HEDGE FUND STRATEGIES: PERFORMANCE, RISK AND DIVERSIFICATION OPPORTUNITIES[1]

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Abstract

This study aimed at comparing the performances of distinct hedge fund strategies and assessing the diversification opportunities using hedge funds. This paper analyses the overall performance of distinct hedge fund strategies (as indices) for the period of 2001-2020. Hedge fund performances are compared using alternative risk adjusted performance metrics; first, alpha based on four asset-pricing models (CAPM, Fama-French 3 factor, Carhart and Fama-French 5 factor models); then, the Sharpe ratio. The findings of the study revealed that almost all hedge fund strategies outperform the benchmark return (MSCI World Index) and are superior in terms of risk/return measures. The alternative risk metrics used in the calculation of risk-adjusted performances did not cause a dramatic change in the rank ordering of the hedge fund strategies.

Keywords: *Hedge Funds, Alpha, Factor Models, Sharpe Ratio*

HEDGE FON STRATEJİLERİ: PERFORMANS, RİSK VE ÇEŞİTLENDİRME FIRSATLARI

Öz

Bu çalışmanın amacı farklı hedge fonu stratejilerinin performanslarını karşılaştırmak ve hedge fonları ile çeşitlendirme olasılıklarını değerlendirmektir. Bu çalışmada 2001-2020 zaman periyodunda farklı hedge fon stratejilerinin (endeks bazında) performansları analiz edilmiştir. Alternatif risk ölçütleri kullanılarak hedge fonları performansları ölçülmüştür. Bunlardan 4 varlık fiyatlama modeline (CAPM, Fama-French 3 Faktör, Carhart ve Fama-French 5 Faktör modelleri) dayanan Alpha, diğeri ise Sharpe rasyosudur. Çalışmanın bulguları, hemen hemen tüm hedge fon stratejilerinin kıyas alınan getiriden (MSCI Dünya Endeksi) daha iyi performans gösterdiğini ve risk/getiri ölçütleri açısından üstün olduğunu ortaya koymuştur. Riske göre ayarlanmış performansların hesaplanmasında kullanılan alternatif risk ölçütleri, hedge fon stratejilerinin performans sıralamasında önemli bir değişikliğe neden olmamıştır.

Anahtar Kelimeler: *Hedge Fonları, Alpha, Faktör Modelleri, Sharpe Rasyosu*

1. Introduction

The hedge fund universe has moved out of the alternative corner and went into the main stream. Hedge fund industry has experienced a tremendous boom in the last decades in terms of both the number of funds traded and total volume of assets. The hedge fund industry has been prospering since the beginning of 1990's. Even after the 2000's and the Dotcom crisis, the hedge fund industry attracted more attention from institutional investors, insurance companies, pension funds and sovereign wealth funds. The value of assets under management increased worldwide up to 2007 reaching almost $2 trillions. Following the Global Financial Crisis (GFC), numerous hedge funds closed and many investors redeemed their assets which led to a decrease in the value of assets managed by hedge funds significantly and couldn't recover until 2013. Growing up each year, the hedge fund sector reached $4 trillions in 2020 mainly compelled by performance Figure (1).

Figure1: Historical Growth Of Assets Under Management (AUM) Of Hedge Funds

Source: https://www.ft.com/content/c87d52b2-d54e-4dae-9b50-98ca1e6c1d4c
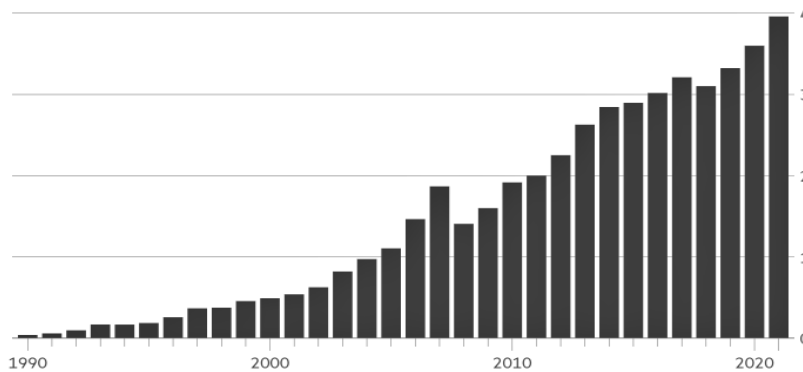
Hedge fund industry is often considered as a sophisticated part of the broad investment industry, led by hedge fund managers that target positive returns regardless of market and manage diversified portfolios with various strategies. Therefore, the hedge fund world is characterized by great differences comprising trading approaches and funds sizes (Fung and Hsieh, 1997; Liang, 1999).

The growing interest in hedge funds stems from their considerable impact on the financial world. In fact, hedge funds have managed to increase market liquidity, enhanced economic flexibility and resilience. These positive contributions came along with important challenges such as: legal and accounting issues, compensation structures, portfolio considerations, management selection as well as the important issue of performance measurement.

Hedge funds can be considered as a significant diversification tool while managing a portfolio; such that traditional portfolio performances can be improved if hedge funds are considered as a part of those portfolios (Amo, et al., 2007; Amin and Kat, 2003; Staman and Scheid, 2008). Indeed, hedge funds were developed to help diversify investment portfolios, manage the risk and achieve steady returns over time.

An investment strategy relies on the manager's experience, skills and insight (Schneeweis, 1998). In every hedge fund, the manager plays an important role setting up the rules of the game. The manager should be able to react in response to market changes and follow an investment strategy to achieve the desired returns. The strategies' approach is significant for the fund's development and therefore, it is crucial for investors (Connor and Woo, 2004).

The aim of this study is to present a thorough analysis of the most significant and important hedge fund strategies, ten main strategies under three main categories. Throughout the recent years, hedge funds have generated historically attractive returns and those returns have triggered massive capital inflows. They have also come across crisis periods and moments of economic slowdown. This paper covers the overall performance of the different hedge fund strategies over the last two decades; hence, compare it with the hedge fund global market and the global equity market, which has been benchmarked by MSCI World Index.

Hedge funds are widely renowned for their attractive superior performance in these recent times. This study also aims to figure out if hedge funds are really superior in term of performance and if there is a significant difference in performance depending on which strategy hedge fund managers adopt. The paper will further enclose the relation between hedge funds' performance and their exposure to systematic risk to see if the strategies' level of exposure affects their risk-adjusted returns.

In order to meet those aims, the performance of hedge fund strategy indices for the period of 2001-2020 are analyzed by using alternative risk adjusted performance metrics; alpha based on four asset pricing models (Capital Asset Pricing Model, Fama-French Three Factor, Carhart Four Factor and Fama-French Five Factor Models) and the Sharpe ratio

The findings of this study showed that indeed hedge fund indices outperform the benchmark and are superior in terms of performance. The higher the exposure levels the better the performance. Although, alternative risk metrics has been utilized to rank order different hedge fund strategies in terms of risk-adjusted performances, no significant change in the rank ordering of the hedge fund indices could be found. Furthermore, hedge fund strategies can provide diversification opportunities when managing a portfolio. The adoption of an investment strategy can provide diversification benefits.

The paper proceeds as follows: Section 2 defines hedge fund strategies and their performance in terms of indices. Section 3 reports Hedge fund strategies' literature review. Section 4 describes the data and the empirical framework. Section 4 reports the results of the study. The study wraps up with a conclusion in the last section.

2. Hedge Fund Strategies and Performances

Hedge funds can be defined as investment tools that provide distinct risk-return profiles in comparison to traditional bond and stock investments. Their main mission is to generate positive returns with low volatility and low correlation and to protect the capital (Ackermann, et al., 1999; Agarwal and Naik, 2000; Fung and Hsieh, 2002). For this purpose, they adopt management styles and investment strategies without fulfilling special regulatory limitations. The low barriers to entry for new managers, the appealing fee structure and the asymmetric rewarding system characterize hedge funds.

To achieve a sustainable performance, risk management is a fundamental activity for the prosperity of a hedge fund. In fact, to survive in highly volatile markets, a well-designed risk management system along with stock picking skills can offer a durable competitive advantage to fund managers. The different risks related to the strategies implemented by hedge funds are more complicated to those associated with traditional investments. There are essentially three types of risks: Market risk, Credit risk and Liquidity risk. These three risk types make different impacts depending upon the investment strategy adopted by the hedge fund (Bali, et al., 2012).

There is no single classification for hedge fund strategies; however, they can be classified into categories of strategies sharing some aspects (Connor and Woo, 2004). The main strategies for hedge funds are (1) Relative value, (2) Event Driven and (3) Directional strategies.

The main hedge fund strategies, including sub-strategies, will be explained and their historical performances will be portrayed in the following section. The hedge fund monthly historical returns will be illustrated by the use of data from Eurekahedge and Credit Suisse for the study period in the figures below.

2.1. Relative Value Strategies

Relative value strategies are arbitrage based strategies that are that seeking profit generating differentiation between two securities (Eurekahedge, 2020). Relative value strategies include: Convertible Arbitrage, Fixed Income Arbitrage and Market Neutral strategies.

Convertible arbitrage is a relative value strategy, which focuses on the profit generated between securities rather than market movements (Credit Suisse, 2020). Still, market fluctuations affect this strategy and credit risk is involved in case of credit spreads widening. Interest rate exposure can also have an impact on this market-uncorrelated strategy. As can be seen from Figure 2, (for the Figures 2 to 12, horizontal axis presents years and vertical axis presents monthly return) in the period of the global financial crisis, the corporate bond market was essentially broken. Credit spreads on corporate bonds experienced sudden widening causing big losses for similar strategies. A flight to safety movement emerged with the instability of financial markets and the plummet of share prices resulting in a weakened liquidity.

Figure 2: Historical Performance of Convertible Arbitrage Index
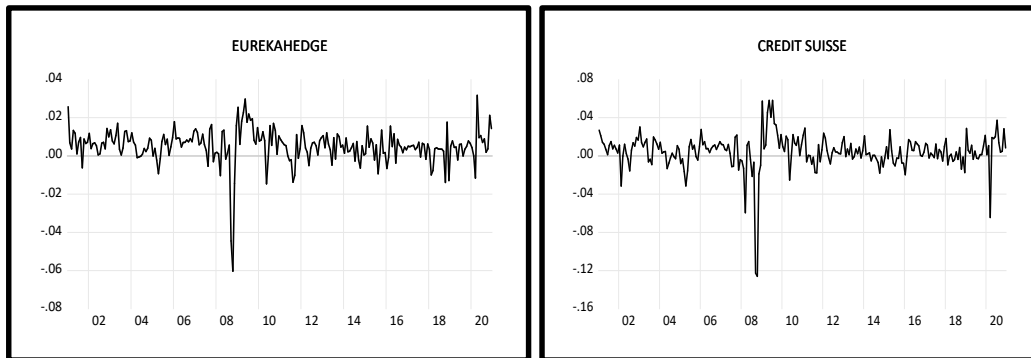
The strategy was touched during this period of decline with a drawdown[4] in November 2008 of (-11.49%) for Eurekahedge and (-32.87%) for Credit Suisse. Other drawdowns to mention were in September 2011 (-2,83%) for Eureka hedge triggered by the credit spread widening caused by the European debt crisis and in March 2020 (-6.43%) for credit Suisse resulting from the credit spread widening caused by the pandemic related recession.

Fixed Income is another relative value strategy where interest rate risk is neutralized. It can however be impacted by credit risk and face the challenge of

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[4] The drawdown refers to the maximum fall in value of a hedge fund strategy calculated through the difference between the value of the lowest through and the value of the highest before the peak. A largest drawdown can imply a financial market circumstance that affected the hedge fund strategy's value and caused its volatility in the past. As, the figures in the text portrays the monthly hedge fund performances, they are unable to present the largest drawdowns.

credit spread widening (Eurekahedge, 2020), which has been experienced by the negative returns generated by these strategies for 2008 GFC and 2020 Covid-19 lockdown (see Figure 3). During the GFC of 2008, such strategies faced with a drawdown of (-12.01%) for Eureka hedge and (-29,01%) for Credit Suisse, as investors came across challenges like increased volatility in their equity portfolios and reduced fixed income yields. The second largest drawdown came in 2020, the early days of the Covid-19 lockdown that brought about an analogous flight to quality and a significant credit spreads widening (-9.41%) for Eureka hedge and (-6.51%) for Credit Suisse.

Market Neutral strategy is characterized by holding a market neutral portfolio which performance is not related to market movements by taking neutral position between long and short investments. The strategy aims to maintain market risk and generate absolute returns (Credit Suisse, 2020). There is no guarantee that the strategy will work as expected, as it depends on the methods and the assets. As presented by Figure 4, these strategies under both Eureka hedge and Credit Suisse negative returns during the GFC of 2008. For Eureka hedge, the strategy's index registered a minimal drawdown in March 2020 (-0.054%) and in September 2008 (-0.042%). On the other hand, for Credit Suisse, the crucial periods that affected the market during this period hit hard its performance recording the largest drawdowns of (-45.10%) in February 2009 and (-35.06%) in March 2020.
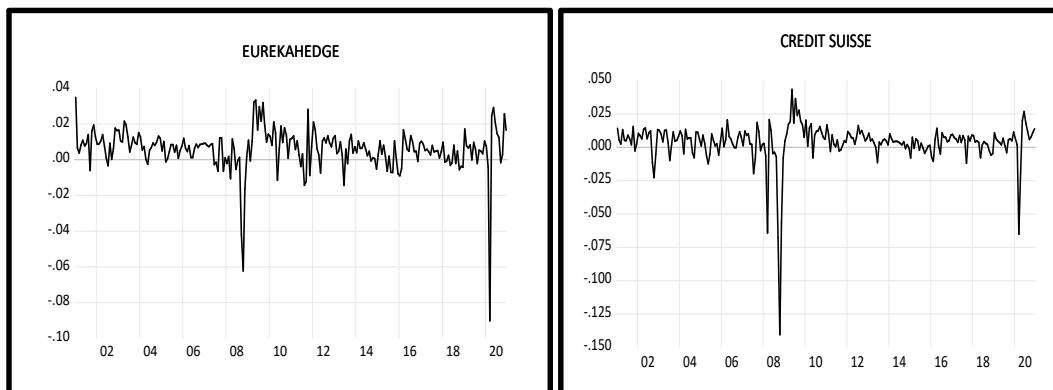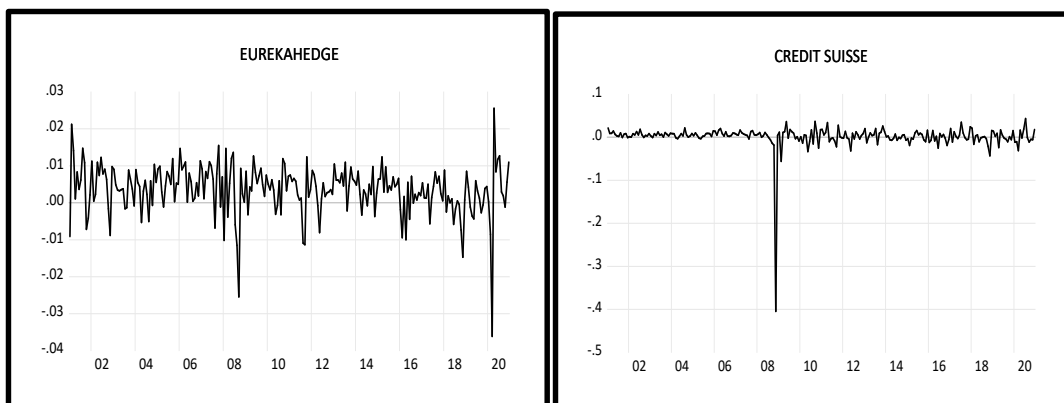
Figure 3: Historical Performance Of Fixed Income Index

**Figure 4: Historical Performance of Market Neutral Index**

2.2. Event Driven Strategies

Event driven strategies look for opportunities emerging throughout a company's life cycle, caused by extraordinary corporate circumstances, like mergers, business combinations, acquisition, liquidation and restructuring (CISDM, 2020). The performance for this strategy doesn't rely on market movement. Nevertheless, weakened equity markets bring about failures that affect the strategy's performance. Among these strategies, there are Event Driven, Distressed Debt and Multi-strategy.

During the studied period, as shown in Figure 5, for both data bases the GFC of 2008 and Covid-19 lockdown had a great impact on the strategy's' performances. Event Driven strategy's index has faced the largest drawdown in February 2009 (-19.15%) for Eureka hedge and in November 2008 (-23.23%) for credit Suisse. This decline was a result of the financial crisis when equity markets went down associated with a widening of credit spreads and a flight to safety.

**Figure 5: Historical Performance of Event Driven Index**
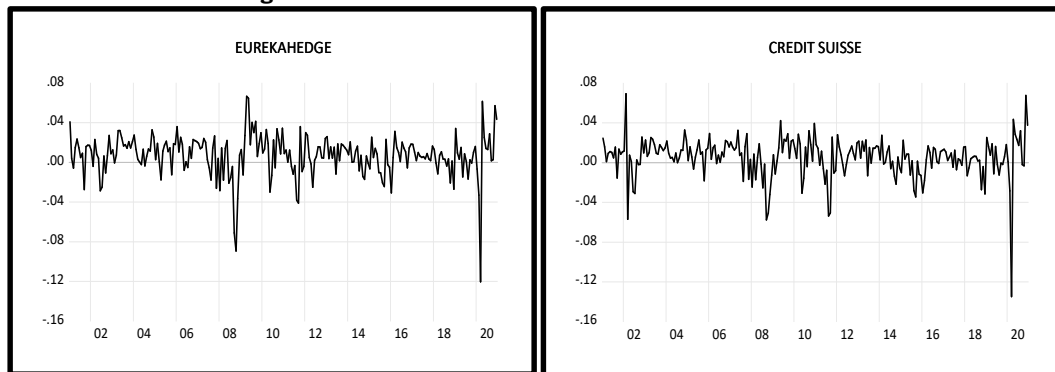
The second drawdown occurred in March 2020 (-15.92%) for Eurekahedge and (-15.51%) for credit Suisse in the aftermath of the virus-related recession. The third drawdown took place in February 2016 for Eureka hedge (-14.31%) and in January 2016 (-7,89%) for Credit Suisse when per-barrel oil prices fell into the low and the average prices of energy bonds dropped close to their bankruptcy recovery values resulting in wide credit spreads.

Distressed Debt strategy is associated to distressed securities such a bonds, share, financial loans or trade receivables of companies facing; emerging; or on the verge of financial distress (Credit Suisse, 2020). The important factor reflecting the performance of this strategy is the presence of distressed paper, which relies on the evolution of credit spreads and on the economic style.

Figure 6 portrays the historical performance of Distressed Debt indexes. Like the preceding indexes, the GFC of 2008 and Covid-19 lockdown had great impact on performance, moreover there have been three important drawdowns in the studied period between 2001 and 2020. The first one happened in February 2009 (-28.24%) for Eurekahedge and (-22.45%) for credit Suisse as a result of the flight to safety trend as numerous investors fled mortgage-backed securities ahead of the housing crisis as well as the evolution of credit spreads that occurred during this financial crisis. The second drawdown was in March 2020 (-9.72%) for Eurekahedge and (-13,32%) for credit Suisse as an aftermath of the pandemic that impacted credit spreads evolution and created a flight to safety among investors. The third drawdown took place in 2016 (-9,68%) for Eurekahedge and (-11.03%) for credit Suisse indices following the evolution of credit spreads triggered by the dropping of the average price of energy bonds.

Figure 6: Historical Performance of Distressed Debt Index
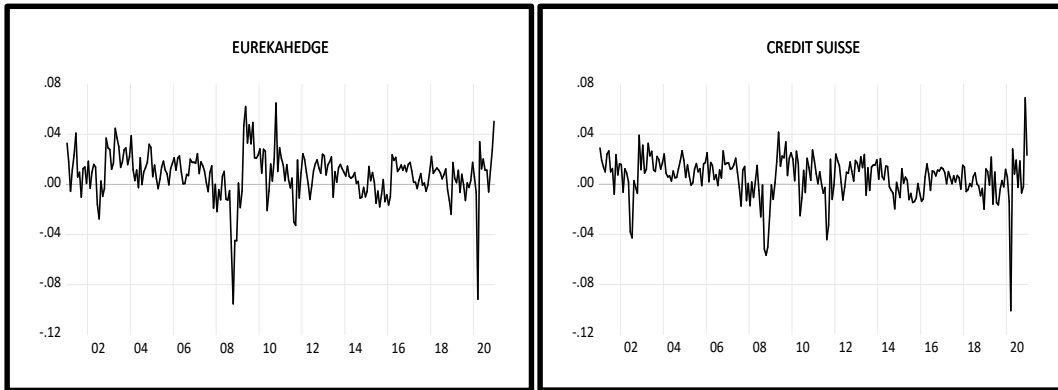
Multi-strategy includes often more than a single strategy especially from the event driven strategies' family (Credit Suisse, 2020). The manager chooses to allocate the capital among the single strategies, it is categorized as an event driven strategy since it lacks of investment directionality. Figure 7 presents the historical performance of hedge funds following Multi-strategy.

Figure 7: Historical Performance of Multi-Strategy Index
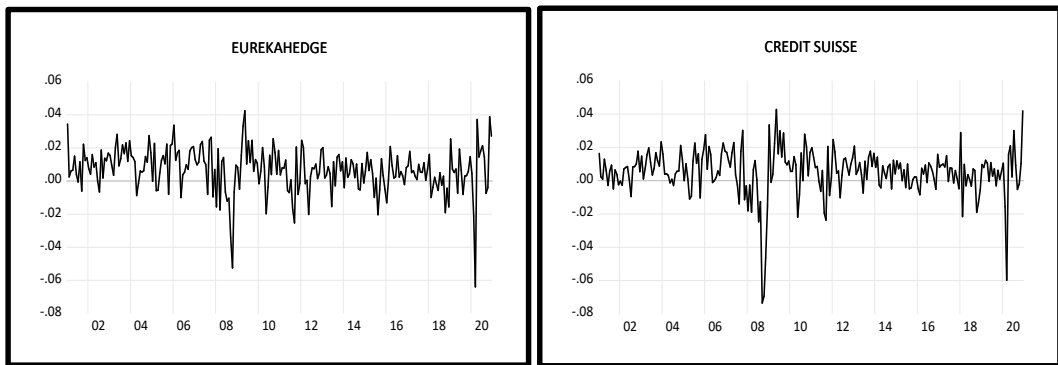
The Strategy's historical performance recorded a drawdown during the financial crisis in February 2009 (-11.71%); (-45.10%). The second one occurred in March 2020 (-8.36%) for Eurekahedge coinciding with the early days of Coronavirus and in September 2011 (39.43%) for Credit Suisse reflecting the impacts of the European debt crisis.

2.3. Directional strategies

Directional strategies aim to seek advantage from major market trends in place of drawing their attention to analysis on single stocks (Hübner et al.,2011). Managed futures, Global Macro, Long/Short Equity and Emerging Markets strategies are considered a part of this category (Eurekahedge, 2020).

In the case of the Global Macro strategy, managers try to predict price changes on capital markets by analyzing the global economic, financial and political conditions, hence set up directional portfolio positions (Credit Suisse, 2020). In addition to that, they study capital markets and the risk-return prospects of investments. Rather than hedging market risks, following their perceptions, they hold directional positions to generate profit from financial markets directions. The strategy depends on managers' skills and experience.

Although, it is not clear from fund performances' under Eurekahedge shown in Figure 8, the funds covered by Credit Suisse obviously presented negative returns for crises periods. Eurekahedge's index performance has encountered

drawdowns associated with events happening in the financial markets. The first drawdown took place in December 2018 (-4.31%) for Eureka hedge index as an aftermath of the market's big decline and the raise of volatility triggered by the announcement of interest rate rise by the Federal Reserve, America's trade war with China and uncertainty in government policies. Followed by a second drawdown in October 2008 (-3.95%). For Credit Suisse index, the largest drawdown occurred in October 2008 (-14.94%) in the light of the financial crisis, the second in March 2020 (-8.09%) resulting from the virus associated market turmoil and the third one in 2016 (-6.26%) after the drop of oil price.

Figure 8: Historical Performance of Global Macro Index
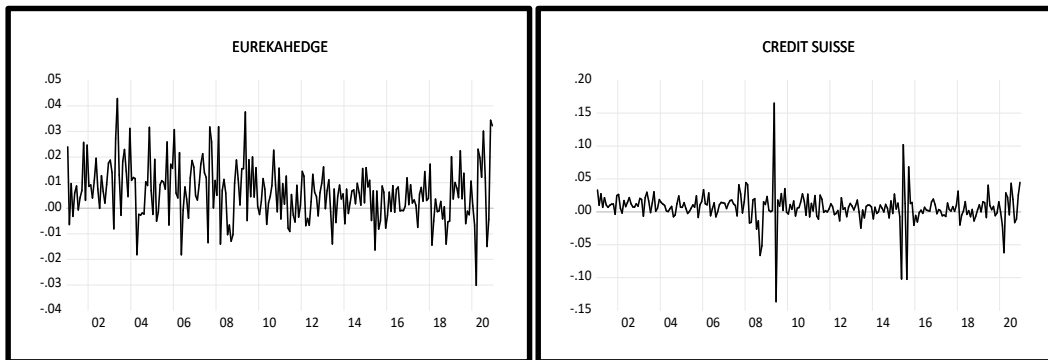
Managed Futures strategy is adopted by managers trading listed derivatives, equity indices, interest rates, treasuries, commodities and precious metals all over the world. Fund managers employ computerized models that effectuate trading decisions automatically. They can periodically readjust the parameters of the trading model. Managed futures strategy can hold a limited or a diversified position on future markets (Credit Suisse, 2020).

As the managed futures strategies are adopting their strategies by the use of computerized models, huge fluctuations could be experienced in funds' returns. Figure 9 presents such fluctuations for both data bases. For Eurekahedge, managed futures index recorded the largest drawdown in August 2004 (-6.29%). This year was a poor year for this strategy as a consequence of the trend reversals that occurred in all the sectors followed by sideways markets since it is hard for markets to stay trendless due to many factors that increase volatility and create trends. On the other side, credit Suisse's managed futures strategy confronted a trend reversal in January 2019 with a large drawdown of (-18.62%). Managed futures strategy withstood the main impactful financial events that interfered with the other strategies.

Figure 9: Historical Performance of Managed Futures Index
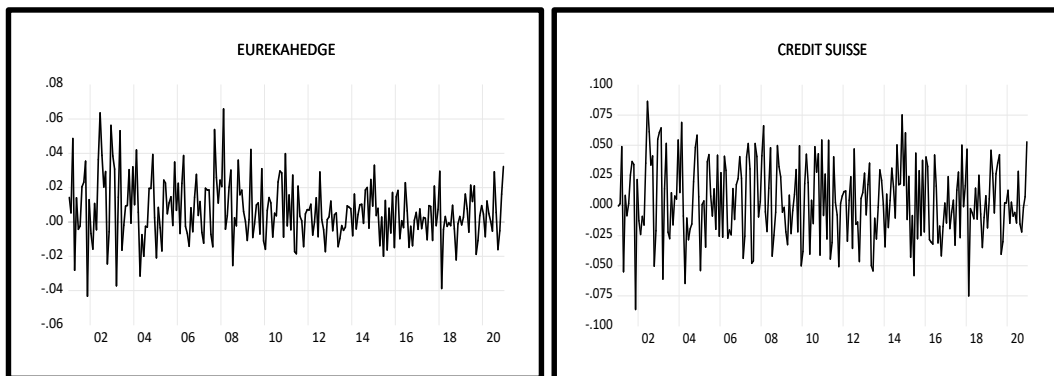
Long short equity is a directional strategy, which is considered as correlated to financial markets. Long short equity strategy is when the manager takes a long position on a stock he perceives as being underpriced by the market and short sells stock he feels as being overprices (Credit Suisse, 2020). This strategy shows positive correlation to the performance of the reference equity markets.

Figure 10 shows the performance of Long/Short Equity strategies during 2001-2020. When equity markets confronted crisis periods, it was reflected on the strategy's historical performance. There was a big drawdown in February 2009 (-21.79%) for Eureka hedge index and (-22%) for Credit Suisse database. The second drawdown was registered in November 2008 (-21.19%) and (-21.63%) for the two indexes respectively. These drawdowns were obviously triggered by the financial crisis that the world has faced (2007-2009). When financial markets are volatile, there is often a flight to quality in investment allocations. People shift their money into gold or less risky investments. Another event has affected this strategy's performance during 2011 with a (-10.44%) and a (-12.64%) drawdowns for both indices when major equity indices fluctuated widely following the news of the European sovereign debt crisis. The strategy registered another significant drawdown in March 2020 (-11.56%) and (-11,17%) as investors around the world took part in a flight to cash and liquidity during a sudden economic shutdown triggered by an unprecedented sanitary crisis (COVID-19). Investors have encountered increased volatility in their equity portfolios.

Figure 10: Historical Performance of Long Short Equity Index
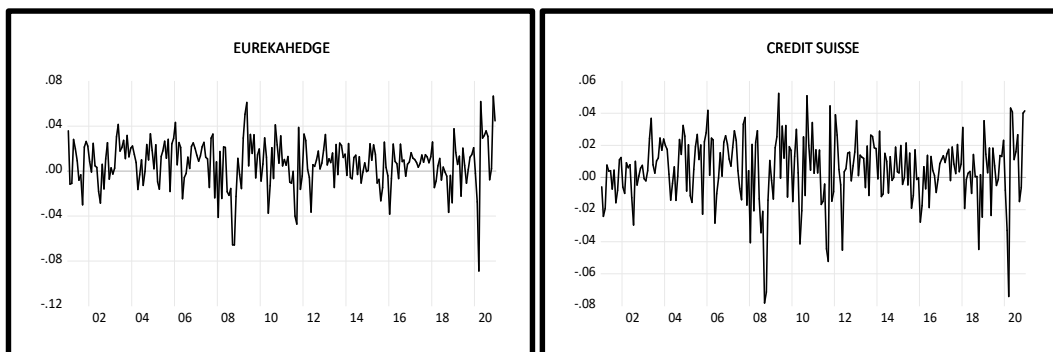
Emerging markets strategy takes directional positions on a large range of financial instruments to anticipate trends. Managers anticipate the macro-economic changes intervening on emerging markets (Credit Suisse, 2020). As, these markets are characterized by their strong volatility, the funds' performances are also volatile (see Figure 11). Throughout the years, the strategy's performance has known drawdowns in result to the extreme financial circumstances the world has faced. In November 2008, the emerging markets index has recorded its maximum drawdown (-25.16%) for Eurekahedge and Credit Suisse index recorded its second largest drawdown (-30.95%) after February 2009 (-32.34%) following the financial crisis. There is no doubt that the industry was greatly affected by the financial market fallout. Another meaningful drawdown came in September 2011 (-10,48%) for both databases when the sector was affected by negative insight of performance fees. The third major drawdown was a result of the coronavirus related recession (-10,09%) for Eureka hedge and (-11,95%) for Credit Suisse.

Figure11: Historical Performance of Emerging Markets Index
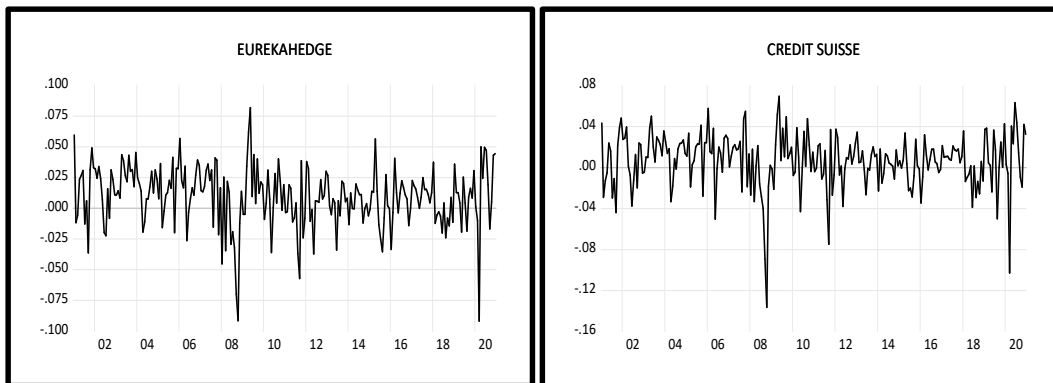
2.4. MSCI World Index Historical Performance

Morgan Stanley Capital International Index displays international performance across numerous countries and regions focusing on distinct geographic zones and stock types like small, mid and large capitalizations. As presented in Figure 12, recent crises for the last two decades affected performances of the world equity markets.

There have been three important drawdowns of MSCI World index in the studied period between 2001 and 2020. The first one happened in February 2009 (-55.36%) when equity markets went down as a result of the flight to safety trend as many investors fled mortgage-backed securities ahead of the housing crisis as well as the evolution of credit spreads that happened during this financial crisis. A second drawdown took place in June 2010 (-38,10%) triggered by the credit spread widening reflecting the aftermaths of the European debt crisis. Another noticeable drawdown to mention was in March 2020 (-21.44%) as an aftermath of the pandemic that triggered credit spreads evolution and created a flight to safety among investors as a result of the coronavirus crisis.

Figure 12: Historical Performance of MSCI World Index
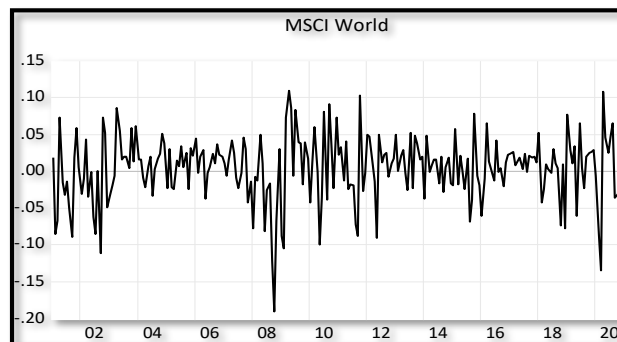
3. Hedge Fund Performance: Literature Review

The history of hedge fund investments goes back to the 1940's. Throughout the years, the popularity and the size of this market segment have grown significantly. Unlike other classical investments, their purpose is to generate absolute returns, which implies creating positive returns in spite of the market movement (Ackermann et al. 1999; Agarwal and Naik, 2000). Hedge fund managers are dealing with large amounts of money using complicated investment strategies

to produce absolute returns in uncertain markets (Amenc, 2002; Naik, 2007). The problematic is that there is yet little information about how they really perform.

Research within the industry of hedge funds has grown along its popularity. Still, the existing researches mostly studied dissimilarities between hedge funds and mutual funs' risk-adjusted performance. Brown (1999), Capocci and Hübner (2004) studied the risk adjusted performance differences between hedge funds and mutual funds, and tried to figure out their return generation continuity. They concluded that hedge funds steadily surpass mutual funds, mostly because hedge funds are more flexible in their investment strategies. As stated by Kosowski et al. (2007), hedge fund performance was proved to persist at annual horizons and it is not by pure luck. Other studies examined hedge funds performance persistence with some other benchmark indexes such as S&P500; Ackermann et al. (1999), Brown et al. (1999), Capocci and Hübner (2004) and Liang (1999), they came with the result that hedge funds perform better than traditional benchmark indices.

On the other hand, Çağıl and Hosseini (2011) documented that Turkish hedge funds are unable to beat the benchmark ISE-100 index and mutual funds.

Although hedge funds have received increased academic attention, there are few studies on how hedge fund strategies perform and few comparative researches of these strategies. The number of literature on hedge fund strategies is limited. This is partly because of the limited access to individual funds data.

Fung and Hsieh (2011) examined long/short strategies and found out that more than %80 of such strategies were unable to achieve positive alphas. Capocci and Hubner (2004) studied hedge funds' investment behavior using Hedge Fund Research database from 1984 to 2000 and applying diverse asset pricing models. The results demonstrated that almost 25% of individual hedge funds produced meaningful excess returns. The majority of them choose to invest in emerging markets and small stocks. Schaub and Schmid (2013) analyzed hedge fund performance during the global financial crisis and the results showed that hedge funds were not capable of effectively managing illiquid portfolios. In the same direction Stoforos et al. (2016) argued that hedge funds could not achieve superior returns over passive investments in the period of crisis. Nikola and Vijay (2019) studied hedge fund strategies performance for the period (2007-2017) and demonstrated that hedge fund strategies are able to outperform the market especially in critical periods and they found Global Macro, Multi-strategy and Emerging Markets to be the best performing strategies.

Hedge fund managers are given the discretionary power and large flexibility to deal with assets using a variety of strategies. Jagannathan, et al. (2010) asserted that hedge fund persistent performance stems from top performers more than bottom performers underlying the importance of managerial talent. In strong market conditions, skilled managers generate higher alpha than low skill managers with their superior asset selection capability. In the same direction, Titman and Tiu (2011) state that skilled managers hedge away systematic risk exposure and therefore show low R^2 in multifactor regressions.

The risks inherent of the hedge funds strategies are manifold. The risk classes provoke different effects based on the investment strategy followed by the hedge fund. Bali, et al. (2012) argued that distressed securities funds can be exposed to default and liquidity risks; emerging countries can encounter country risk; long/short equity funds may face an exposure to the short-squeeze risk by their brokers and fixed income arbitrage funds can be affected by credit spread widening. They assumed that hedge funds with higher exposure to systematic risk deliver better risk-adjusted performance. Bali, et al. (2011) also demonstrated that relative value strategies had lower discrepancies and spread in their exposures (beta

factors) than directional strategies. Using asset-pricing models, Agarwal and Naik (2004) revealed that hedge funds exhibit significant exposures to Fama and French (1993) three-factor model and Carhart (1997) momentum factor.

The fact that hedge fund returns can be uncorrelated to the performance of capital markets can raise question about their diversification opportunities. Asness, et al. (2001) advanced that there are diversification benefits from incorporating hedge funds to a portfolio of stocks and bonds, because hedge fund managers mix long and short positions, and by that they isolate security selection from the performance of the underlying asset. Amin and Kat (2003) made use of Sharpe ratios and figured out that hedge funds are efficient when they are used as components of portfolios due to their un-correlation to the markets. On other side, Sun, et al. (2012) argued that hedge fund managers who employ single investment strategies provide higher performance. Also, Kamışlı (2020) documented that Turkish hedge funds have an asymmetric causality with exchange rate, bond index and gold index returns.

4. Comparative Analysis of Hedge Fund Strategies' Performance

The aim of this study is to present a thorough comparative analysis of the most significant and important hedge fund strategies and to reveal the long-term relationship between them. Different asset pricing models and Shape ratio will be used to measure the performance of the different strategies.

4.1. Data and Descriptive Statistics

In order to cover the general performance of hedge funds and compare hedge fund strategies, the research adopts a time-series and a comparative research method. Hedge fund strategies' indices values are collected and then analyzed for the period of January 2001 to December 2020, which gives a large sample of returns and prices over a long time span.

Two databases are being used to resolve potential divergence among different databases and to produce a comprehensive sample that is illustrative of the hedge fund industry. Eurekahedge and Credit Suisse databases are used; which are one of the most comprehensive on the market.

The Eurekahedge Global Hedge Fund Database is Eurekahedge's main database with 25,877 hedge funds as of 2020 with 11563 active hedge funds including Funds of funds (FOF) that are excluded in this study. The database contains several regional and specialized hedge funds including Asia (AHF), Emerging Markets (EMHF), Frontier Markets (FMHF), Latin America (LAHF), Insurance-Linked Securities (ILS), Commodity Trading Advisors and Managed Futures (CTA), Long Only Absolute Return Funds (LOARF), Obsolete Funds (OHF) and several others (Eurekahedge, 2020).

Eurekahedge incorporates 2530 funds in its index measuring only the largest funds which cut out a large number of funds tracked by the database. To be included in their index, funds should be operating for at least a year and should have $50 millions AUM. Moreover, funds that have a distinct share class or are the same but in a different currency are eliminated (Eurekahedge, 2020).

The Credit Suisse Hedge Fund Database composed of nearly 9,000 funds and considers the funds with a minimum of US$50 million value. Credit Suisse includes 284 funds in its index culled from a database of about 9000 funds. It takes in only funds that have a minimum investment of $50 millions and, audited financial statements and a one-year track record then gets rid of duplicate funds. Furthermore, Credit Suisse database applies a rules-based methodology to

decrease subjectivity in the picking process and to bring off maximum representation of the index world (Credit Suisse, 2020).

The number of funds possibly present in both databases is usually very small because databases tend to have different clients and only a very small number is reporting to more than one database.

Table 1 shows the number of individual hedge funds in each of Eurekahedge and Credit Suisse strategies indices. There are 10 strategy indices in total. The Eurekahedge Hedge Fund Index and the Credit Suisse Hedge Fund Index, which are the main indices, contain of all the funds in this table.

Table1: Number of Funds in Hedge Fund Strategies Indices

	Eurekahedge	Credit Suisse
Convertible Arbitrage	900	70
Fixed Income	78	11
Market Neutral	181	23
Event Driven	358	34
Distressed Debt	19	9
Multi-Strategy	110	31
Global Macro	310	26
Managed Futures	242	20
Long/Short Equity	54	16
Emerging Markets	278	44
TOTAL Funds	2 530	284

Benchmarking with an index is coherent when the index is representative, rule-based, fully investable, transparent, diversified, timely reported and liquid (Filippo Stefanini 2006). In this study, Morgan Stanley Capital International (MSCI) World index that represent international equity markets is selected as benchmark to hedge fund strategies performance.

The variables to be used in the factor models have been downloaded from Kenneth French Data Library from Tuch School of Business. Tables 2-3 report the descriptive statistics of the indices' returns for Eurekahedge and Credit Suisse over the period time.

As shown in Table 2, all the means or the average rate of returns of the Eurekahedge global hedge fund and the hedge fund strategies except Market neutral strategy exceed the benchmark MSCI World index, while having less volatility measured by standard deviation. It is evident that hedge fund strategies have a better risk/return profiles comparing to the MSCI World index. Among the various hedge fund strategies, Emerging Markets strategy has the highest mean and also the highest standard deviation. It's the most volatile strategy followed by Long/short Equity and Event Driven strategies. Relative Value Strategies Market Neutral and Convertible Arbitrage have the lowest volatilities among all. Convertible Arbitrage and Global Macro have the best risk/return ratios. In a normal distribution, the kurtosis equals three. An investment with a higher kurtosis will manifest a distribution with fat tails both in the negative and positive ends. For Eurekahedge indices, Relative Value and Event Driven strategies are leptokurtic, which implies extreme fluctuations because of the fat tails. On the other hand, Directional strategies are platykurtic (Kurtosis less than 3) underpinning small fluctuations. Most of hedge fund strategies indices are negatively skewed which can

imply a higher probability of extreme negative returns. The tail of a distribution with negative skewness tends to spread out towards the left. The Managed Futures and Global Macro strategies are the only strategies with positive skewness, making it desirable amongst investors. The normality of the returns data is tested using a Jarque-Bera normality test (1987), which indicates that the hedge fund indices are not normally distributed.

Table 2: Descriptive Statistics of Hedge Fund Strategy Indices for Eurekahedge and MSCI World Index

Indices	Mean	Median	Sd	Skewness	Kurtosis	Jacues-Bera	Largest Drawdown
Eurekahegde Hedge Fund Index	0.0065	0.0075	0.0143	-0,6487	2,9144	27.6881	-12.26%
Relative Value Strategies							
Convertible Arbitrage	0.0052	0.0057	0.0090	-2.1809	14.785	1073.96	-11.49%
Fixed Income	0.0059	0.0071	0.0117	-3.1430	23.051	621.101	-12.01%
Market Neutral	0.0035	0.0043	0.0066	-1.3207	6.3730	93.0463	-0.054%
Event Driven Strategies							
Event Driven	0.0070	0.0090	0.0208	-1.4972	7.7939	112.327	-19.15%
Distressed Debt	0.0080	0.0098	0.0187	-1.3154	7.0626	174.520	-28-24%
Multi-Strategy	0.0067	0.0072	0.0133	-1.0438	4.2782	56.1935	-11.71%
Directional Strategies							
Global Macro	0.0061	0.0060	0.0109	0.3271	0.7273	10.5445	-4.31%
Managed Futures	0.0064	0.0047	0.0177	0.4542	0.7688	24.7198	-6.29%
Long/Short Equity	0.0068	0.0085	0.0209	-0.7497	2.3655	26.1489	-21.79%
Emerging Markets	0.0098	0.0110	0.0241	-0.7566	2.2628	42.5417	-25.16%
Benchmark							
MSCI World	0.0043	0.0104	0.0450	-0.6552	1.6414	36.1315	-55.36%

Descriptive statistics for Credit Suisse is given in Table 3. Credit Suisse global hedge fund index and the hedge fund strategies' indices, apart from Market Neutral, Fixed Income and Managed Futures, register a higher rate of returns than the benchmark and have lower standard deviations. Convertible Arbitrage provides the same average return as the market benchmark. We can say that hedge fund strategies are less volatile than the MSCI proxy. Among hedge fund strategies, Managed Futures, Emerging Markets and Market Neutral have the highest volatility and while Global Macro and Emerging Markets have the best mean, Market Neutral have the worst rate of return. With that, we can say that Market Neutral have the least favorable risk ratio among the strategies. Multi-strategy and Distressed Debt strategy have the best risk/return ratios. All hedge fund strategies are leptokurtic (kurtosis more than three) except Managed Futures and Long Short Equity strategies implying small fluctuations in comparison to the other strategies. All hedge fund strategies indices are negatively skewed suggesting the probability of extreme negative returns. Jacque-bera's critical value is exceeded for most of the hedge funds indices except from Managed Futures. It is the only strategy with a normal distribution. To examine the degree to which hedge fund strategies move in relation to each other. Tables 4-5 display correlation matrix between the different strategies for the selected timespan.

Table 3: Descriptive Statistics of Hedge Fund Strategy Indices for Credit Suisse and MSCI World Index

Indices	Mean	Median	Sd	Skewness	Kurtosis	Jacues-Bera	Largest Drawdown
Credit Suisse Hedge Fund Index	0.0045	0.0059	0.0151	-1.4089	5.3636	151.919	-19.67%
Relative Value Strategies							
Convertible Arbitrage	0.0043	0.0052	0.0188	-2.6961	18.474	1753.75	-32.87%
Fixed Income	0.0037	0.0052	0.0152	-4.8268	37.801	7242.92	-29.01%
Market Neutral	0.0014	0.0040	0.0290	-11.493	159.97	62189.4	-45.10%
Event Driven Strategies							
Event Driven	0.0051	0.0052	0.0200	-1.7975	10.529	30.877	-23.23%
Distressed Debt	0.0055	0.0083	0.0170	-1.5608	7.7694	58.1198	-22.45%
Multi-Strategy	0.0052	0.0064	0.0140	-1.8517	8.790	501.314	-45.10%
Directional Strategies							
Global Macro	0.0066	0.0071	0.0236	-0.3425	17.588	1170.79	-14.94%
Managed Futures	0.0037	0.0025	0.0320	-0.0135	-0.514	2.9262	-18.62%
Long/Short Equity	0.0048	0.0056	0.0205	-0.8497	2.0511	41.60	-22%
Emerging Markets	0.0066	0.0098	0.0263	-1.2541	4.5563	151.919	-32.34%
Benchmark							
MSCI World	0.0043	0.0104	0.0450	-0.6552	1.6414	36.1315	-55.36%

Table 4 and 5 reveals that Managed Futures strategy has a low correlation with all the other strategies for Eurekahedge and Credit Suisse. The Managed Futures have the lowest correlation to the MSCI index followed by Market Neutral and Global Macro strategies for Eurekahedge. For Credit Suisse, it portrays a negative correlation with the MSCI index. Market Neutral and Global Macro strategies have the lower correlation to the benchmark.

Table 4: Correlation Matrix of Hedge Fund Strategies for Eurekahedge and MSCI Word Index

	1	2	3	4	5	6	7	8	9	10	11	12
1	1											
2	0.8182	1										
3	0.8862	0.9623	1									
4	0.6825	0.7794	0.7687	1								
5	0.5390	0.8320	0.7069	0.5392	1							
6	0.0324	0.3992	0.1694	0.1330	0.6358	1						
7	0.6630	0.7692	0.7664	0.7239	0.4889	0.0535	1					
8	0.8293	0.9151	0.9358	0.8208	0.6167	0.0921	0.8688	1				
9	0.7056	0.8149	0.7976	0.7864	0.5883	0.0653	0.8454	0.8847	1			
10	0.7969	0.9690	0.9351	0.7932	0.8011	0.3149	0.7806	0.9108	0.8487	1		
11	0.3029	0.5712	0.5326	0.4093	0.4719	0.2915	0.4365	0.5053	0.4802	0.5624	1	
12	0.7735	0.8969	0.9145	0.7278	0.7121	0.1445	0.7369	0.8525	0.7987	0.9249	0.4563	1

Note: 1-MSCI World; 2-Eurekahedge Hedge Fund Index; 3-Long/Short Equity; 4-Convertible Arbitrage; 5-Global Macro; 6-Managed Futures; 7-Distressed Debt; 8-Event Driven; 9-Fixed Income; 10-Multi-Strategy; 11-Market Neutral; 12-Emerging Markets

Managed Futures have showed a low correlation with other investment strategies. When there are trends to be followed on the futures market, the strategy performs well. In the adverse scenario, when the market moves sideways, there are wrong signals and the mathematical models will change among buy and sell decisions when prices find no direction. Volatility can be a conflicting plot for this strategy.

With a negative or a low correlation to traditional assets, hedge fund strategies can possibly offer diversification benefits in a portfolio along with traditional assets.

Table 5: Correlation Matrix of Hedge Fund Strategies for Credit Suisse and MSCI World Index

	1	2	3	4	5	6	7	8	9	10	11	12
1	1											
2	0.7617	1										
3	0.8483	0.9097	1									
4	0.5390	0.7273	0.6286	1								
5	0.3024	0.5053	0.4000	0.3525	1							
6	-0.0090	0.2958	0.1989	0.0051	0.3105	1						
7	0.6748	0.8176	0.7394	0.6788	0.3474	0.0227	1					
8	0.6899	0.8350	0.7843	0.6287	0.3756	0.0708	0.8793	1				
9	0.4735	0.6695	0.5251	0.7946	0.3406	0.0054	0.6076	0.5557	1			
10	0.6691	0.9083	0.8209	0.8009	0.4326	0.1824	0.7662	0.7575	0.7189	1		
11	0.2812	0.3963	0.2713	0.2273	0.1158	0.0009	0.3524	0.2839	0.3617	0.4293	1	
12	0.7660	0.8343	0.8163	0.6506	0.4320	0.0780	0.7126	0.7133	0.5866	0.7401	0.2629	1

Note: 1-MSCI World; 2-Credit Suisse Hedge Fund Index; 3-Long/Short Equity; 4-Convertible Arbitrage; 5-Global Macro; 6-Managed Futures; 7-Distressed Debt; 8-Event Driven; 9-Fixed Income; 10-Multi-Strategy; 11-Market Neutral; 12-Emerging Markets

Although, average returns reveal the different hedge fund strategies performances for a period of time, such returns are not sufficient enough to compare the performances of the different strategies. In order to compare the performances of different strategies, one need to consider the risk exposure of each strategy. In order to compare the performance of hedge fund strategies, asset pricing based measures as risk adjusted performance, and standard Sharpe ratio, as risk-adjusted returns, have been utilized.

4.2. Methodology

In order to compare the performances of distinct hedge fund strategies performances and the benchmark, two measures have been utilized. One of the measure is Alpha, and the other is the Sharpe Ratio.

Alpha is a risk-adjusted measure of active return on investment; it demonstrates how an investment has performed taking the risk involved. A positive alpha is a proxy for superior performance in relation to the factor returns. It is firmly ingrained in the prevalent investment lexicon as an important measure of performance; investors and fund managers are all looking for a positive and a significant alpha (Fung et al., 2008).

Alpha can be calculated by the use of several asset pricing models. Among these models the Capital Asset Pricing Model (CAPM), Fama-French Three Factor Model (FF-3), Carhart Four Factor Model (Carhart 4) and Fama-French Five Factor Model (FF-5) are the most common models used in the literature, and all of them are utilized in this study to measure the alpha. [5]

CAPM defines the relation between systematic risk and expected returns for assets, especially, stocks. It is mainly used in finance to price risky securities and generate expected returns for assets given their risk (Litner, 1965; Perold, 2004)

$$R_{it} - R_{ft} = \alpha_{it} + \beta_i (R_{Mt} - R_{ft}) \tag{1}$$

---

[5] The variables used in factor models is downloaded from Kenneth French Data Library from Tuch School of Business. Further information about the data and variables refer: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Where, R_{it} is total return of a fund i at time t; R_{ft} is risk free rate of return (one-month US T-Bills) at time t; R_{Mt} is market portfolio (MSCI world) return at time t.

FF – 3 factor models are basically an asset-pricing model that expanded the basic capital asset pricing model by adding size risk and value risk factors to the market risk factor. It claims that value and small-cap stocks perform better than the market on a regular basis (Fama, 1993).

$$R_{it} - R_{ft} = \propto_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{it} \qquad (2)$$

Additional two factors added to original CAPM that are the size premium (small minus big; SMB) and value premium (high minus low; HML)

A refinement of the three-factor model developed by Eugene Fama and Kenneth French, the Carhart model adds a fourth factor, which is momentum. Momentum is a measure of the tendency keep on a certain path for assets, rising or falling (Carhart, 1997).

$$R_{it} - R_{ft} = \propto_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD_t + \varepsilon_{it} \qquad (3)$$

The Carhart model is given in equation 3 and additional factor added to FF-3 model is the momentum factor which is denoted by UMD_t.

Fama and French extended their three-factor model by including two more other factors; which are profitability (robust minus weak) and investment (conservative minus aggressive) (Fama and French, 2015). Such new model is called as Fama-French 5 factor model (FF-5). The FF-5 model is shown in equation 4.

$$R_{it} - R_{ft} = \propto_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_{it} \qquad (4)$$

As shown in equation 4, the additional factors in FF-5 model are the return spread of the most profitable minus the least profitable (RMW) and return spread of firms that invest conservatively minus aggressively (CMA).

The Sharpe ratio (1966) is one of the most widespread performance measurement tools in both the academia and the industry (Eling and Schuhmacher, 2007; Ackerman, et al., 1999; Liang and Kat, 2001). It is calculated by measuring the difference between hedge fund return (r_i) and risk-free rate (r_f), then dividing such excess return (if any) by the fund's standard deviation (σ_i), which measures the funds' return volatility. Sharpe ratio is calculated for each hedge fund index using the following formula:

$$Sharpe\ Ratio = \frac{(r_i - r_f)}{\sigma_i} \qquad (5)$$

4.3. Empirical Findings

Investors would profit from adopting more sophisticated models that adjust for traditional and exotic risks while measuring hedge funds' performance. Tables. 6-7 report Eurekahedge and Credit Suisse strategies' indices related alpha and their associated systematic risk in relation to the market over the time period.

Table 6: Eurekahedge Strategies' (α) And Market Risk (β)

	CAPM		FF-3 Model		Carhart Model		FF-5 Model	
Indices	**α**	**β**	**α**	**β**	**α**	**β**	**α**	**β**
Eurekahegde Hedge Fund Index	0.0046*	0.261*	0.0039	0.256*	0.0038*	0.277*	0.004*	0.259*
Relative Value Strategies								
Convertible Arbitrage	0.0036*	0.138*	0.0033*	0.136*	0.0034*	0.136*	0.0033*	0.131*
Fixed Income	0.0042*	0.186*	0.0038*	0.186*	0.0039*	0.180*	0.0037*	0.178*
Market Neutral	0.0023*	0.047*	0.0020*	0.046*	0.0015*	0.081*	0.0013*	0.068*
Event Driven Strategies								
Event Driven	0.0046*	0.384*	0.0039*	0.381*	0.0039*	0.375*	0.0039*	0.363*
Distressed Debt	0.0060*	0.277*	0.0052*	0.277*	0.0052*	0.257*	0.0054*	0.257*
Multi-Strategy	0.0049*	0.237*	0.0044*	0.235*	0.0042*	0.249*	0.0042*	0.232*
Directional Strategies								
Global Macro	0.0045*	0.133*	0.0043*	0.131*	0.004*	0.149*	0.0039*	0.139*
Managed Futures	0.0053*	0.014	0.0051*	0.013	0.0041	0.073*	0.0042	0.046
Long/Short Equity	0.0043*	0,413*	0.0036*	0.407*	0.0034*	0.425*	0.0038*	0.392*
Emerging Markets	0.0070*	0.414*	0.0062*	0.411*	0.0061*	0.417*	0.0064*	0.379*

Note: * Significant at 1% level

Over the entire period, all models assessed are statistically significant with a p-value of the F statistic < 0.01 except Managed Futures strategy. This strategy exhibits non-significant betas for all the models except for Carhart model and non-significant alphas for Carhart and the five factor models which implies that they fail to outperform when taking into consideration exotic risks inherent to these models. Overall, Eurekahedge global hedge fund and the distinct strategies provide significant and positive alphas, which imply that they mainly outperform the market. Concerning the ranking of the different strategies, the four models delivered the same results in which Emerging Markets, Distressed Debt; are the best performing strategies followed by Multi-strategy and Managed Futures except for Carhart and the Five factor models in which they delivered non-significant alphas. A hedge fund can exhibit a high alpha in a model more than the other because its exotic risk exposures performed well. On the other hand, Relative value strategies come in the last positions in terms of performance for CAPM and for the Five-factor model and Along Long/Short Equity for Fama French and Carhart models.

Over the whole period, almost all strategies showed significant amounts of market risk to different degrees. Emerging Markets, which is the most successful, has the highest risk exposure. Event driven strategies and Long-Short equity have a high level of systematic risk whereas Relative value and Global Macro strategies have the least risk exposure. For Eurekahedge, strategies that have higher risk adjusted performance tend to have higher risk exposure apart from Long-Short strategy, which seems to have a lower risk-adjusted performance with a significant exposure level.

For credit Suisse database, all hedge fund indices except Market Neutral and Managed Futures strategies, outperform the market with positive and significant alpha over the period of time. The estimated models were statically significant with a p-value of the F statistic < 0.01 and F statistic < 0.05 except for market neutral that delivered non-significant alphas for all the models estimated and managed futures that delivered non-significant alphas for all the models and an only a significant exposure to Carhart model during the time period.

Table 7: Credit Suisse Strategies' (α) And Market Risk (β)

Indices	CAPM		FF-3 Model		Carhart Model		FF-5 Model	
	α	**β**	**α**	**β**	**α**	**β**	**α**	**β**
Credit Suisse Hedge Fund Index	0.0026*	0.258*	0.0021*	0.256*	0.0016*	0.294*	0.0018*	0.256*
Relative Value Strategies								
Convertible Arbitrage	0.0024*	0.227*	0.0019**	0.225*	0.0011**	0.221*	0.0015**	0.186*
Fixed Income	0.0021*	0.307*	0.0017**	0.306*	0.0016**	0.338*	0.0015**	0.329*
Market Neutral	-0.0002	0.181*	-0.0005	0.181*	-0.0007	0.199*	6,6E-05	0.133*
Event Driven Strategies								
Event Driven	0.003*	0.307*	0.0023*	0.306*	0.0018**	0.338*	0.0016**	0.329*
Distressed Debt	0.0036*	0.256*	0.0029*	0.255*	0.0028*	0.261*	0.0031*	0.237*
Multi-Strategy	0.0034*	0.210*	0.0030*	0.208*	0.0026*	0.234*	0.0027*	0.203*
Directional Strategies								
Global Macro	0.0049*	0.159*	0.0046*	0.158*	0.0044*	0.173*	0.0037*	0.168*
Managed Futures	0.0026	-0.004	0.0026	-0.005	0.0007	0.12*	0.0004	0.084
Long/Short Equity	0.0025*	0.387*	0.0019*	0.384*	0.0011**	0.441*	0.0015**	0.393*
Emerging Markets	0.0040*	0.448*	0.0033*	0.444*	0.0029*	0.466*	0.0034*	0.413*

Note: * 1 % significance; ** 5% significance

Global macro, emerging markets, distressed debts and multi-strategy; are the most successful strategies while relative value strategies realize the lowest performance following CAPM and are the less performing along Long/Short Equity for Fama French, Carhart and the five factor models.

Market risk level was significant for almost all the strategies in different degrees; Emerging markets have high significant beta comparing to the other strategies, Event value strategies like Distressed debt and Event Driven record a high-risk exposure level. Long-Short strategy, which seems to have a low risk-adjusted performance have a significant exposure level. Relative value strategies (Market Neutral and Convertible Arbitrage), Global Macro and Multi-Strategy have the least exposure level.

Seeking alpha might not be enough for investors who are looking forward to having a deep and a complete evaluation of hedge funds' performance. In this case, other tools can be used to measure the risk-adjusted returns of hedge funds adopting dissimilar strategies. Table 8 presents performance measurement with Sharpe ratio.

All hedge fund strategies perform better than MSCI world according to Sharpe ratios' results apart from Market Neutral strategy for Credit Suisse database.

Adjusting for risk can be meaningful to compare between hedge fund strategies. For Eurekahedge, the highest Sharpe ratio 1.632 belongs to Global macro, which implies that the Global macro index generates almost 170 basis points of returns per unit of standard deviation, on average. Followed by Convertible Arbitrage and Multi-strategy while Distressed Debt came is the fifth position.

Table 8: Performance Measurement with Sharpe Ratio

Indices	Eurekahedge	Credit Suisse
Hedge Fund Index	1.353	0.800
Relative Value Strategies		
Convertible Arbitrage	1.614 (2)	0.594 (8)
Fixed Income	1.452 (4)	0.599 (7)
Market Neutral	1.287 (6)	0.042 (10)
Event Driven Strategies		
Event Driven	1.013 (9)	0.713 (5)
Distressed Debt	1.316 (5)	0.923 (2)
Multi-Strategy	1.520 (3)	1.024 (1)
Directional Strategies		
Global Macro	1.632 (1)	0.830 (3)
Managed Futures	1.084 (8)	0.292 (9)
Long/Short Equity	0.971 (10)	0.635 (6)
Emerging Markets	1.261 (7)	0.741 (4)
Benchmark		
MSCI World	0.455	0.455

Note: Numbers in ( ) indicates the rank order of each strategy

For Eurekahedge, Emerging Markets, Distressed Debt, Managed Futures and Event Driven strategies were among the best performing strategies according to their return means and following their alpha results but these strategies lost their rankings according to Sharpe ratio's results. In fact, the Sharpe ratio uses standard deviation to measure a fund's risk-adjusted return, the higher it is the better hedge fund returns have been relative to the risk they have taken on and the higher the standard deviation, hedge funds need to earn higher returns to get a high Sharpe ratio. Despite earning high returns in comparison to the other strategies, Emerging Markets, Distressed debt, Managed Futures and Event Driven strategies have high Standard deviations, which refers to price fluctuations and higher risk. Their additional risk is more significant than their high returns. These strategies' volatilities made them lose their rankings among hedge fund strategies according to Sharpe ratios. Convertible arbitrage, Market Neutral and fixed income strategies were among the lowest performers following average returns and alphas results but managed to get to the top for Eurekahedge on account of their low volatilities which implies that funds having the lowest standard deviations can score a higher Sharpe ratio if they have steady decent returns.

Concerning Credit Suisse database, Multi-strategy recorded the highest Sharpe ratio 1.024. Distressed debt came in the second position followed by Global Macro. Sharpe ratio ranking results didn't change significantly comparing to alpha's results and based on returns' means. The best performing strategies alternated their ranking positions with Emerging Markets and Global Macro losing their leading first and second positions according to their average returns and

alpha results to Multi-Strategy and Distressed debt taking the lead which is due to their difference in terms of the risk they take on. Thus, Emerging Markets and Global macro have one of the highest standard deviations among hedge fund strategies that are more significant in comparison to the high returns they provide. One the other hand, Managed Futures is under the least performing strategies with a low return compared to other strategies and the highest standard deviation among all. These findings underline the importance of risk adjustment to get a significant comparison of index performance.

Overall, Global Macro, Multi-strategy and Distressed Debt are among the best performing strategies in Common for Eurekahedge and Credit Suisse while Managed Futures, Market Neutral and Long/Short Equity are under the list of the least performing strategies for both databases.

While analyzing the performance of the two databases, we can notice for risk adjusted performance metrics alpha and Sharpe ratio that Credit Suisse is underperforming compared to Eurekahedge. There may be factors that explain hedge fund returns and can make a difference for these databases. Fung and Hsieh (2004) argue that hedge fund returns depend on management fees, fund size and leverage while Liang (1999) noticed a positive correlation with performance fees, fund assets and lock-up periods. Funds with more assets tend to generate high returns at lower levels of volatility leading to superior risk-adjusted performance, on the other hand smaller funds have a higher probability of producing lower alphas. Asset under management (AUM) can be an indicator of performance for investors, an increasing AUM may underline a positive performance and investors are attracted to a promising performance (Giles, 2002).

Not to forget that managerial skill can also play a role in the generated returns for hedge fund strategies. In this study, we observed for the risk adjusted performance metrics alpha and Sharpe ratio that Credit Suisse is underperforming compared to Eurekahedge. Discrepancy between the two databases can be due to the number of individual hedge funds in each hedge strategy index. Credit Suisse present smaller number of funds compared to the other database, which can explain its lower performance compared to Eurekahedge.

According to these results, Hedge fund strategies are proved to provide an appreciated performance. They tend to outperform the market and the strategies diverse in term of performance level. Thereby, investors can make use of hedge funds as an uncorrelated diversification investment vehicle to maximize profits.

5. Discussions and Conclusion

Hedge fund industry provides diverse sophisticated investment strategies to appeal the investors. The distinct strategies have usually dissimilar exposures; still, there are certain exposures that are proper to nearly every hedge fund such as volatility and equity market. Furthermore, macroeconomic risk has an important place in interpreting hedge fund performance for almost all the strategies, which explains hedge fund strategies performance in reaction to extreme circumstances. In fact, hedge fund strategies experienced big declines in their performance in crisis periods. The global financial crisis of 2008 and the Covid-19 crisis were poor periods for major hedge fund strategies. Some strategies were attained more than others due to the nature of the strategy. Managed Futures and Global Macro strategies faced the least declines and were able to perform well despite these two crises. With their low correlation to the global market, Managed Futures provided a protection to their investors in periods of strong downturns on financial markets. Global Macro is a close strategy to Managed Futures. For this strategy, managers try to obtain profit from the direction of movements on financial markets instead of hedging market risk. Despite the several crises of these past decades, hedge fund

industry has stand high and kept on achieving positive results and an appreciated performance.

The majority of hedge fund indices outperform the overall equity market. Hedge fund strategies, which have higher systematic risk level, tend to perform better, like Emerging Markets strategy. To evaluate the performance of hedge fund strategies, investors can have recourse to alternative risk metrics for the measurement of risk-adjusted performances. Based on our findings, the majority of hedge fund indices outperform the MSCI World benchmark index. Similar findings were concluded by Ackermann et al. (1999), Brown (1999), Liang (1999), Capocci and Hübner (2004) and Fung and Hsieh (2011); when comparing hedge funds with passive index benchmarks such as S&P500, they came with the result that most hedge funds perform better than traditional benchmark indices during their period studies.

After assessing performance by calculating alphas and Sharpe ratios, the results demonstrated that hedge funds displayed a significant exposure to the four asset-pricing models. Furthermore, it is also reported that Global Macro, Distressed Debt and Multi-strategy were the most efficient strategies. Our results are similar with Nikola and Vijay (2019) in which they found Global Macro, Multi-strategy and Emerging Markets to be the best performing strategies in their study period of 2007-2017. These strategies' ranking differs depending on a database. It is important to note that generated returns for hedge fund strategies can stem from managerial skill as well which can explain certain discrepancies among hedge fund databases. On the other hand, Relative Value strategies and Long/ Short Equity strategies are the least efficient strategies in terms of performance.

Finally, employing alternative risk metrics in the calculation of risk-adjusted performances did not cause a dramatic change in the rank ordering of the hedge fund indices. According to their risk preferences, investors may pick one or more strategies from different categories in attempt to diversify or to maximize their profits. Risk loving investors will go with Emerging Markets or Managed Futures strategies known for their high volatilities. Risk-adverse investors may opt for Multi-strategy or Global Macro strategies as they are offering best risk/return combination.

Hedge funds represent a significant diversification approach while managing a portfolio owing to their low correlation to the financial capital markets. Portfolio efficiency is boosted with their presence along other traditional assets. Investors may use one or more than a single strategy to diversify and to maximize profits. It is important to note that hedge fund managers have a key role in hedge fund strategies performance. They are confronted with inherent risks depending on the strategy adopted and it relies on the manager capability and skills to hedge away risks and sustain the performance of hedge fund strategies. Managers who anticipate correctly the macro-economic changes intervening in the markets can anticipate trends and react rapidly in response to market changes.

Investors should seek for skilled hedge fund managers who have a positive history of returns and look for investment opportunities in potential grooming sectors like biotech companies, private credit, responsible investment (RI), or environmental social and governance (ESG) amidst environmental problems and social justice movements. Investing in both public and private markets can also be a source diversification.

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