fixed return.

However, the investment returns are not always normally distributed. The empirical research indicates that most returns are asymmetrically distributed. The reasons why the returns are asymmetric are not surprised. Both the common market crashes and rallies contributed to the abnormal returns. This is the reason why mean and variance are not sufficient in reflecting performances. Thus, the consideration of the moment of high orders is crucial in further analysis on the risk-return characteristics of hedge funds.

As we are all taught in fundamental statistics, a higher kurtosis implies that a distribution has extreme outliers, and a negative skewness implies extreme outliers occur to the downside. We suggest an investment return analyzing procedure as follows. Firstly, the Jacque-Bera test should be used to test the normality of returns. Secondly, if the returns follow a normal distribution, the traditional mean-variance measures should be sufficient in performance evaluations. Otherwise, the moments of higher order, especially the $3^{rd}$ moment and the $4^{th}$ moment are necessary in performance measurement.

For a large amount of sample data, the normality test statistic, the normality test statistic of JB test follows a chi-square distribution with two degrees of freedom. The critical value depends on the level of significant desired. For most commonly used level of significant of 5% and 1%, the critical values are 5.99 and 9.21, respectively. Note that

two critical values are computed in MATLAB using the command x = chi2inv(P, V) where P is the level of significance (0.95 or 0.99) and V is the degrees of freedom (V = 2).

As mentioned, the non-normal returns are usual in the real world. According to Scott and Horvath (1980), the moments of high orders should be used to further interpret in the risk-return profile if the returns are not approximately normal. There are two assumptions before applying moments of higher order. First, the investor's utility function is of higher order than the quadratic. Second, the mean value and variance do not completely determine the distribution.

If the both of the assumptions are satisfied, we can use the moments of higher order to catch the true risk-return performance. As shown in Scott and Horvath (1980), the investor's utility function can be interpreted in the Taylor series expansion in which the first two terms contain the mean and variance as shown as follows:

$$E(U) = U(\mu) + \frac{U^2(\mu)}{2} + \sum_{i=3}^{\infty} \frac{\mu_i}{i!} U^n(\mu)$$

The skewness and kurtosis of the utility function are similar to third and further moments of the Taylor series expansion. Scott and Horvath (1980) suggested a sophisticated transformation of these moments to explain the extreme returns. The details will be covered late in this section.

Skewness, the third central moment of a distribution, is used as a measure of the symmetry of a return distribution around its mean. A return distribution with positive

skewness has frequent small losses with a few extreme gains. On the other hand, a return distribution with negative skewness has frequent small gains and a few large losses.

From the risk-return perspective, rational investors would prefer the distribution with a positive skewness to the distribution with a negative skewness. This is because a positive skewed distribution has its mean return fallen above the median. Skewness zero means the distribution is perfectly symmetrical. One example of skewness zero is standard normal distribution. The sample skewness can be computed easily by using command *S = skewness(X)* in MATLAB or *S = SKEW(X)* in Excel, where X is the data set aligned as column vectors.

Kurtosis, the fourth central moment of a distribution, measures the degree of peakedness and heaviness of the tails of a distribution. A normal distribution has a kurtosis of three. Distribution that is more peaked than normal is called leptokurtic; and a distribution that is less peaked than normal is called platykurtic. The leptokurtic distribution has the notorious fat-tail effects in the either side of return distribution. The sample kurtosis can be computed by using command *S = kurtosis(X)* in MATLAB or *S = KURT(X) + 3* in Excel, where X is the data set aligned as column vectors.

## 3.4 Transformation of the Moments of Higher Order

Brulhart and Klein (2006) introduced a sophisticated idea to analyze the true extreme returns of investments. The large negative skewness and kurtosis could be led by its small standard deviation. Based on this conjecture, the skewness and kurtosis are standardized by multiplying $s^3$ and $s^4$, respectively. The transformed format should provide a deeper

insight to the extreme returns. The complete transformation is shown in Table [2]. The consistently negative bias for measures of the first four orders of moments decrease as the degrees of freedom (DOF) and the sample sizes n increase.

## 3.5 Drawdown Statistics

The drawdown analysis is a straightforward measure. To explain the concepts, we draw a graph to demonstrate the idea as showed in Figure [1].

The maximum drawdown, which is also recognized as peak to valley, is the maximum loss between the highest point to the lowest point in a certain time horizon. As showed in the figure, the loss occurs between point A and point B. The time horizon from point A to point B is the drawdown period. Then, the time that point B takes to reach point C is called recovery period. Point C is on same level of as the peak point A. In some cases, the loss is completely recovered by the end of the inspection. Then, the portion that still to be recovered is used as another indicator.

The drawdown measure is easy to understand. However, it is not a perfect measure. According to Lhabitant (2004), there are some disadvantages of the drawdown measure. First, assuming everything is equal; the magnitude of drawdown is usually greater than the fund measured in a short time horizon. The comparisons between the magnitudes of drawdown on hedge funds that measured in different time horizons do not provide much valuable information. Second, the magnitude of drawdown of hedge fund is severe when the time interval is not long enough. Moreover, the different hedge funds should be tested under the same time horizon. Third, the maximum drawdown itself is not able to

demonstrate a big picture of the performance. For instance, the fund which has a one time maximum loss of 10% is better than the fund which has two times maximum losses of 9% under the same time horizon. The maximum magnitude of drawdown is independent from the average loss in this measurement. Accordingly, we re-calculate the hedge fund indices as well as equity and bond indices so that they are measured under the same time horizon to make sure they are comparable.

# 4: ANALYSIS OF HEDGE FUND EXTREME RETURNS

## 4.1 Data Descriptions

Due to the nature of hedge fund industry, the fund performances are not easily available to the general public. For this study, we obtained private data from KCS Fund Strategies Inc. The database contains 154 individual hedge funds in Canadian market from September of 1996 to June of 2008. The overview of Canadian hedge fund market is shown in Table [3]. Different from U.S. hedge fund market, the Canadian hedge fund market is less efficient and less crowded. These two facts make the Canada hedge fund market a profitable one. The other obvious feature is that the Canadian hedge fund industry is dominated by three hedge fund strategies, namely Equity Long/Short strategies (49.35%), the Managed Futures strategies (12.34%) and the Equity Market Neutral strategies (11.04%). These three hedge fund strategies cover over 70% of all hedge funds of the database.

The hedge funds in the database can be classified into fourteen different strategies groups. The minimum and maximum returns of each strategy in Table [3] are two extreme values of an average monthly return in the time period. We noticed that the Event Driven hedge fund features both the minimum (-36.6%) and maximum (23.82%) returns among all the strategies groups. However, these two extreme returns are respectively calculated by one and two individual funds at the corresponding month, which can not provide useful comparisons between indices.

Following the research methodologies described in Chapter 3, we choose TSX equity index and DEX bond index as the benchmarks to compare the risk and return profiles on various hedge fund indices. Considering the less-efficient and less-mature hedge fund market in Canada, there is no authorized hedge fund index to choose from. In this thesis, we choose five major hedge fund strategies based on the criterions that each of the hedge fund strategy must have at least four funds during the studied time horizon. After careful considerations, we select the time horizon from January 2003 to May 2008. This period is relatively free of extreme events so that it well represents the common condition of the Canadian market. The last month of the database is not included here because some of the data are not available. Thereafter, we are ready to construct the five sub-indices based on the selected strategies as well as an overall hedge fund index.

## 4.2 Performance Comparisons

The statistical properties of the bond index, the equity index and hedge fund sub-indices are shown in Table [4]. Note that the selected equity index and the bond index are evaluated in a much longer time horizon due to the relative mature markets of equity and bond trading. There are monthly returns of these two indices measured from January of 1994 to June of 2008. However, the individual Canadian hedge funds in the database started to operate from very different time points, which are generally later than the equity and bond indices. The differences between the indices are available in Table [4]. We do have some better ideas in mind about the comparisons of indices. We also noticed that the significant change of risk and return profile of TSX and DEX that are measured in different time horizons.

The bond index, the equity index, the overall hedge fund index and four of the five hedge fund sub-indices have negative skewness at the studied time horizon. The Event Driven hedge fund strategy is an exception. Another finding is that the hypothesis of normality, based on Jarque-Bera test values shown in Table [4], cannot be rejected to the bond and hedge fund indices at 5% of confidence interval (critical value is 9.21). On the other hand, the Jarque-Bera test value of the equity index is slightly greater than the critical value.

TSX index, DEX index, the overall index and other five hedge fund sub-indices are plotted in Figure [2] with the same scale of vertical and horizontal axis. The histograms show that none of the four distributions look normal but the bond index and the overall hedge fund index looks more structured and consistent. On the other hand, the equity index and the Equity Hedge index look more fractured and spread out. The distribution of the equity index and the Equity Hedge index clearly show more negative skewness than the other two indices. If we take a close observation, we could notice that TSX index experienced a few times of extreme negative events which had over 5% loss.

The Sharpe ratios of the bond index, the equity index and each hedge fund sub-index are shown in Table [4]. We retrieved the Canadian 3-month Treasure bill rates from the same time horizon, and took them into the database to compute the risk-free interest rate. The average rate is 3.17% annually. The monthly mean return and standard deviation are annualized to calculate the desired Sharpe ratio. All the hedge fund sub-indices, except

the Equity Market Neutral strategy, show a higher Sharpe ratio than that of TSX and DEX, The Equity Hedge strategy has the highest Sharpe ratio among the sub-indices. As shown in Table [3], there are fourteen hedge fund strategies in the given database. Due to the imbalance structure of this database, some hedge fund strategies contain over 10% of total hedge funds, while others have less than 2%. Considering the situation, we follow the selection criterions discussed in the coming paragraph to select the top five of the most representative sub-indices which cover the most characteristics of all hedge funds in the Canadian market.

The screening standards are based on the following criteria. First, the hedge fund strategy groups must have at least four individual hedge funds at any month during the tested time period. As shown in Table [3], a few hedge fund strategies have one or two individual funds such that the strategy cannot represented by these funds only. Second, the selected funds must have minimum 12 monthly returns during the operation. In this case, there are eight funds which are not qualified in the database, and they will be screened out during the calculations. We initially would like to set some capital requirement, but the lack of asset value make this criterion in vain. Hence, the five main sub-indices are defined and ready for the further analysis.

The classification of hedge funds in the given database is consistent with the framework of Scotia Capital Canadian hedge fund performance index strategy classification. The hedge funds can be classified into the groups with high or low market exposure, or other words, directional or non-directional. Then, within each investment style (Relative Value,

Event Driven and Opportunistic), hedge funds will be further categorized into one of fourteen strategy category groupings.

### 4.2.1 Considerations of Higher Moments and Drawdown Statistics

Detailed research data of moments of higher order are provided in Table [5]. The common hidden risk factors of hedge funds, skewness and kurtosis, are calculated for each strategy group. For the reason of comparisons, the same performance indicators of the bond index and equity index are listed in the table as well. The transformed third moment and fourth moment should provide deep insight of the real risk-return profile of each investment style.

In addition, the research results of drawdown statistics are documented in Table [6], which exposes the magnitude and time of maximum drawdown, and length to recovery in the studied period. If the index is not recovered from the drawdown yet, another indicator, the "still to be recovered" indicator is recorded. To have a straightforward understanding to the index performance in the studied time horizon, the moving trends of the equity index and the bond index are plotted and shown in Figure [3]. Meanwhile, the performance of the overall hedge fund index and other five sub-indices are plotted and shown in Figure [4].

***The Overall Hedge Fund Index***

The overall hedge fund index is constructed from the given database. Note that eight hedge funds that not qualified are screened out during the evaluation. The overall index shows a decent mean return and standard deviation, and has a lower kurtosis and higher

skewness than that of the bond and equity indices. As shown in Table [4], the overall Hedge Fund Index has the highest Sharpe ratio among all indices. However, the index has a negative skewness, which is not favourable to investors.

The analysis of the third moment and the fourth moment suggest that the overall index has more extreme returns than the bond index during the studied period. However, the overall index is still much better than the equity index.

The analyses to drawdown statistics are also conducted to the overall hedge fund index. The overall index has a maximum drawdown of 3.47% in five months. Fortunately, the index quickly recovered in one month. Comparing with the equity index and the bond index, the overall hedge fund index has a less severe impact.

***Long/Short Equity Strategy***

The data in Table [5] indicate that the mean return of the Equity Hedge strategy is greater than that of TSX and DEX indices under the same time horizon. The Equity Hedge strategy has the advantage of lower standard deviation over TSX index, but losts the advantage to DEX bond index.

As for skewness and kurtosis, the Long/Short Equity index has less extreme returns than the equity index. The Long/Short Equity has the lowest kurtosis among these three indices. However, from the perspective of higher moment analysis, the Equity Hedge strategy suffers most from the extreme returns. The research data indicate that the Equity hedge strategy has the most negative skewness and highest kurtosis among these three

indices. This implies that the return distribution of the Long/Short Equity index shifts to right, and has a fat tail on the left side.

The Long/Short Equity index has a worse loss of 5.26% in three months, and the index quickly recovered in four months.

***Managed Futures Strategy***

The Managed Futures hedge fund strategy has a similar mean/variance performance to TSX index; the difference is that it has a slightly lower mean return and standard deviation. The Managed Futures index shows unfavourable negative skewness and high kurtosis. The further analysis of higher moments indicates that the Managed Futures hedge fund strategy has more extreme returns than the bond index, but still much better than the equity index under the same time horizon.

The analysis of drawdown statistics indicates that the Managed Futures hedge fund strategy has a maximum loss of 5.81%, but the loss is lower than the maximum loss of the equity index. The index recovered to its previous peak level in three months.

***Equity Market Neutral (EMN) Strategy***

Due to the nature of the EMN hedge fund strategy, the standard deviation of the Equity Market Neutral strategy is relatively small among all hedge fund sub-indices. The mean/variance of the Equity Market Neutral strategy is very closed to that of the bond index. However, the mean return and standard deviation are slightly lower. As shown in

Table [4], the EMN strategy has the lowest Sharpe ratio among the hedge fund sub-indices.

From the perspective of skewness and kurtosis, the EMN hedge fund strategy has an exposure in extreme returns. The return distribution of EMN hedge fund strategy shifts to its right ride and has a fat tail on its left side because of the negative skewness. The transformation of the third moment and fourth moment reveals the true risk/return profile of the EMN hedge fund index. The third moment of the EMN hedge fund strategy is much greater than that of the equity index, although the third moment still has a negative value. On the other hand, this strategy does not have too many extreme returns based on the value of the fourth moment.

Once again, these observations prove that the transformed skewness (the third central moment) and kurtosis (the fourth central moment) provide an insightful look at the real extreme returns faced by the hedge funds. The small value of standard deviation plays a critical role in the analyses of extreme returns of hedge funds.

Among all indices, the EMN hedge fund index has the smallest maximum loss over the studied time horizon. It has a 1.96% of maximum loss, which is much better than other indices. The index suffered the loss in one month, and recovered in three months.

***Multi-Strategy***

The key performance indicators of the Multi-Strategy Hedge Fund index are shown in Table [4] and [5]. Comparing to the equity index, the Multi-Strategy Hedge Fund index looks better due to its slightly higher mean return and lower standard deviation. However, from the perspective of skewness and kurtosis, the Multi-Strategy Hedge Fund index has a worse exposure of extreme returns than the equity index because it has a lower skewness and higher kurtosis.

This conclusion is overturned by the further analysis on the higher moments. As shown in Table [5], although the third and fourth moments of the Multi-Strategy Hedge Fund index is worse than the bond index, these two moments are still better than those of equity index. In other words, the hedge fund index has a greater third moment and smaller fourth moment than those of the equity index.

Based on the data in the given database, the magnitude of maximum drawdown is 6.60% up to May 2008. The Multi-Strategy Hedge Fund index is on the way of recovering. Our research indicates that another 21.15% of total drawdown has not recovered yet.

***Event Driven Strategy***

There is one thing needs to be noticed to the Event Driven hedge fund index: its positive skewness. It is the only fund with positive skewness in our studied indices, although the Event Driven hedge fund index has a high kurtosis. The analysis on the moments of higher order tells another story. The Event Driven hedge fund index has the largest fourth moment in all the funds.

We do not have the value of the worse loss over the studied time horizon to the Event Driven hedge fund index. The index is keep falling until the end of the observation time horzion. However, the research indicates that the maximum loss until May of 2008 is 8.19%. Then, we are not able to document when the index will reach its bottom.

### 4.2.2 Extreme Returns Explained So Far

Table [4], [5] and [6] provide deep thoughts on the analysis of extreme returns in the Canadian hedge fund market. The calculations of Sharpe ratio shown in Table [4] suggest that hedge fund indices, except the Equity Market Neutral hedge fund index, should be more preferable than the bond index and the equity index. The normality tests to all eight indices suggest that the overall hedge fund index and other sub-indices have the return distributions that are closed to normal in the studied time horizon. However, the normality hypothesises to the bond and the equity indices are all rejected.

The risks of extreme returns faced by hedge funds are exaggerated when using skewness and kurtosis as the risk indicators. The analysis of moments of higher order reveals the true risk/return profile of each index. Generally speaking, hedge fund indices have a higher third moment (the exception is the Equity Hedge strategy) and lower kurtosis (the exceptions are the Equity Long/Short strategy and the Event Driven strategy) than the equity index. The results are demonstrated in Table [5].

As shown in Table [6], the overall hedge fund index and sub-indices generally have smaller maximum losses than the equity index. Besides, they are quickly recovered in couple of months.

### 4.2.3 Consideration of De-Levering Method

***Equalization of Fourth Moments***

To provide further comparisons among the three indices, we conduct a series of research by equalizing certain moments of each index. Hence, the comparison between "apple" and "orange" becomes possible. To do so, these three indices still have to be evaluated under the same time horizon.

We set the DEX Universe Bond index as the reference index to de-lever the equity index, the overall hedge fund index and other five hedge fund sub-indices. Meanwhile, the 3-month Canadian Treasure-bill rate is used as the risk-free interest rate. We obtained all the Treasure-bill rates from Bank of Canada.

The detailed de-levering procedures are as follows. First, the fourth moment of the equity index, which is usually much higher than that of Bond index, is set equal to the fourth moment of the bond index. The leverage ratio is then defined such that some cents of one dollar will be invested in the index and the rest of the dollar will be invested in the

riskless asset, in our case, the Canadian Treasure-bill. The other parameters of performance follow the classical portfolio theory.

The transformations are conducted to equalize the fourth moment of these indices. The results are shown in Table [7]. Under the same fourth moments, the overall hedge fund index has the leverage ratio of 0.516, which means 0.516 of one dollar is invested in the overall hedge fund index. The rest of one dollar will be invested in the Canadian 3-month Treasure bills such that the constructed portfolio will have the equal fourth moment as the bond index. In the case of the Managed Futures hedge fund index which has a leverage ratio of 1.678, we will short sell 0.678 dollar of the Treasure bills.

The research results indicate that the overall hedge fund index and other hedge fund sub-indices, with the exception of the Equity Market Neutral hedge fund index, have higher returns than the bond index and the equity index. Except the Managed Futures index which has a standard deviation of 3.452, other hedge fund indices have standard deviations which are close to that of the equity index and the bond index. Bond index is the only index which has a negative third moment. The Managed Futures index shows an extraordinary high third moment in all the considered indices.

Meanwhile, the drawdown statistics are conducted to the de-levered portfolios which have the same amount of fourth moment. Similarly, we reproduce the all the selected indices; the results are shown in Table [8]. One interesting observation is that the Managed Futures hedge fund index has the worse loss in the studied period, which is

many times of the maximum loss of other indices. The data also indicate the index recovered in four months. Other than the above fact, the overall hedge fund index and the other five sub-indices have lower magnitude of maximum loss than that of the bond and equity indices.

### *Equalization of Second Moments*

The research on the equalization of the fourth moments suggests that some hedge fund indices suffer less exposures of extreme return than the equity index. However, the standard mean/variance measure usually ignores the risks associated with higher moments. In this case, we do the research to equalize the second moment of each index, and the results are shown in Table [9].

The second moment of investor's utility function refers to the standard deviation of each index. The Bond index is still the benchmark index. The research data in the table show that the overall hedge fund index achieved the highest return among the studied indices. In addition, the returns of hedge fund indices, with the exception of EMN hedge fund index, are higher than the equity and bond indices. Another observation is that the fourth moment of the bond index is higher than that of the equity index, which is consistent with the result of the paper (Brulhart and Klein, 2006).

The drawdown statistics research is also conducted to the de-levered portfolios which have same amount of the second moment. The research results are shown in Table [10].

As we expected, these results again prove that the hedge fund indices have less severe extreme returns than the bond index and the equity index.

# 5: CONCLUSION

The research on the comparisons among the bond, equity and hedge fund sub-indices are conducted under the same time horizon. The five main hedge fund sub-indices and the overall hedge fund index generally have higher mean return and lower standard deviation than that of the equity index and bond index over the same time horizon. Some of them show negative skewness and high kurtosis. However, taking the transformed third and fourth moments into considerations, the extreme returns are not that severe as we ever thought.

These hedge fund indices are generally better than the performance of equity index, and have a comparable performance with the bond. The only exception is the Long/Short Equity hedge fund index which shows a lower negative third moment and a higher kurtosis than the equity index. The other is the Event Driven hedge fund index which has a higher fourth moment than the equity index.

The drawdown statistics research provides a straightforward measure to the extreme returns. As expected, the hedge fund indices have smaller magnitude of maximum drawdown than that of equity index. We are not sure about the Event Driven hedge fund index because the index is still keep falling down up to the end of the studies time horizon. Another finding is that the studied indices have very short time periods of drawdown and can recover in a few months.

The research is conducted to the given hedge fund database. We expect the results could be improved in the future. First, the more individual hedge funds we have in the database, the more convincible research results we can get. Comparing with the TASS/Tremont database which contains over 3000 hedge funds, the given database contains only 154 individual hedge funds and is relatively small. A larger database is needed to improve the accuracy of the research. Second, considering the short history and less-mature stage of Canadian hedge fund market, we expect a longer time horizon which can provide more information in the research.

**Table [1]: The MSCI Hedge Fund Classification Standard (*Source: MSCI*)**

| **Primary Characteristics** | | | | | | |
|---|---|---|---|---|---|---|
| **Investment Process** | | | **Geography** | | | |
| **Group** | **Process** | | **Area** | **Region** | | |
| **Directional Trading** | Discretionary Trading<br>Tactical Allocation<br>Systematic Trading<br>Multi-Process | Commodities<br>Convertibles<br>Currencies<br>Equity<br>Fixed Income<br>Diversified | **Developed Markets** | Europe<br>Japan<br>North America<br>Pacific ex Japan<br>Diversified | **GICS Sector** | Consumer Discretionary<br>Consumer Staples<br>Energy<br>Financials<br>Health Care<br>Industrials<br>Information Technology<br>Materials<br>Telecom Services<br>Utilities<br>No Industry Focus |
| **Relative Value** | Arbitrage<br>Merger Arbitrage<br>Statistical Arbitrage<br>Multi-Process | | **Emerging Markets** | EMEA<br>Asia Pacific<br>Latin America<br>Diversified | | |
| **Security Selection** | Long Bias<br>No Bias<br>Short Bias<br>Variable Bias | | **Global Markets** | Europe<br>Asia ex Japan<br>Asia<br>Diversified | **Fixed Income Focus** | Asset-Backed<br>Government Sponsored<br>High Yield<br>Investment Grade<br>Mortgage-Backed<br>Sovereign<br>No Fixed Income Focus |
| **Specialist Credit** | Long-Short Credit<br>Distressed Securities<br>Private Placement<br>Multi-Process | | | | | |
| **Multi-Process Group** | Event Driven<br>Multi-Process | | | | **Capitalization Size** | Mid and Large Cap<br>Small Cap<br>Small and Mid Cap<br>No Size Focus |

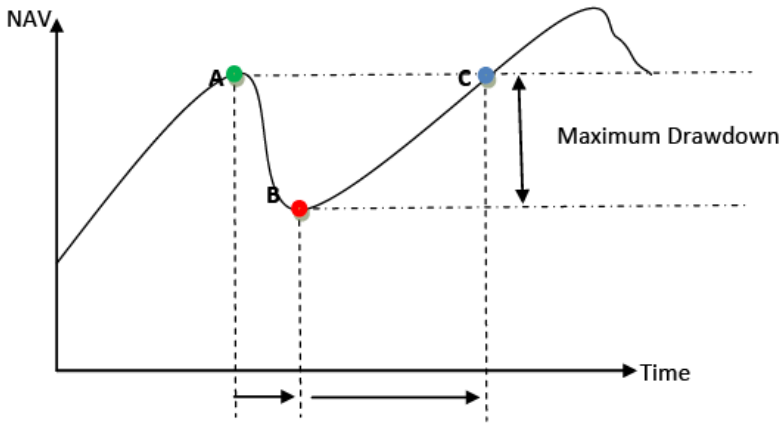
**Table [2]: The Transformation of Skewness and Kurtosis**
**(*Source: Brulhart and Klein, (2006)*)**

DOF and *s* in the table stand for Degree of Freedom and Standard deviation, respectively.

| | **First Moment** | **Second Moment** | **Third Moment** | **Fourth Moment** |
|---|---|---|---|---|
| **Standard Formula** | $\frac{\sum r_i}{DOF}$ | $\frac{\sum (r_i - \bar{r})^2}{DOF}$ | $\frac{\sum (r_i - \bar{r})^3}{DOF}$ | $\frac{\sum (r_i - \bar{r})^4}{DOF}$ |
| **Name** | Mean | Variance | N/A | N/A |
| **Units** | Percent | $Percnet^2$ | $Percnet^3$ | $Percnet^4$ |
| **Transformation** | N/A | Square Root | $\frac{3rd\ Moment}{\sigma^3}$ | $\frac{4th\ Moment}{\sigma^4}$ |
| **Name** | Mean | Standard Deviation | Skewness | Kurtosis |
| **Units** | Percent | Percent | N/A | N/A |

**Figure [1]: The Concept of Drawdown Analysis**

We draw a picture to explain the drawdown concepts. Point A is one of historical high point and Point B is the valley of the index. In the practical research, we try three drawdown time periods and select the one has the maximum loss. Point C is the point where index recover from its previous trough.



## Table [3]: Canadian Hedge Fund Market Overview

The information is obtained by observing the hedge funds in the given database. The minimum and maximum returns are two extreme values of the average monthly returns.

| | Number of Funds | Starting Period | Ending Period | Min (%) | Max (%) |
|---|---|---|---|---|---|
| Convertible Arbitrage | 3 | Jul-98 | Jun-08 | -5.07 | 5.45 |
| Emerging Markets | 1 | Aug-05 | Jun-08 | -12.08 | 12.27 |
| EMN | 17 | Jun-99 | Jun-08 | -8.99 | 5.75 |
| L/S Equity | 76 | Aug-96 | Jun-08 | -9.51 | 15.78 |
| Event Driven | 6 | Jan-98 | Jun-08 | *-36.6* | *23.82* |
| Fixed Income Arbitrage | 4 | Nov-96 | Jun-08 | -5.30 | 7.82 |
| Managed Futures | 19 | Jan-97 | Jun-08 | -8.66 | 18.94 |
| Global Macro | 9 | Dec-01 | Jun-08 | -8.04 | 14.43 |
| Long Only | 3 | Sep-97 | Jun-08 | -12.94 | 23.19 |
| Merger Arbitrage | 1 | Jul-02 | Jun-08 | -9.66 | 10.47 |
| Multi-Strategy | 11 | Feb-98 | Jun-08 | -15.05 | 16.62 |
| Options | 1 | May-07 | Jun-08 | -23.90 | 20.24 |
| Short Selling | 2 | Jul-04 | Jun-08 | -10.21 | 8.10 |
| Volatility | 1 | Jul-07 | Jun-08 | -0.97 | 2.64 |

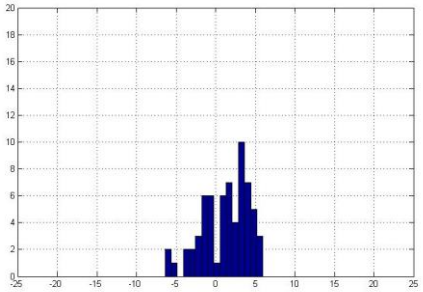
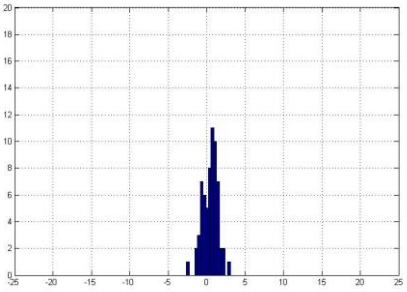
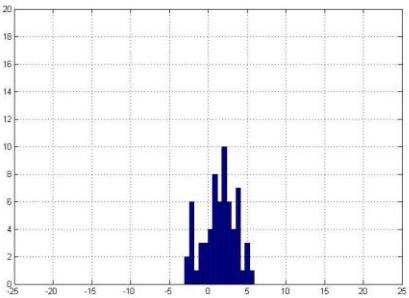
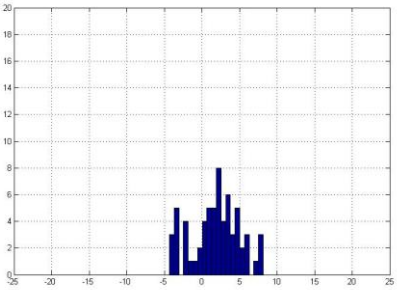
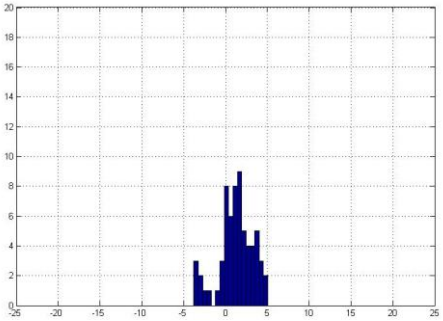
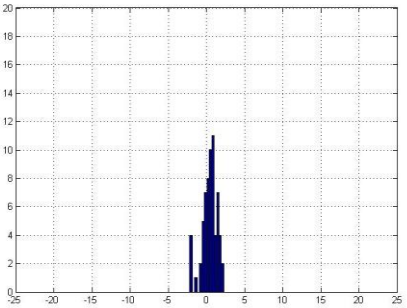
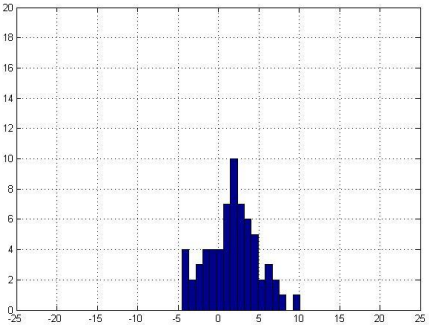
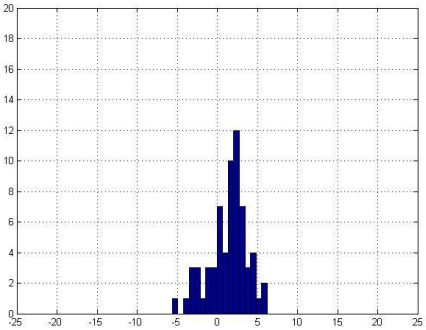
## Table [4]: Statistical Properties of Equity and Hedge Fund Indices

The research results are evaluated from January 2003 to May 2008. Equally weights are assigned to each individual hedge fund. The risk-free interest rate is computed from the practical Canadian 3-month Treasury bill rates. The Sharpe ratio is calculated by using the annualized data.

| Index | Mean (%) | Standard Deviation (%) | Skew | Kurtosis | Jarque-Bera stat | Sharpe Ratio |
|---|---|---|---|---|---|---|
| **Canada Equity and Bond Indices** | | | | | | |
| TSX | 1.281 | 2.958 | -0.635 | 2.712 | 9.971 | 1.191 |
| DEX | 0.459 | 1.007 | -0.312 | 3.539 | 3.798 | 0.670 |
| **Hedge Fund Indices** | | | | | | |
| Overall HF Index | 1.463 | 2.128 | -0.271 | 2.504 | 1.458 | 1.952 |
| Equity Long/Short | 1.829 | 3.164 | -0.526 | 2.474 | 3.749 | 1.713 |
| Managed Futures | 1.253 | 2.054 | -0.611 | 3.282 | 4.265 | 1.668 |
| Equity Market Neutral | 0.452 | 0.990 | -0.740 | 3.788 | 7.613 | 0.657 |
| Event Driven | 1.749 | 3.153 | 0.079 | 2.892 | 0.098 | 1.631 |
| Multi – Strategy | 1.355 | 2.427 | -0.653 | 3.292 | 4.846 | 1.557 |

**Figure [2]: Return Histograms of Different Indices (01/2003 ~ 05/2008)**

The returns histograms for each index are adjusted such that they have the same sale of X- and Y- Axis.

| | |
|---|---|
|  |  |
| **TSX Index** | **DEX Index** |
|  |  |
| **Overall Index of Hedge Fund** | **Long/Short Equity** |
|  |  |
| **Managed Futures** | **EMN** |
|  |  |
| **Event Driven** | **Multi-Strategy** |

## Table [5]: Higher Moments of Equity and Hedge Fund Indices

These values are calculated based on monthly data provided in the database. In the calculation, the third moment can be calculated by multiplying skewness and the standard deviation of power of 3. The fourth moment can be calculated by multiplying kurtosis and the standdeviation of power of 4.

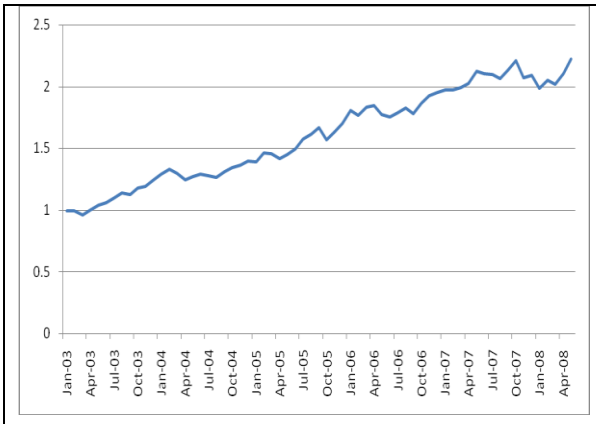
| Index | Standard Deviation (%) | Skew | Kurtosis | Third Moment ($\%^3$) | Fourth Moment ($\%^4$) |
|---|---|---|---|---|---|
| **Canada Equity and Bond Indices** | | | | | |
| TSX | 2.958 | -0.635 | 2.712 | -16.441 | 207.599 |
| DEX | 1.007 | -0.312 | 3.539 | -0.318 | 3.636 |
| **Hedge Fund Indices** | | | | | |
| Overall HF Index | 2.128 | -0.271 | 2.504 | -2.609 | 51.391 |
| Equity Long/Short | 3.164 | -0.526 | 2.474 | -16.671 | 248.013 |
| Managed Futures | 2.054 | -0.611 | 3.282 | -5.300 | 58.443 |
| Equity Market Neutral | 0.990 | -0.740 | 3.788 | -0.719 | 3.645 |
| Event Driven | 3.153 | 0.079 | 2.892 | 2.461 | 285.818 |
| Multi – Strategy | 2.427 | -0.653 | 3.292 | -9.331 | 114.237 |

## Table [6]: Peak to Trough Drawdowns and Recovery Times

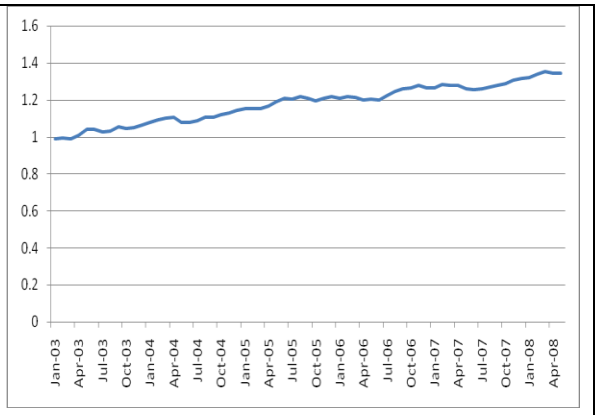
We first reproduce the indices in the selected time period. The peak to tough drawdown is defined by from the historical high point to its valley. The length of drawdown is counted from the highest point to lowest point. If the index is recovered from its trought, the time to recovery is documented. If not, the portion not covered yet will be calculated. All the results calculated are based on monthly values.

| Index | Peak to Trough Drawdown (%) | Length of Drawdown (Months) | Time to Recovery (Months) | Still to be Recovered (%) |
|---|---|---|---|---|
| **Canada Equity and Bond Indices** | | | | |
| TSX | -10.041% | 3 | 4 | N/A |
| DEX | -2.690% | 2 | 3 | N/A |
| **Hedge Fund Indices** | | | | |
| Overall HF Index | -3.466% | 5 | 1 | N/A |
| Equity Long/Short | -5.258% | 3 | 4 | N/A |
| Managed Futures | -5.813% | 3 | 3 | N/A |
| Equity Market Neutral | -1.959% | 1 | 3 | N/A |
| Event Driven | -8.188% | 3 | 0* | 100.000% |
| Multi – Strategy | -6.604% | 3 | 4* | 21.245% |

**Figure [3]: The Performances of TSX and DEX (01/2003 ~ 05/2008)**

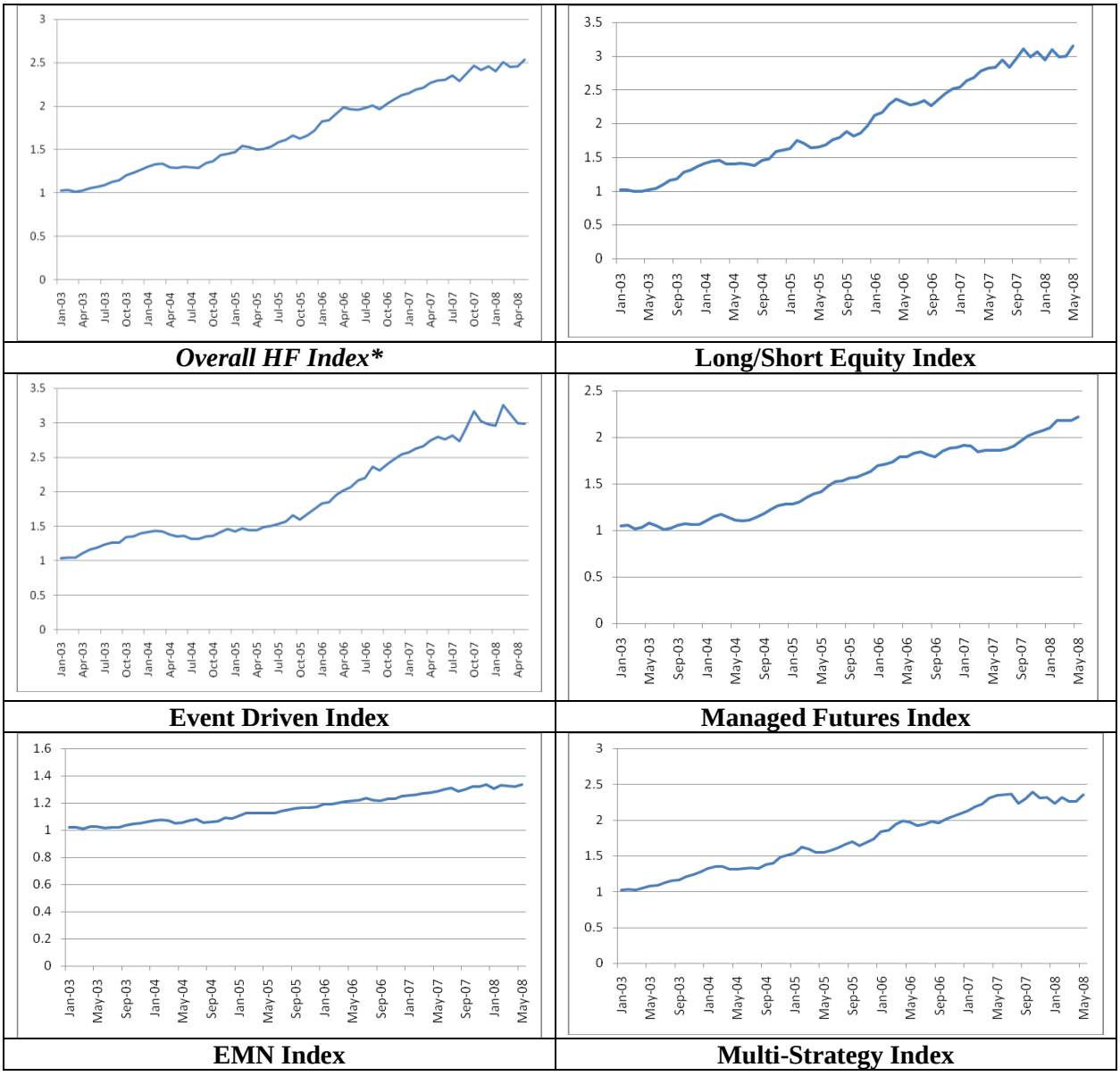



**TSX (the Equity Index)**




**DEX (the Bond Index)**

**Figure [4]: Performances of Hedge Fund Indices (01/2003 ~ 05/2008)**



## Table [7]: De-Levering to Match Fourth Moments

The complete calculation procedures are covered in the thesis. The risk-free interest rates are calculated from Canadian 3-month Treasury bill rate.

| Index | Leverage | Average Return (%) | Standard Deviation (%) | Third Moment ($\%^3$) |
|---|---|---|---|---|
| **Canada Equity and Bond Indices** | | | | |
| TSX | 0.364 | 0.634 | 1.074 | 2.931 |
| DEX | 1.000 | 0.459 | 1.007 | -0.318 |
| **Hedge Fund Indices** | | | | |
| Overall HF Index | 0.516 | 0.883 | 1.100 | 3.618 |
| Equity Long/Short | 0.348 | 0.809 | 1.104 | 3.772 |
| Managed Futures | 1.678 | 1.924 | 3.452 | 98.731 |
| Equity Market Neutral | 0.999 | *0.452* | 0.990 | 2.192 |
| Event Driven | 0.336 | 0.763 | 1.072 | 2.788 |
| Multi – Strategy | 0.422 | 0.725 | 1.025 | 2.532 |

## Table [8]: Peak to Trough Drawdown of De-Levered Portfolios (4th Moment was Equalized)

All the indices are evaluated in the time period from Jan 2003 to May 2008. The 3-month Canadian Treasury Bill are retrieved from Bank of Canada. The research based on the previous calculations which are equalized the fourth moments of all portfolios.

| | Peak to Trough Drawdown (%) | Length of Drawdown (months) | Time to Recovery (months) | Still to be Recovered (%) |
|---|---|---|---|---|
| **Equity L/S** | -2.06% | 2 | 2 | N/A |
| **Futures** | -9.96% | 3 | 4 | N/A |
| **EMN** | -2.04% | 1 | 3 | N/A |
| **Event** | -2.24% | 5 | 4 | N/A |
| **Multi** | -1.80% | 2 | 3 | N/A |
| **Overall Index** | -1.38% | 5 | 1 | N/A |
| **TSX** | -3.10% | 3 | 4 | N/A |
| **DEX** | -2.69% | 2 | 3 | N/A |

## Table [9]: De-Levering to Match Second Moments

The complete calculation procedures are covered in the thesis. The risk-free interest rate are calculated from Canadian 3-month Treasury bill rate.

| Index | Leverage | Average Return (%) | Third Moment ($\%^3$) | Fourth Moment ($\%^4$) |
|---|---|---|---|---|
| **Canada Equity and Bond Indices** | | | | |
| TSX | 0.340 | 0.610 | -0.645 | 2.754 |
| DEX | 1.000 | 0.459 | -0.318 | 3.636 |
| **Hedge Fund Indices** | | | | |
| Overall HF Index | 0.473 | 0.832 | -0.289 | 2.596 |
| Equity Long/Short | 0.318 | 0.762 | -0.201 | 2.536 |
| Managed Futures | 0.490 | 0.749 | -0.649 | 3.377 |
| Equity Market Neutral | 1.017 | 0.456 | -0.756 | 3.900 |
| Event Driven | 0.319 | 0.738 | 0.083 | 3.108 |
| Multi – Strategy | 0.415 | 0.717 | -0.664 | 3.326 |

## Table [10]: Peak to Trough Drawdown of De-Levered Portfolios (4th Moment was Equalized)

All the indices are evaluated in the time period from Jan 2003 to May 2008. The 3-month Canadian Treasury Bill are retrieved from Bank of Canada. The research based on the previous calculations which are equalized the fourth moments of all portfolios.

| | Peak to Trough Drawdown (%) | Length of Drawdown (months) | Time to Recovery (months) | Still to be Recovered (%) |
|---|---|---|---|---|
| Equity L/S | -1.23% | 1 | 4 | N/A |
| Futures | -1.50% | 2 | 2 | N/A |
| EMN | -1.43% | 5 | 2 | N/A |
| Event | -2.09% | 5 | 4 | N/A |
| Multi | -2.13% | 1 | 2 | N/A |
| Overall Index | -1.55% | 4 | 4 | N/A |
| TSX | -2.86% | 3 | 4 | N/A |
| DEX | -2.69% | 2 | 3 | N/A |

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