C I G E

CENTRO DE INVESTIGAÇÃO EM GESTÃO E ECONOMIA

**UNIVERSIDADE PORTUCALENSE – INFANTE D. HENRIQUE**

**DOCUMENTOS DE TRABALHO**

**WORKING PAPERS**

**n. 10 | 2009**

# Hedge funds strategies-are they consistent?

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**Nov/2009**

# "Hedge funds strategies-are they consistent?"

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## Abstract

Alternative investment has grown considerably, transforming this industry in the forefront of investment innovation. Despite their public acknowledgment and profound influence in the financial market, there is still relative small understanding about hedge funds strategies style.

This paper intends to determine whether stylistic characterization exists across hedge fund strategies, by comparing, for the period of 1998 to 2008, the performance of the EDHEC indices with one of the most representative indices of hedge funds, the CSFB/Tremont index, regarding seven main strategies.

The results do not reject the hypothesis of equal mean monthly returns on every strategy, comparing the two data sources, showing that there is no significant differences between the strategies analyzed, suggesting that the purity in each style is not as developed and accurate as we may suppose.

**Keywords**: Hedge funds, strategies and style, consistency, purity, bias

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**INTRODUCTION**

Over the past 60 years the alternative investment industry has grown considerably, transforming this industry in the forefront of investment innovation. Despite their public acknowledgment and despite their profound influence in the financial market, there is still relative small understanding about hedge funds strategies style.

The first mention of Hedge Fund remounts to 1949, when Alfred Winslow Jones launched an equity fund called A.W.Jones&Co.[1] His main objective was to make small net profits in all markets using leverage and combining short and long positions.

Today, the term hedge fund includes several investment strategies styles, and is best defined by their freedom from regulatory controls stipulated by the Investment Company Act of 1940. Accordingly to the National Securities Markets Improvement Act of 1996, hedge funds provide exemption from regulatory oversight and investment restrictions implies restrictions on public advertising and solicitation of investors. Despite the special media and regulatory attention, the term "Hedge Fund" has yet no precise legal definition. Nevertheless, the new hedge fund industry shares a series of common characteristics that distinguishes them from more traditional investment funds (long only strategies). Although these characteristics should not be considered as absolute signals, we can identify several of them: hedge funds are actively managed, have flexible investment policies, use unusual legal structures, offer limited liquidity most of the times, have limited transparency and target specific investors.

The variety of hedge funds strategies is challenging both to academics as to practitioners, which lies in understanding and benchmarking managers strategies whose underlying operations are essentially opaque, whose instruments vary widely and who in general have historically outperformed the underlying market.

However, in 2008 almost hedge strategies posted their worst losses[2]. Regarding the index of funds of hedge funds as an aggregate view of this industry performance, it is

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[1] See A. Jones(1949)
[2] See Hedge Fund Week, as of 17.02.09, based on a report from Edhec Risk and Asset Management

the first time since 1997 that this index has posted negative returns. The recent events marked by the worldwide financial crisis had a significant impact on hedge funds returns. Can this mean that finally hedge funds have followed strategic style purity, enabling us to detect style consistency and style deviation?

The purpose of this paper is to determine if stylistic characterization exists across hedge fund strategies. To do so, we ask two questions: Do the widely variety of hedge funds strategies follows basic styles? And if so, are pure style indices able to capture a significant percentage of the behaviour of the time-series of competitive indices?

To address these questions we study the performance of the "index of the existing indices", the EDHEC indices[3] and compare it with one of the most representative indices of hedge funds, the CSFB/Tremont index, regarding seven main strategies: Convertible arbitrage, Emerging markets, Event driven, Fixed income arbitrage, Global macro, Long/Short Equity and Market neutral, during the period 1998 to 2008.

Our results may suggest that the purity in each studied hedge fund strategic style is not as developed and accurate as we may at first glance believe.

This paper is structured as follows. The next Section presents a literature review on the main issues of Hedge Funds, considering different strategies and the difficulties that arise from the biases in data. Section three describes the data and methodology of our work. Section four reports the results of our empirical analysis and Section five concludes.

1. **LITERATURE REVIEW**

**Hedge Funds Strategies and Style**

The first issue to address is that hedge funds through time failed to be a homogeneous group and are now a diversified range of investment strategies with very different risks and return characteristics. However, trying to understand their common nature and

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[3] Source: EDHEC RISK

the differences between their strategies are crucial for the investors to follow a coherent investment plan. In order to do so it is necessary to segregate their universe into a range of standardized investment styles Lhabitant [2006]. According to a survey launched by the Alternative Investment Management Association in 2003, 47% of the respondents use already one or more outside classification systems. Among this group, the source of outside classifications relies in CSFB/Tremont (27%), Hedge Fund Research (27%) and MSCI (23%), followed by others.

Understanding the universe of hedge funds styles is complex, but for the sake of simplicity we decided to consider two important indices, the CSFB/Tremont and the EHDCE Alternative Indices, with historical data performance from 1998 till 2008. We do not aim to claim that these existing sources of outside classification are better than the existing others, but those are two indices that consider simultaneously the seven main strategies regarded in our study.

An extended academic research has been made through time regarding performance consistency in hedge funds strategies or styles.

Fung and Hsieh [1997] for instance, report that hedge funds returns have low and sometimes negative correlation with the asset class returns of mutual funds. They attribute this discrepancy to the use of leverage and changes in asset exposure by hedge funds. Later on, Fung and Hsieh [2001], based on Sharpe's model (1992) specified a style model, considering style factors as a main style whose characteristics are common to many similar styles.

$$(1) \quad R_t = \propto + \sum_k b_k SF_{k,t} + \varepsilon_t$$

Where $R_t$ is a fund's returns, $(SF_{k,t})$ are the style factors, and $(b_k)$ are the factor loadings.

Equation (1) provides a framework for the quantitative degree of diversification in a hedge fund portfolio in terms of its exposure to various classes of hedge fund styles. Using as Data the CSFB/Tremont Style Indices and HFR Style indices, they conclude being halfway towards having a complete set of asset-based style factors for the Hedge Fund industry as a whole.

Goetzmann and Brown [2001] suggest another simple but quite general procedure to identify asset management styles where asset weights vary through time. If there are $K$ such styles the ex-post total return in period $t$ for any given fund can be presented as

$$(2) \quad R_{jt} = \alpha_{jt} + \beta'_t I_t + \varepsilon_{jt}$$

where fund $j$ belongs to style $J$. The factor loadings in factor $I_t$ are given by $\beta_{Jt.}$.

In an interpretation closer to the financial practitioners $\beta_{Jt}$ refers to a characteristic of a typical stock in the $J_{th}$ style classification (size, market to book, price earnings multiple, etc.) and represents the return to that attribute *(cf.* Lakonishok, Shleifer and Vishny [1994]). Goetzmann and Brown [2001] further considered another equation where $\mu_{Jt}$ is the expected return for style J conditional upon the factor $I_t$, and $\varepsilon_{jt}$ has zero mean ex-ante.

$$(3) \quad R_{jt} = \mu_{jt} + \varepsilon_{jt}$$

Based on their results it would be possible to consider that $\mu_{Jt}$ differs across styles. Studying historically monthly returns of large base of hedge funds from 1989 to 2002, Goetzmann and Brown [2001] found a number of distinct styles for management. The data used in his study was based in Fung and Hsieh [1997] and Ackerman, McEnally and Ravenscraft [1999]. There are at least **eight distinct styles** or philosophies of asset management currently employed by hedge funds, and risk exposure depends very much on style affiliation. This styles according to Goetzmann and Brown [2001] can be classified in *US EQUITY HEDGE, EVENT DRIVEN, GLOBAL MACRO, PURE EMERGING MARKET, NON US EQUITY HEDGE, NON DIRECTIONAL/RELATIVE VALUE, PURE LEVERAGED CURRENCY* and *PURE PROPERTY*. They conclude that the particular style of fund management influences the persistence of funds returns, and stated that 20% of the cross sectional variability of funds depends only of the style of management. Therefore there is of outmost importance to define standards for hedge funds style classification, considering style analysis and style management.

Smedts and Smedts [2006] studied the dynamics in investment regarding nine investable hedge funds strategies whose source comes from the daily investable HFR

indices for eight single strategies: CONVERTIBLE ARBITRAGE, DISTRESS SECURITIES, EQUITY HEDGE, EQUITY MARKET NEUTRAL, EVENT-DRIVEN, MACRO, MERGER ARBITRAGE and RELATIVE VALUE ARBITRAGE. Lastly they considered Funds of Funds. They conclude that hedge funds managers can indeed outperform the market, but this is only due to one of the main characteristics of hedge funds strategies, that is, their ability to successfully regard market timing. They consider that market timing is inherent to the concept of hedge fund industry.

We hope our research, using two sets of transparent, rule-based indices, will help investor to better understand hedge fund industry.


**The Biases in Hedge Funds Databases**

According to HedgeFund.net Channel Capital Group Inc., in his last report regarding the year of 2008: *"The total estimated assets managed by hedge funds, excluding double counting of assets in funds of funds, decreased by 23.2% in Q4 2008 to $1.932 trillion after peaking in Q2 near $3 trillion. The decline resulted in total assets falling 32.5% in 2008 compared to an increase of 32.9% in 2007. The hedge fund industry assets declined to levels not seen since Q3 2006. Performance losses reduced assets an estimated 6.9%, or $173.1 billion and the total reduction in assets from Q3 of $599.9 billion is the largest dollar value change, up or down, on record for the industry."*

Comparing it with a former research of TASS Research$^{TM}$ in 2003, were the estimations of alternative investment AUM's represented $750 billion, we may now be certain of the major importance of these financial instruments and their implications in the Financial Industry.

An industry of this dimension can no longer be considered as before with total lack of transparency and rationalization. However the different indexes available on the market are still constructed from different data, according to diverse selection criteria and methods of construction. We can report instantly two main sources for biases

regarding (i): the different way each database is constructed (i.e. net versus total fees, etc…) and (ii): by the fact that data/prices are supplied by the hedge funds individually regarded, meaning this a considerably lack of reliability due to lack of transparency. On the other hand, some Hedge Funds indices demands audit financial statements which will help in some way to reduce this lack of transparency and the manipulation of prices.

An objective judgment of the best existing index is difficult to find, therefore, the use of some combination of competing indexes will allow us to reach a better understanding of investment style purity.

### *Self-Selection Bias*

Hedge funds as private investment pools are not required (and are not allowed) to disclose performance or asset allocation to the public. Most hedge funds provide information to data providers, but only in a voluntary basis. This allows hedge funds managers discretionarily disclose the information they though to fit better their private interests. It is impossible to quantify this type of bias, although a similar study has been conducted by James Heckman [1979] in economics. No further academic research was found about this subject due to the considerably lack of information.

### *Database/Sample Selection Bias*

According to the database sources selected or samples selection, we can find important performance bias. Liang [2000] reported this bias as a result of several mainly differences in returns, inception date, net assets value, incentive fee, management fee, investment style as well as survivorship bias.

Different criteria used by the hedge funds managers also cause sample selection bias towards some segments of funds. The option of reporting to some databases and not to other implies differences in the sample sets.

Differences in data collection methods between databases are also other important source of sample selection bias.

*Survivorship Bias*

Survivorship bias is other common problem when regarding historical data returns. A simple definition regards the fact that large number of hedge funds has disappeared or stops reporting information to data vendors during the time sample, and this may overstated the historical returns while understating historical risk. Therefore it is important to consider that hedge funds that contribute to the successfully performance over the past 10 years are not the same through time, and this constitutes a bias in the sample.   Brown et al. [2001] observed that 50% of hedge fund managers disappear within 30 months, and only 4% have been in business for 10 years. Gregoriou [2002] based on the Zurich Capital Markets database in the 90's concluded that funds tend to fail more in the first year, and that the median life of a hedge fund is 5.5 years.

Other studies have been conducted through time. Malkiel [1995] started a survey on mutual funds, and concluded that in traditional asset management there is survivorship bias of 0,5% to 1,5% per annum.  Regarding hedge funds there is a large literature on this subject, the most relevant dated from 1999 till 2003. Ackerman, McNally and Ravenchaft [1999] studied the HFR and MAR databases, including funds of funds, from 1989 till 1999, and found a survivorship bias of 0,16% per annum. Later on, Fung and Hsieh [2000b, 2001], based on TASS data base, from 1994 till 1998, detected a higher value of 3%.   Barry [2003] studied the same database from almost the same period, (1994-2001) and reported a survivorship bias of only 1,4%. What can explain those differences? Liang [2000] demonstrates in his study that the differences in database construction, the inclusion of funds of funds in data and the time differences in the samples, explain these discrepancies. This attrition rate tends to increase in bull or bear markets, as is stated by Brown and Goetzmann [1995] and Brown et al. [2001]. They illustrated that this rate is influenced during higher moments of the distribution of returns and impacts the degree of serial correlation.

***Backfill or Instant History Bias***

Backfill or Instant History Bias happens when a hedge fund allows the managers to backfill their historical returns, considering that they do not exist in the database since their inception. Of course the mangers only choose to do so when this is favorable to their results, which provides bias to the past performance upwards. Barry [2003] studied the TASS database and observed that 80% of hedge funds backfill at least six months of data, 65% of all funds backfill at least 12 months and 50% backfill more than two years.

Academic research, Fung and Hsieh [2000b,2001], Edwards and Caglayan [2001] and Barry [2003], using several data bases during an average period of 1994 till 2001,suggest an estimate bias of 1,2% to 1,4% per annum, comparing the average returns since inception data with the average returns since the fund's reported data.

The CSFB/TREMONT INDEX does not suffer from this bias, since they do not allow data do be backfill.

***Infrequent Pricing and Illiquidity Bias***

Most hedge funds due to their strategy hold illiquid securities or securities that are difficult to price, causing the marking to market of this assets very difficult. Possible solutions found by the managers are not reliable, since it depends very widely on their personal opinions. Rahl [2001] discussed the results obtained by a survey of Capital Market Risk Advisors (CMRA) on NAV/fair value prices and found considerable differences in valuation result from different prices approaches.

Asness, Krail and Liew [2001] studied the risk-adjustment returns when a manager tries to smooth his returns, and found that adjusting data rises significantly the effective risk (market exposure) of the that fund.

Other academic studies, conducted by Ackermann et al. [1999] and Fung and Hsieh [200a, 2000b] suggest that a hedge fund must have an historical period analysis sufficient large with observations of at least 24 months or 36 months, respectively.

### *Different Indices, Different Performance Bias*

Several academic studies, namely those of Brooks and Kat [2001] and Fung and Hsieh [2002] provide information about the difficulties in measurement and interpretation of the results of hedge fund indices. The heterogeneity existing in between all existing hedge funds indices was first documented by Amenc and Martellini [2001, 2003]. They found that the average correlation between the indices that focus on the same strategy/style, are usually at an acceptable level and the low correlations appears on strategies of pure alpha, such as Fixed Income Arbitrage, Equity Market Neutral, Long/Short Equities and Global Macro. Furthermore, the major inconsistencies seem to appear in market crisis such as occurred in 1998 till 2000 and August 1997 till Dec2008. (See ANNEX, Figure 1 and 2)

## 2. DATA AND METHODOLOGY

According to AIMA Report 2008, assets under management are concentrated in few firms. 390 hedge fund firms each manage more than $1 billion and, together, control 80% or $2.1 trillion of the global assets as of early 2008, according to HFI. The oft-tooted fact that there are thousands of hedge funds has very little relevance for most investors. The industry has become more concentrated at the top end. The largest 100 hedge funds accounted for three-quarters of industry assets in 2007, up from 54% in 2003 according to IFSL (International Financial Service London).
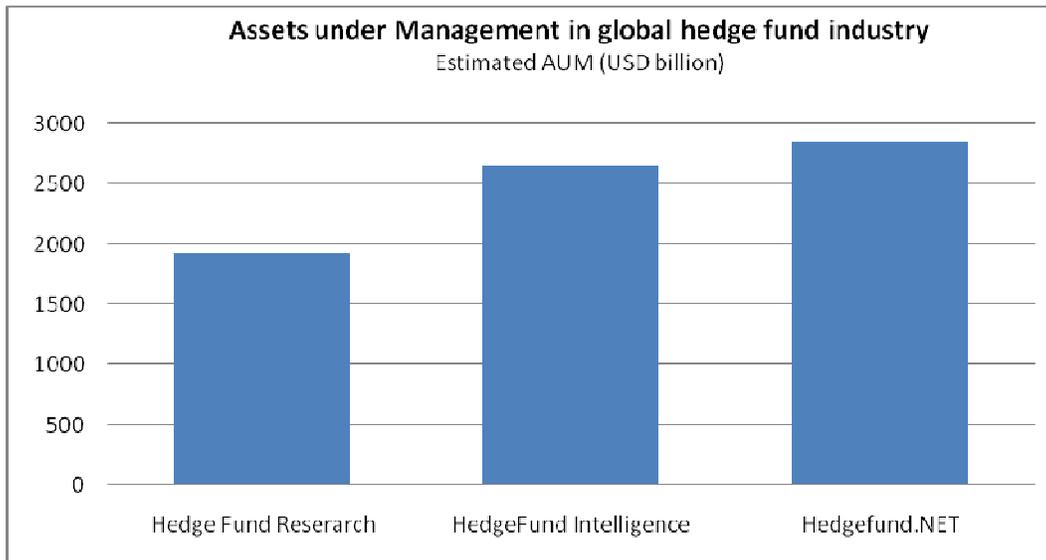


Source: Alternative Investment Solutions, Hedge Fund Research, Hedge Fund Intelligence, Hedgefund.net
Notes: HFR estimates are as of Q2 2008. HFI estimates are as of beginning 2008. Hedgefund.net estimates are as of Q1 2008.

Hedge fund Indices are often accused of heterogeneity and lack of representativeness. Amenc and Martellini [2003] and the EDHEC Risk and Asset Management Research Center suggested an original solution using all the relevant information containing in all the competing indices producing a set of stable, more representative, easy to replicate, non-commercial and with fewer biases indices. On average, Amenc and Martellini [2003] conclude that pure style indices are able to capture about 80% of the behavior of the time-series of competing indices.

**TABLE 1:** Comparison between the major hedge fund index providers

| | Altvest | CSFB | EACM | HENNESSE | HRF | HFNET | MAR | S&P | VAN HEDGE | ZURICH | EDHEC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Managed Futures | | X | | | | X | X | X | | | |
| Global Macro | X | X | | X | X | X | X | X | X | | x |
| Lomg/Short Equity | X | X | X | | X | X | | X | | X | x |
| Dedicat Short | X | X | X | X | X | X | X | | X | | x |
| Emerging Markets | X | X | | X | X | X | X | | X | | x |
| Market Neutral | | X | | X | X | X | X | X | X | | x |
| Fixed Income Arbitrage | | X | | X | X | X | | X | X | | x |
| Convertible Arbitrage | | X | X | X | X | X | | X | | X | x |
| Merger Arbitrage | X | X | X | X | X | X | X | X | | X | x |
| Distressed | X | X | X | X | X | X | X | X | X | X | x |
| Event Driven | X | X | X | X | X | X | X | | | X | x |

*Source: Web sites.*

Our decision to use EDHEC Risk Alternative Indices and with CSFB/TREMONT Indices, was based in Lhabitant[2006] where he studied the tracking errors for the seven strategies we use here and concluded that the tracking error was stable over time and remains at acceptable levels. He defends that according to many researchers and investors they may even be classified as potential benchmarks. (see Appendix 1 in ANNEX for a short description of the main alternative strategies accordingly to Amenc and Martellini [2003].)

Edhec Alternative Indexes are able to capture a very large fraction of the information contained in the competing indexes (e.g. the average percentage of variance explained by the Indexes is 79.12% across all sub-universes).

On the one hand Edhec Alternative Indexes generated as the first component in a factor analysis have a built-in element of optimality, since there is no other linear combination of competing indexes that implies a lower information loss. Since competing indexes are affected differently by measurement biases, searching for the linear combination of competing indexes that implies a maximization of the variance explained, leads implicitly to a minimization of the bias. As a result, Edhec Alternative Indexes tend to be very stable over time and, as a result, easily replicable.

Credit Suisse/Tremont Hedge Fund Index is compiled by Credit Suisse Tremont Index LLC. It is an asset-weighted hedge fund index and includes only funds, as opposed to separate accounts. The Index uses the Credit Suisse/Tremont database, which tracks over 5000 funds, and consists only of funds with a minimum of US$50 million under management, a 12-month track record, and audited financial statements. It is calculated and rebalanced on a monthly basis, and shown net of all performance fees and expenses. It is the exclusive property of Credit Suisse Tremont Index LLC.

Our main objective is to determine if different hedge funds strategies achieve statistical significant different media monthly returns through time or if we can not statistically confirm that. Therefore we use a test T of Student, for comparison of means of two pair's samples. We determined the p-value, as the probability associated with pair upped test T of Student with a distribution bi-variant. Generally, one rejects the null hypothesis if the p-value is smaller than or equal to the significance level.

We tested the null hypothesis with a significance level of 5%.

$H0: \mu_{\Delta i} = 0$

$H1: \mu_{\Delta i} \neq 0$

Where $\Delta i = X_i - Y_i$, being $X_i$ and $Y_i$ the two values of the pair number *i*, to compare.

*i* = 1 to 7, being:

1= Equity Market Neutral;2= Long/Short Equities;3= Global Macro;4= Fixed Income Arbitrage;5= Event Driven; 6= Emerging Markets;7= Convertible Arbitrage

This T test has been applied both in comparison of different strategies and in comparison of the two different sources of data used. It was not necessary to verify the assumption of the monthly returns normality because the test used does not require so when the number of samples is superior to 30, accordingly with the Central Limit Theorem.

### 3. EMPIRICAL RESULTS

These results must be taken with precaution, since from August 2007 till December 2008, this period can be classified as an abnormal situation, in sequence of the subprime crises in USA, as well as the years of 1998 and following, due mainly to the debt market crisis. (See figures 1 and 2, in Annex).

We are aware that the analysis developed in this paper could be improved in a number of ways, but our aim is quite simple for now: are hedge funds strategies consistent, producing different medias monthly returns in our sample, considering the monthly returns in percentage or not?

According to Table 2, we may not reject the null hypothesis of equal media monthly returns on every strategy comparing the two sources of data. From Jan 98 till Dec 08, the difference is not statistically significant, with a significance level of 0,05.

More information can be detected when regarding the sample and excluding the year of 2008, where we may reject the null hypothesis for the strategy Equity Market Neutral.

**TABLE 2: Comparing p-value EDHEC vs CSFB/TREMONT JAN98 to DEZ08**
**(percentage monthly returns)**

| TIME PERIOD | Equity Market Neutral | Long/Short Equity | Global Macro | Fixed Income Arbitrage | Event Driven | Emerging Markets | Convertible Arbitrage |
|---|---|---|---|---|---|---|---|
| DEZ08 TO JAN98 | 0,618441539 | 0,404484163 | 0,366992065 | 0,366992065 | 0,681727037 | 0,144406795 | 0,406798944 |
| DEZ07 TO JAN98 (EXCL. 2008) | **0,03022047** | 0,372701486 | 0,301141141 | 0,255945898 | 0,76613029 | 0,050895235 | 0,897325633 |

Another way of testing the consistency of different strategies was used applying a T Test to the possible pairs between the seven different strategies considering only one data source.

For the EDHEC Risk data source, as we can see in Table 3, the null hypothesis cannot be rejected between the strategy Fixed Income Arbitrage and three other strategies, Equity Market Neutral, Global Macro and Event Driven. For all the other strategies, as the Table 3 demonstrates, we can reject the null hypothesis. The media of the monthly returns of the other strategies are coherent between themselves.

**TABLE 3: Comparing p-value on seven different strategies by EDHEC RISK source from JAN98 to DEC08 (percentage monthly returns)**

EDHEC RISK JAN98 to DEC08

| P.VALUE | EQ. MKT NEUTRAL | LONG/SHORT EQUITIES | GLOBAL MACRO | FIXED INCOME ARBITRAGE | EVENT DRIVEN | EMERGING MARKETS | CONVERTIBLE ARBITRAGE |
|---|---|---|---|---|---|---|---|
| EQ. MKT NEUTRAL | - | 0,584685 | 0,341654 | **0,020537** | 0,651920 | 0,84760 | 0,252501 |
| LONG/SHORT EQUITIES | - | - | 0,844392 | 0,053233 | 0,764334 | 0,89274 | 0,148219 |
| GLOBAL MACRO | - | - | - | **0,006435** | 0,674092 | 0,835343 | 0,104551 |
| FIXED INCOME ARBITRAGE | - | - | - | - | **0,019678** | 0,263998 | 0,321332 |
| EVENT DRIVEN | - | - | - | - | - | 0,997453 | 0,086530 |
| EMERGING MARKETS | - | - | - | - | - | - | 0,430415 |
| CONVERTIBLE ARBITRAGE | - | - | - | - | - | - | - |

For the CSFB/TREMONT data source, something slightly different occurs as shown in Table 4. The null hypothesis cannot be rejected between the strategy Fixed Income Arbitrage and three other strategies, Long/Short Equities, Global Macro and Event Driven. Nor can we reject the null hypothesis for the strategies Convertible Arbitrage and Global Macro. For all the other strategies, as Table 4 demonstrates, we can reject the null hypothesis. The media of the monthly returns of the other strategies are statistically coherent between themselves.

**TABLE 4: Comparing p-value on seven different strategies by CSFB/TREMONT source from JAN98 to DEC08 (percentage monthly returns)**

CSFB/TREMONT JAN98 to DEC08

| P.VALUE | EQ. MKT NEUTRAL | LONG/SHORT EQUITIES | GLOBAL MACRO | FIXED INCOME ARBITRAGE | EVENT DRIVEN | EMERGING MARKETS | CONVERTIBLE ARBITRAGE |
|---|---|---|---|---|---|---|---|
| EQ. MKT NEUTRAL | - | 0,407186 | 0,326477 | 0,351521 | 0,505956 | 0,900186 | 0,830246 |
| LONG/SHORT EQUITIES | - | - | 0,825027 | **0,021323** | 0,565613 | 0,284988 | 0,122761 |
| GLOBAL MACRO | - | - | - | **0,001232** | 0,436029 | 0,318287 | **0,041983** |
| FIXED INCOME ARBITRAGE | - | - | - | - | **0,002373** | 0,306769 | 0,062589 |
| EVENT DRIVEN | - | - | - | - | - | 0,559518 | 0,054367 |
| EMERGING MARKETS | - | - | - | - | - | - | 0,692642 |
| CONVERTIBLE ARBITRAGE | - | - | - | - | - | - | - |

For more detailed information please consult Table 5 in Appendix.

## 4. CONCLUDING REMARKS

While there has been significant literature regarding new models to predict hedge fund returns, quite little is known about the different strategies used and their coherence in the mean monthly returns.

According to our results we may not reject the null hypothesis of equal mean monthly returns on every strategy comparing the two data sources, EDHEC RISK and CSFB/TREMONT. From Jan. 1998 till Dec. 2008, our sample period, the differences are not statistically significant at a significance level of 5%.

We may then conclude that, between 1998 and 2008, we found no statistically significant differences between the mean monthly returns in the seven strategies analyzed. These does not means that there are no differences at all. We can see some differences in volatility, for instance, accordingly to Figure 1 and Figure 2 in Annex, but these are not the main subject studied in this paper.

Special reference must be made when comparing the two different data sources, or when we exclude the year of 2008 from our sample period. For these cases we suggest that some strategies should be studied more deeply, namely, the Fixed Income Arbitrage strategy, Equity Market Neutral and Event Driven, which, when comparing to several other strategies, reveal as being able to reject the null hypothesis. However we must not forget that the year of 2008 was known for special abnormal period in financial markets, and this of course is the main play field for hedge funds if the strategies are consistent.

Our conclusion remarks may suggest that the purity in each studied style is not as developed and accurate as we may at first glance suppose.

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**TABLE 5: Comparing p-value on seven different strategies by CSFB/TREMONT source from JAN93 to JAN09 (percentage monthly returns)**

**CSFB/TREMONT JAN09 to JAN93**

| P.VALUE | EQ. MKT NEUTRAL | LONG/SHORT EQUITIES | GLOBAL MACRO | FIXED INCOME ARBITRAGE | EVENT DRIVEN | EMERGING MARKETS | CONVERTIBLE ARBITRAGE |
|---|---|---|---|---|---|---|---|
| EQ. MKT NEUTRAL | - | 0,32606044 | 0,105913456 | 0,329350072 | 0,274249845 | 0,759632908 | 0,899339163 |
| LONG/SHORT EQUITIES | - | - | 0,331920823 | **0,014799197** | 0,84129996 | 0,513185704 | 0,120127488 |
| GLOBAL MACRO | - | - | - | **0,000511013** | 0,22258487 | 0,205420243 | **0,014238528** |
| FIXED INCOME ARBITRAGE | - | - | - | - | **0,000147736** | 0,273916251 | **0,047903262** |
| EVENT DRIVEN | - | - | - | - | - | 0,600173444 | **0,014759256** |
| EMERGING MARKETS | - | - | - | - | - | - | 0,625940052 |
| CONVERTIBLE ARBITRAGE | - | - | - | - | - | - | - |

## Appendix 1

Information on hedge fund strategies accordingly with Martellini, Bied and Amenc [2002]

*Convertible Arbitrage*: Attempts to exploit anomalies in prices of corporate securities that are convertible into common stocks (convertible bonds, warrants, convertible preferred stocks). Convertible bonds tend to be under-priced because of market segmentation; investors discount securities that are likely to change types: if issuer does well, convertible bond behaves like a stock; if issuer does poorly, convertible bond behaves like distressed debt. Managers typically buy (or sometimes sell) these securities and then hedge part of or all of associated risks by shorting the stock. Delta neutrality is often targeted. Over-hedging is appropriate when there is concern about

default as the excess short position may partially hedge against a reduction in credit quality.

*Emerging Markets*:  Invests in equity or debt of emerging (less mature) markets that tend to have higher inflation and volatile growth. Short selling is not permitted in many emerging markets, and, therefore, effective hedging is often not available, although Brady debt can be partially hedged via U.S. Treasury futures and currency markets.

*Equity Market Neutral*: Hedge strategies that take long and short positions in such a way that the impact of the overall market is minimized. Market neutral can imply dollar neutral, beta neutral or both.
– Dollar neutral strategy has zero net investment (i.e., equal dollar amounts in long and short positions).
– Beta neutral strategy targets a zero total portfolio beta (i.e., the beta of the long side equals the beta of the short side). While dollar neutrality has the virtue of simplicity, beta neutrality better defines a strategy uncorrelated with the market return.
Many practitioners of market-neutral long/short equity trading balance their longs and shorts in the same sector or industry. By being sector neutral, they avoid the risk of market swings affecting some industries or sectors differently than others.

*Event Driven*: corporate transactions and special situations
– Deal Arbitrage (long/short equity securities of companies involved in corporate transactions)
– Bankruptcy/Distressed (long undervalued securities of companies usually in financial distress)
– Multi-strategy (deals in both deal arbitrage and bankruptcy)

*Fixed-Income Arbitrage*: Attempts to hedge out most interest rate risk by taking offsetting positions. May also use futures to hedge out interest rate risk.

*Global Macro*: Aims to profit from changes in global economies, typically brought about by shifts in government policy that impact interest rates, in turn affecting currency, stock, and bond markets. Participates in all major markets – equities, bonds, currencies and commodities – though not always at the same time. Uses leverage and derivatives to accentuate the impact of market moves. Utilizes hedging, but the leveraged directional investments tend to make the largest impact on performance.

*Long/Short Equity*: Invests equally in long and short equity portfolios generally in the same sectors of the market. Market risk is greatly reduced, but effective stock analysis and stock picking is essential to obtaining meaningful results. Leverage may be used to enhance returns. Usually low or no correlation to the market. Sometimes uses market index futures to hedge out systematic (market) risk. Relative benchmark index is usually T-bills.

Figure 1: EDHEC seven different Strategies

Monthly Returns (%)

EDHEC Equity Market Neutral
EDHEC Event Driven
EDHEC Long/Short Equity
EDHEC Emerging Markets
EDHEC Global Macro
EDHEC Convertible Arbitrage
EDHEC Fixed Income Arbitrage

Figure 2: CSFB/TREMONT Hedge Fund Index seven different Strategies