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Hedge Fund Indices: Investable, Non-Investable and Strategy Benchmarks

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In the mutual fund industry, which is based on a passive investment approach, and where respecting the tracking error is an inevitable notion, the use of indices is necessary in order to play on exposure to the market. In the hedge fund universe, where it is frequently said that performance is extracted from managers, reflecting active asset management, the implementation of hedge fund indices may be surprising, because the notion of index is commonly associated with the notion of passive management.

However, picking the best performers in the hedge fund universe appears to be a very challenging task. Hedge funds tend to be extremely secretive about their performance and their investment strategy, making it very difficult for investors to differentiate between returns explained by the style of the fund (i.e. beta drivers) and returns generated by the skill of the manager (i.e. alpha drivers). On the other hand, according to different academic studies (for example Naik and Agarwal (2000), or Ko, Ko and Teo (2004)) the existence of performance persistence is not well-established. In an attempt to rationalise the whole investment process, institutional investors increased pressure on the industry to provide them with hedge fund benchmarks at the beginning of the 90s.

Traditional performance measures such as the Sharpe ratio do not account for hedge fund risks (e.g. exposure to multiple risk factors, extreme risks, etc.). In other words, traditional performance indicators cannot inform investors about hedge funds' risk-adjusted performance. For this reason, investors turned to multi-factor models to measure hedge fund alphas. Unfortunately, traditional multi-factor models also fail to properly account for the specific characteristics of hedge funds (e.g. dynamic and non-linear exposure to risk factors). Building on Glosten and Jagannathan's (1994) contingent-claim-approach, some attempts have been made to capture hedge funds' non-linear exposure to risk factors through the use of options. However, though theoretically robust, these models are characterised by high model risk (i.e. problem of misspecification). A practical alternative to this approach consists of using factors embedding hedge funds' original risk characteristics. Hedge fund indices therefore appeared to be ideal candidates to serve as pseudo-risk factors. Such models must however be handled with care. Investors have to bear in mind that the relevance of the results strongly depends on the quality of inputs.

In this respect, the development of *peer indices* (i.e. non-investable indices) has been a strong response to the need of investors for a better understanding of hedge fund performance. A multitude of "boutiques" specialised in hedge funds (HFR, CSFB/Tremont, MAR/Hedge, etc.) have launched their own indices relying on different databases (HFR, TASS, MAR/Hedge, etc.), following varying construction methodologies and diverse management principles. Furthermore, it is worth noting that index providers have themselves made considerable efforts towards increasing their own level of transparency. Some of them now dispose of an independent index committee, and most of them publish the composition and the details of the construction methodology on dedicated websites.

More recently, firms specialized in hedge funds accompanied by respected traditional financial institutions (e.g. S&P, MSCI, Dow Jones, FTSE) have launched series of investable hedge fund indices offering investors a low-cost solution compared to funds of hedge funds (henceforth FoHF) to gain exposure to hedge

fund strategies. Generally based on platforms of separate accounts rather than on hedge fund databases, this new generation of indices has been able to provide investors with improved liquidity (up to weekly) and increased transparency (i.e. managed accounts allow for full transparency and daily pricing). In addition, for all these indices, the composition, construction methodology and management principles are overseen by an independent committee and disclosed to the public. The success of these indices was almost immediate and assets managed by investment vehicles linked to these indices rapidly reached 10 billion dollars.

In Anson (2003), the author highlighted the demand of institutional investors for relative returns. After an overview of hedge fund indices, the author concluded that the alternative industry is still maturing, and that hedge fund indices are not good indices since they provide investors with a somewhat confusing picture of the performance of hedge fund strategies. He thus suggested that investors pay particular attention to the adequacy of the index characteristics, and the investor's objective. In the meantime, however, index providers have improved their construction methodology and management principles. In parallel, new series of investable hedge fund indices have been launched. Our contribution will thus be to revisit the issue of hedge fund strategy benchmarks in light of these new elements, and answer the question that what implicitly asked in Anson (2003) but could not be answered by the author due to lack of elements. Can investors in the alternative arena measure the relative return of hedge funds? In other words, can investable and/or non-investable hedge fund indices provide investors with useful tools for performance measurement?

This study proposes an overview of hedge fund strategy benchmarks, on the basis of academic studies, the points of view of practitioners and documentation from index providers. The remainder of the article is organized as follows. The first section discusses the relation between purposes and requirements. The second section gives an overview of "non investable" hedge fund indices while the third section examines the latest industry development, namely "investable" hedge fund indices.

Section 1: The relation between purposes and requirements

Two distinct purposes have to be distinguished: an index can be used as a yardstick for investments in specific styles, instruments or locations; or it can be used as an investment vehicle. Each purpose is associated with some construction requirements. Indices that act as yardsticks have to be unambiguous, verifiable, accountable and representative, while indices that act as investment vehicles have to be unambiguous, verifiable, accountable, investable and reasonable.

- An index is unambiguous when all funds are specified with regard, for example, to their weight in the index, style, or general partner.
- An index is accountable when the guidelines are submitted to an independent committee.
- An index is reasonable when its constituents are compatible with the investor's requirements, for example in terms of risk.
- An index is verifiable when the construction methodology is publicly available.
- An index is representative when it accurately reflects the whole universe of hedge funds, or a universe focused on a particular style.
- An index is investable when the investors are able to replicate the index by reaching and maintaining a certain level of tracking-error.

The requirements appear to be very challenging. Concerning representativity, some managers do not agree to their fund's characteristics being included in the databases, because they are not seeking new investors, or because of poor performance. A whole segment of the universe is thus unobservable, posing some problems when it comes to assessing the representativity dimension.

On the other hand, reasonableness and investability are subjective attributes of a good index, because they depend on the specific preferences of each investor: the required levels of tracking-error and risk vary among investors. Investability will suffer on the one hand from the low liquidity of the funds that make up the index (e.g. some of them have long lock-up and/or redemption periods, limited extra capacity, others are closed to new investments, etc.), and on the other hand from high transaction costs caused by the turnover of the index composition, which will generate *ipso facto* a high level of tracking error.

Similarly, as mentioned by Grosvenor (2004), unambiguity can be viewed on two levels. Firstly, users can have access to the names of the funds that are constituents of an index. This is the case of an increasing number of indices (e.g. S&P, CSFB/Tremont, etc.). Secondly, users can have access to information regarding the managers (e.g. biographies), and the fund (e.g. strategy description or assets under management). This is the case for very few indices (e.g. MSCI indices). For an index focusing on a particular strategy, some funds are ambiguous because they follow a multi-strategy approach. A modification of the strategy followed can also occur. This phenomenon is often referred to as the style drift bias (see for example Lhabitant (2001)).

Whereas providers may pursue the same goal, for example the design of a benchmark for hedge fund strategies, the difficulty in reaching all the attributes can lead them to choose a compromise between the requirements. The importance that is given to each attribute is liable to differ. It is important to distinguish between the different purposes of indices, because it is challenging to achieve compatibility for example between representativity and investability. The notion of an all-in-one index which attains both representativity and investability simultaneously has to be handled very cautiously. To be representative, an easy way is to cover the whole universe or a whole strategy, including closed funds. Conversely, an investable index, defined by Anson (2003) as a “pool of hedge fund managers that represent the performance that may be accessed through investment”, must include open funds only, and a fund has to be removed when it closes. In the end, however, finding an optimal trade-off between representativity and investability is essential to respond to investors’ needs for *quality* benchmarks.

The construction of an appropriate benchmark is one of the major challenges of the performance measurement process. Without *quality* benchmarks, it is not possible to differentiate between returns due to the investment style of the manager and returns due to the talent of the manager, which in turn makes it difficult to measure relative returns. While a good index is above all an index that is representative of its investment universe, a *quality* benchmark is above all representative of an investor’s risk profile. It should be noted that in some cases, an index may be used as a benchmark if the manager is following a strategy that is closely linked to this index. In most cases, however, the strategy benchmark (cf. Kuenzi (2003)), i.e. the strategic asset allocation of the manager, will differ from the one of the most widely available commercial indices. For those managers, indices cannot be good benchmarks. Benchmarks that are representative of their specific risk profile will thus have to be customised. As highlighted by Sharpe (1992), the style analysis can be used to construct such benchmarks as long as style indices are collectively exhaustive and mutually exclusive. In practice, investors are somewhat reluctant to use non investable solutions as benchmarks. A *quality* benchmark must thus be investable and provide investors with a solution offering a low tracking error versus their strategy benchmark, which implies that indices used in the style analysis must be both representative and investable. As a consequence, constructing *quality* benchmarks is not a trivial task.

Section 2: An overview of non-investable hedge fund indices

The creation of hedge fund indices is justified by the fact that investors are faced with a lack of transparency and the complexity of the strategies. Their goal is to play the role of a lighthouse for the investment policy of investors. Nevertheless, the notion of index in the alternative arena has to face theoretical shortcomings, and there are numerous practical challenges to cope with when constructing it.

2.1. Theoretical shortcomings

As explained by Duc (2004), the aim of hedge funds is to generate absolute performance based mainly on manager skill in an active management process. In the traditional universe, the differences in returns come from the instruments in which the capital is invested, e.g. bonds as opposed to stocks. As highlighted by Fung and Hsieh (1997) hedge fund returns differ not only because of the underlying assets (i.e. Location), but also because of the strategies applied (i.e. Strategy Factors, like leverage or long/short bias). The traditional universe is based on a buy-and-hold strategy, while dynamic strategies are employed in the hedge fund universe. That is why introducing hedge funds into a traditional portfolio allows it to be diversified. Nevertheless, if managers have the constraint of replicating an index (in other words, a weighted-average performance of the hedge fund universe), this is contrary to the idea of absolute returns engendered by manager skill. The constraint of benchmarked management prevents the hedge fund manager from exploiting his main source of performance, namely his management skills focused on particular strategies. On the other hand, as stressed by Liew (2003), the growth in assets managed in the alternative arena is accompanied by a decrease in the average “quality” of hedge fund. Indeed, there is an increasing proportion of hedge funds posting negative returns.

In the traditional universe, the current attitude of managers in the context of a bear market is to say that even if their performance is negative, it is better than that of the index, but this kind of attitude is contrary to the initial aim of generating alpha. Hedge funds are expected to produce absolute returns i.e. returns that are uncorrelated with traditional stock and bond indices. Their performance should thus be positive, in both down and up markets.

Finally, from an evaluation perspective, using peer indices to measure the performance of alternative investment also raises a few questions (see for example Bailey (1992)). As will be seen further in this section, hedge fund indices are severely affected by several performance measurement biases. Moreover, hedge fund indices are made up of managed funds. As a result, hedge fund indices embed both alternative betas, and to a certain extent, alternative alphas. It is thus difficult to use them as yardsticks since they make it difficult to differentiate between “normal” returns (i.e. beta drivers) and abnormal returns (i.e. alpha drivers or manager skill).

2.2. Practical challenges

In addition to theoretical shortcomings, the construction of a good index has to cope with several practical challenges, which are mainly related to its required characteristics, the numerous biases impacting the displayed performance downwardly or upwardly, and the weighting schemes. As pinpointed by Fung and Hsieh (2000), some of these biases are inherent to the very nature of the alternative industry (i.e. “natural biases”) while some others are due to the way information is processed (i.e. “spurious biases”). We will take a closer look at these issues in the remainder of this sub-section.

2.2.1. Performance measurement biases

2.2.1.1. Selection bias

Since hedge fund managers have no disclosure requirements and the inclusion of a fund is a voluntary manager decision, only funds with good performance want to be included in a database. The performance calculated by databases thus tends to be overstated relative to the actual universe performance. Another upward bias comes from the fact that some funds prefer to stop reporting to a database just before going bankrupt (e.g. liquidation or termination bias). Extremely bad returns generally recorded the weeks before they cease their operations are thus not observable. However, these upward biases are potentially mitigated by managers who have performed well but do not want to publish their performance because they have reached their goal in terms of assets under management. As a result, they do not need to attract new investors. The net effect is what is generally referred to as self-selection bias.

Moreover, the criteria for inclusion in a database are not the same among data vendors (see Illustration 1 below). As a result, the investment universes covered by the different hedge fund indices are not the same, which in turn, leads to potential performance discrepancy.

The main consequence of selection biases is that investment universes covered by the different databases are not identical. In this respect, Fung and Hsieh (2003) highlighted the fact that the number of funds that are common to the different data vendors is relatively low. In December 2000, HFR had about 1,150 funds, TASS 1,060 funds and MAR 910 funds, but only 315 funds were contained in the three databases. Consequently, if a database has a particular concentration of hedge funds that perform well, an upward bias will occur. Duc (2004) found evidence of the same. The percentage of common funds between two indexes varies around 50% as of November 2003 (here the providers are Altvest, CISDM-MAR, Barclays, Hedgefund.net, HFR and TASS). If we consider the funds that are only constituents of one index, it ranges between 14% (CISDM-MAR) and 23% (Altvest). This increases the risk of sampling bias. Unfortunately the net effect of this bias is unaccountable since the investment universe is by definition unobservable. The net effect is generally referred to as the selection bias. Database managers are trying to reduce the impact of this bias by increasing the size of their database in order to converge to the whole investment universe.

Illustration 1: Selection Criteria of the Major Non-Investable Hedge Fund Indices

Index Providers	Minimum Size	Track Record	Defunct Funds[1]	Funds Closed to New Investors[2]
Altvest	No	No	Yes	Yes
Barclay	No	No	Yes	Yes
CISDM	No	No	Yes	Yes
CSFB	10mn USD	1 year	Yes	Yes
EACM	20mn USD	2 years	No	No
Hennessee	10mn USD	1 year	Yes	Yes
HF Net	No	No	No	Yes
HFR	No	No	Yes	Yes
MSCI	15mn USD	No	Yes	Yes
Van Hedge	No	No	Yes	Yes

1 This involves funds that no longer communicate their results to a database for one reason or another (bankruptcy, merger with another fund, fund closed to new investors, etc.). If the past performances of defunct funds are retained in the index history the answer is “Yes”; if they are excluded from the index history the answer is “No.”

2 If the funds that are closed to new investment are included in the index the answer is “Yes”; otherwise the answer is “No.”

Source: Edhec Risk

2.2.1.2. Survivorship bias

Survivorship bias occurs if the database only contains information on ‘surviving funds’. Surviving funds are those that are in operation and report information to the database vendor at the end of the data sample. The opposites of these are defunct funds. They stop reporting to the database because of bankruptcy, liquidation or any other reason (e.g. merger). Good funds that close generate a downward bias, while bad funds that fail generate an upward bias.

The magnitude of the survivorship bias basically depends on two parameters, namely 1/ the attrition rate (i.e. percentage of funds that stop reporting to a database every year), and 2/ the average return difference between surviving and defunct funds. As highlighted in Brown, Goetzmann and Park (2000) 50% of the funds in existence for at least six months terminate within the next two years, and less than 5% of all funds survive after five years. The attrition rate is thus of major concern in the alternative arena. In this respect, it is worth noting that the level of the attrition rate depends on the way information is collected by the database manager. As stressed in Liang (2000), TASS tends to be more proactive in that they tend to contact newly launched funds for inclusion in the database, while HFR tends to be more reactive and generally includes funds that have demonstrated interest in reporting their performance. As a result, it is shown that the TASS database turns out to have a higher attrition rate, and thus a higher survivorship bias than HFR.

Estimations of survivorship bias range from -1.32% to 6.67%, depending on the observation period, the sample or even the definition used to calculate the survivorship bias (see Illustration 2). Estimations made in Fung and Hsieh (2000) and Goetzmann and Ibbotson (1999), respectively 3% and 2.75%, are the most frequently used estimations in studies on hedge fund performance.

Illustration 2: Estimations of the Survivorship Bias in the Literature

Reference	Database	Observation Period	Sample (all funds / defunct funds)	Procedure	Estimated Bias (in annual % terms)
Ackerman et al. (1999)	HFR & MAR	1988-1995	547 / 146	A	0.16
Amin & Kat (2003)	TASS	1994-2001	1721 / 526	B	1.77
Anjilvel et al. (2000)	FRM	1990-2000	1130 / n.m.	A	2.20
Baquero et al. (2004)	TASS	1994-2000	1797 / 612	A	2.11
Bares et al. (2001)	FRM	1996-1999	2308 / 131	A	1.30
Barry (2003)	TASS	1994-2001	2208 / 1272	A	3.70
Brown et al. (1999)	US Offshore Fund Directory	1990-1996	395 / 65	A & B	A: 2.75 & B: 0.75
Capocci et al. (2004)	HFR & TASS	1994-2000	2796 / 80	A & C	A: 1.22 & C: 6.67
Darst (2000)	MAR	1995-1999	2202 / n.m.	C	1.15
Das (2003)	ZCM	1989-2000	2467 / n.m.	A & B	A: 2.16 & B: -1.32
Edwards & Caglayan (2001)	MAR	1990-1998	1665 / 496	A	1.85
Edwards & Liew (1999)	MAR	1982-1996	1456 / n.m.	A	1.91
Fung & Hsieh (2000)	TASS	1994-1998	1722 / 602	A	3.00
Kazemi et al. (2002)	n.m.	1998-2000	n.m. / n.m.	A	2.17
Liang (2000)	HFR TASS	1993-1998	HFR: 1162 / 110 TASS: 1627 / 426	A	HFR: 0.39 TASS: 2.24
Liang (2003)	ZCM	1994-2001	2357 / 1193	A	2.32

A All funds versus surviving funds at the end of the sampling period

B All funds versus surviving funds until the end of the sampling period

C Surviving funds versus defunct funds

Source: Edhec Risk

To reduce the impact of this bias, some database managers are maintaining records on “surviving” and defunct funds (this part of the database is often referred to as the hedge fund graveyard).

2.2.1.3. Instant history bias

Instant history bias (or backfill bias) is the consequence of adding a hedge fund whose earlier returns are backfilled between the inception date of the fund and the date it enters the database. Again, different databases will handle this issue differently, and as a result, the impact of this bias will depend on the index provider. As illustrated in the following table, estimations range from 0.05% to 4.20%, depending on observation periods, samples and the length of the incubation periods (see Illustration 3). Again, the estimation in Fung and Hsieh (2000), namely 1.4% per year, is often referred to in hedge fund performance studies.

Illustration 3: Estimations of the Instant History Bias in the Literature

Reference	Database	Observation Period	Sample (all funds / defunct funds)	Incubation Period	Estimated Bias (in annual % terms)
Ackerman et al. (1999)	HFR & MAR	1988-1995	547 / 146	24	0.05
Barry (2003)	TASS	1994-2001	2208 / 1272	12	1.40
Brown et al. (1997)	TASS	1977-1996	1230 / 138	27	3.60
Capocci et al. (2004)	HFR	1984-2000	2796 / 801	12 / 24 / 36 / 60	0.96 / 2.76 / 3.48 / 4.20
Edwards & Caglayan (2001)	MAR	1990-1998	1665 / 496	12	1.17
Fung & Hsieh (2000)	TASS	1994-1998	1722 / 602	12	1.40
Posthuma & van der Sluis (2004)	TASS	1996-2002	3580 / n.m.	*	4.35

*Depends on funds

Source: Edhec Risk

To reduce or avoid this bias some index providers do not backfill returns. Others, however, continue to backfill a few months (e.g. 4 trailing months for HFR) or the full history (e.g. HF Net). Returns obtained from these providers should thus be handled with care.

2.2.1.4. Short history bias

Fung and Hsieh (2004) argue that the short history of data prevents the impacts of varying market environments on hedge fund performance from being evaluated. Starting in the 90s, reliable data mainly covers a bullish market. Using multi-factor models to construct pro formas of hedge fund strategies' systematic returns starting in 1927, Agarwal and Naik (2004) found some evidence that the short-term performance of hedge funds is misleading. Hedge funds' long-term systematic returns appear to be 34% lower on average than their short-term returns. Similarly, long-term volatility is higher by 47% and CVaR at 90%, 95% and 99% levels by respectively 100%, 60%, and 40% compared to short-term measures.

On the other hand, performance studies often require funds to be operating through the whole observation period or at least impose a minimum track record length so that funds can be considered in the sample. As a result, many funds may be dropped from the sample, causing bias. This data conditioning bias is often referred to as multiple periods sampling bias. Estimations of this bias range from 0% to 0.60% a year depending on the observation period, the sample and the constraint imposed on the length of the minimum track record (see Illustration 4).

Illustration 4: Estimations of Multi-Period Sampling Bias in the Literature

Reference	Database	Observation Period	Sample (all funds / defunct)	Incubation Period	Estimated Bias (in annual terms)
Ackerman, McEnally & Ravenscraft (1998)	HFR & MAR	1988-1995	547 / 146	Varying length	Insignificant
Edwards & Caglayan (2001)	MAR	1990-1998	1665 / 496	12 / 24 versus 36	0.29% / 0.32%
Fung & Hsieh (2000)	TASS	1994-1998	1722 / 602	36	0.60%

Source: Edhec Risk

2.2.2. Index weighting and rebalancing

According to Fung and Hsieh (2003, 2004), to maintain an equally-weighted portfolio, a contrarian strategy has to be followed. This consists of selling the funds that outperform their peers, and, conversely, in buying the funds that underperform their peers. However, in terms of benchmarked management, it signifies that winners are sold and losers are bought, which is a strange strategy for a manager who wants to perform well. In addition, equal weighting is absolutely not representative of the market composition where more than 75% of the capital is concentrated in less than 25% of the funds. In the light of this right-skewed distribution of the capital among funds, an equally-weighted index appears to be somewhat inappropriate.

Conversely, when an index is value-weighted, a momentum strategy is followed. Better funds will have an increasing weight in the index. This reflects the market impact of the different funds more accurately, according to their size and their performance. Furthermore, if the investor wants to compare the performance of the hedge fund universe with the performance of the traditional universe, a value-weighting scheme presents the advantage of also being used in traditional indices like the S&P 500 and the Russell 1000. However it engenders more capital coming from investors following the index and it has to be considered under the constraint of the limited capital capacity of the hedge funds. Consequently, a value-weighted index suffers from the fact that successful hedge funds usually close to new capital and stop reporting. Additionally, value-weighted schemes do not take the leverage used by the managers into account. Finally, information on assets under management is rarely provided on a real-time basis. Value weighted indices are thus prone to timeliness issues and often have to estimate lacking data. Errors and/or estimation of errors in reporting can thus introduce some distortions.

When the index is rebalanced, the portfolio also has to be rebalanced. This involves selling when the index removes a fund and buying when the index adds a fund, but it is very challenging to track the index replacements under the constraints of lock-up periods, the lack of synthetic substitutes and transaction costs.

As can be seen from Illustration 5, there is no consensus on either the best weighting scheme or the optimal rebalancing frequency.

Illustration 5: Overview of Major Non-Investable Hedge Fund Indices

Index Provider	Launch Date	Base Date	Index Weighting	Nbr of Funds in the Database	Nbr of Funds in the Indices	Rebalancing Frequency
Altvest	2000	1993	E.W.*	2600	2600	Monthly
Barclay Group	2003	1997	E.W.*	2450	2053	Monthly
CISDM	1994	1990	Median	2300	+1280	Monthly
CSFB/Tremont	1999	1994	V.W.**	3300	431	Quarterly
EACM	1996	1996	E.W.*	100	100	Annual
Edhec	2003	1997	P.C.A.***	n.a.	n.a.	Quarterly
Hennessee	1987	1987	E.W.*	3500	+690	Annual
HF Net	1998	1976 -1995 ⁺	E.W.*	+2300	+2300	Continual
HFR	1994	1990	E.W.*	2300	+1400	Monthly
MSCI	2002	2002	E.W.* & V.W.** **	1800	+1500	Quarterly***
Van Hedge	1994	1988	E.W.*	5400	+1300	Monthly

* E.W. stands for Equally Weighted

** V.W. stands for Value Weighted

*** P.C.A. stands for Principal Component Analysis

⁺ Depends on the strategy

** For the global indices

*** For inclusion and Monthly for the "reranking" of funds

Source: Edhec Risk

2.2.3. Sub-strategy definition

Since there is no standardisation in terms of categorisation and sub-strategy definition, each index provider constructs its own strategy classification. This explains why the number of sub-indices differs so widely among providers. At the end of 2003, Zurich provided 5 sub-indices, while MSCI provided over 190. In the same vein, CTA does not constitute an individual strategy in HFR, because it is included in the Macro strategy, while CTA is an individual strategy in CSFB/Tremont.

The notion of strategy drift involves a manager's discretionary change in investment strategy. In the hedge fund industry, this can generate large profits. Nevertheless, because there is no requirement to notify the index provider, this practice is problematical for indices that focus on a particular strategy. The criteria for inclusion in a strategy also differ. This explains why a fund can be alternatively included in different sub-indices among different providers. Moreover, the classification is a complicated task due to the fact that it is made on the basis of a description drawn up by the manager, as it appears in the offering documents. In some cases, the description is too sketchy or subject to interpretation to classify the fund with certainty in the relevant strategy. It can engender either a misclassification or the impossibility of the fund being included in the index, and in that case it introduces a bias in the representativity of the index.

In the case of composite benchmarks, i.e. benchmarks containing individual funds that follow different strategies, the problem of the sub-strategies also exists. Highlighting the heterogeneity in the composition of composite hedge fund indices, Grosvenor (2004) gives the example of the S&P Hedge Fund Index and the Hedgefund.net/Tuna Aggregate Average. While the first includes 40 funds covering three strategies, the second includes 4,500 funds covering 30 strategies. Additionally, the inclusion of FoHF in composite indices is not a

general rule. As a result, the weight of a particular strategy in a composite index can differ among providers: as of July 2003, about 7% of the funds were convertible arbitrage in the CSFB/Tremont Composite Index, 3.2% in the Hedgefund.net/Tuna Aggregate Index, and 37.5% in the S&P Composite Index (here S&P group together equity market neutral, fixed income arbitrage and convertible arbitrage).

2.3. Heterogeneity engendered

A potential consequence of the difficulties in constructing an index can be low correlation between the different indices (in terms of returns), even if they are designed to represent the same universe. The literature gives abundant examples of the heterogeneity engendered.

Amenc and Martellini (2003) use two methods to test the heterogeneity of returns. Firstly, it can be measured by the maximum difference in monthly returns. Secondly, it can be measured by the average and lowest correlation between various indices. Following the first method, from January 1998 to December 2000, it appears that the maximum differences range from 1.85% for Merger Arbitrage to 22.04% for Long/Short. Except for Merger Arbitrage, the level of the maximum differences is high, for example 17.80% for Global Macro, 19.45% for Emerging Markets and 21.20% for Short Selling. 7 of the 12 strategies studied exhibit their maximum difference between August and October 1998 (LTCM crisis), tending to indicate a more pronounced heterogeneity in periods of crisis. Following the second method, average correlation ranges from 0.43 (Equity Market Neutral) to 0.93 (Emerging Markets). The lowest correlation ranges from -0.19 between the EACM and Zurich Long/Short indices (here the two indices have a different net exposure!) to 0.88 for Merger Arbitrage, which is the strategy that displays the lowest maximum difference in monthly returns.

Similar results have been obtained in Kohler (2003) at the hedge fund universe level and in Grosvenor (2004) at the hedge fund strategies level. In this respect, Duc (2004) argues that the heterogeneity is significantly more pronounced in single strategy indices because they are smaller than composite indices. Consequently the impact of the misclassification of one fund is higher. Moreover, single strategy indices do not benefit from diversification of the biases across different strategies.

This evidence on the performance heterogeneity of hedge fund indices raises some questions regarding the meaningfulness of using hedge fund indices as yardsticks in the performance measurement process. Which series of indices should be selected, given that the results will strongly depend on this choice? Is there a right choice?

2.4. Alternatives to non-investable hedge fund indices

2.4.1. The FoHF Approach

Even if database vendors try to reduce the magnitude of the biases by correcting data, the impact of these corrections is not clearly evaluated. That is why a FoHF approach can be chosen.

According to Fung and Hsieh (2004), a FoHF database permits three biases to be mitigated: selection bias, survivorship bias and instant history bias. Concerning selection bias, even if a fund gives up reporting to databases, it is still included in the FoHF. Moreover, a FoHF can invest in a fund that has never reported to a database. Survivorship bias is reduced because the historical return of a fund that goes bankrupt or ceases operations remains in the historical return of the FoHF. The survivorship bias of 0.63% per year found by Amin and Kat (2002) for FoHF has to be compared to the bias of 3% per year found by Fung and Hsieh (2002) for individual funds. The low number of FoHF that cease to report to databases can be explained in three ways, as mentioned in Duc (2004):

- FoHF suffer to the lowest proportion from fluctuations in assets under management.
- FoHF are less subject to bankruptcy because the bankruptcy of one of its constituents does not imply the bankruptcy of the FoHF.
- FoHF have a greater capacity to absorb new investment. When a constituent closes, its weights will only diminish. However, in order to avoid a negative impact for existing investors, the FoHF manager can decide to restrict new cash inflows. In such cases, a twin is generally created to absorb new investments, and the manager of the closed FoHF continues to report to databases to promote the twin fund.

Instant history bias is mitigated because the past returns of a fund that has just joined a FoHF are not included. Moreover, FoHF are built to be launched rapidly onto the market and registered with databases. Fung and Hsieh (2000) estimate an instant history bias for FoHF of 0.7%, half that of individual hedge funds.

Consequently, it has been argued that FoHF databases give a “sufficiently qualitative representation” of the FoHF universe. The indices that are built on the basis of such databases thus provide a better estimation of the FoHF universe. Since FoHF invest in the hedge fund universe, it also gives a good representation of the universe of individual hedge funds. However, according to Duc (2004), the due diligence process conducted in FoHF eliminates the funds that suffer from structural problems. Those funds are mainly poor performers. This engenders an upward bias that impacts FoHF indices. On the other hand, the double-fee structure penalises the performance of FoHF. If it is considered that the costs engendered by manager research, due diligence, strategy allocation and risk management are superior to their positive impact on performance, a correction involves adding 2 points per year to the returns of FoHF. Liew (2003) shows that actively managed FoHF may make up for the disadvantage of their double-fee structure if their hit ratio lies above 70% (i.e. at least 70% of the selected

funds belong to the skilled group). FoHF managers have to be able to pick skilled hedge funds to justify the double-fee structure.

As a result, it is difficult to measure the “net” bias involved in FoHF; in other words, the result of the comparison between the upward bias engendered by the due diligence process and the downward bias engendered by the double-fee structure. What we can say, however, is that FoHF indices from different providers are again diversely impacted by biases. As illustrated in Amenc and Martellini (2003), the performance of FoHF indices is still suffering from significant heterogeneity. As a matter of fact, the maximum difference in monthly returns is 8.01% between the CISDM and Altvest FoHF indices in December 1999. Similarly, FoHF indices obtained a score of 12.43% in the heterogeneity index designed by the authors, which indicates that the performance of FoHF indices is more heterogeneous than that of Emerging Market, Event Driven or Merger Arbitrage indices. On the other hand, there is no FoHF index dedicated to specific strategies. It is thus not possible to use these indices as benchmarks for single hedge funds. While an index is supposed to be representative of an investment universe, a benchmark is expected to be representative of a manager’s risk profile. Unfortunately FoHF indices do not have the flexibility that would allow them to suit to a fund’s risk profile. As a result, FoHF indices can at best be good proxies for the market. On top of it should be noted that these indices are not investable.

2.4.2. The Index of Indices Approach

Given that it is impossible to come up with an objective judgment on the best existing index, a natural idea consists of using some combination of the different indices available on the market (henceforth referred to as competing indices) to reach a better understanding of what the common information about a given investment style would be. One straightforward method would involve computing an equally-weighted portfolio of all competing indices. Since competing hedge fund indices are based on different sets of hedge funds, the resulting portfolio of indices would be more exhaustive than any of the competing indices it is extracted from. The index of indices construction methodology pushes the logic one step further and consists of using factor analysis techniques to generate a set of indices that can be thought of as the best possible one-dimensional summaries of information conveyed by competing indices for a given style, in the sense of the largest fraction of the variance explained.

Technically speaking, this amounts to using the first component of a Principal Component Analysis (PCA) of competing indices. The coefficients of the first component are normalized so that they sum up to 1. The resulting coefficients are then used to construct portfolios of indices. It is thus possible to generate an index of indices for every single strategy. Note that the first component typically captures a large proportion of cross-sectional variations because competing style indices tend to be at least somewhat positively correlated. Indices of indices generated as the first component in a factor analysis have a built-in element of optimality, since there is no other linear combination of underlying indices that implies lower information loss.

As illustrated in Amenc and Martellini (2003), indices of indices are able to capture a very large fraction of the information that is common to the multitude of indices available on the market. The average percentage of variance explained by these indices is 79.12% (and the median percentage of variance explained is 81.12%) across all sub-universes. This percentage of variance is all the more significant in that the correlation between the competing indices is high. For example, Emerging Market style indices have a percentage of variance explained that is greater than 90% from a population of 7 competing indices. The mean correlation was almost 0.93 for Emerging Market indices. In the same vein, the Event Driven and Merger Arbitrage indices of indices capture more than 80% of the information originally available in a set of eight and four underlying indices, respectively. On the other hand, the percentage of information loss is higher in the case of Equity Market Neutral (41.09% = 100% - 58.91% information loss) and Fixed-Income Arbitrage (35% = 100% - 65% information loss). This is because these strategies were the ones for which the heterogeneity of information provided by competing index providers was the most extreme. The authors also tested for the representative qualities of indices of indices. To this end, they constructed equally-weighted portfolios for each of the strategies from a proprietary database made up of 7,422 funds (portfolios therefore contain more than 600 funds on average, and as a result are considered to be relatively representative of their management universe). They then calculated the correlation coefficient of those portfolios with the series of indices of indices over the period from January 1998 through December 2000. Indices of indices turn out to be systematically more correlated with the representative portfolios than the underlying indices entering into their composition, confirming that indices of indices are more representative than the different indices available on the market.

On the other hand, since underlying indices are affected differently by measurement biases, searching for the linear combination of underlying indices that implies a maximisation of the variance explained leads implicitly to a minimisation of the bias. As a result, the indices of indices tend to be less biased on average than the indices entering into their composition. One appealing side-effect is that indices of indices tend to be very stable over time, which in turn, makes it easier to replicate their performance (see Amenc et al. (2004)). Since they are on average more representative and less biased than the underlying indices they are made up of they are better indices than the latter. However, since the underlying indices are not directly investable, indices of indices are not investable either. Given the fact that they do not provide investors with a viable passive alternative, they cannot be used to customise quality benchmarks.

As a conclusion, non-investable hedge fund indices, as a result of their lack of representativity, tend to present a confusing picture of the performance of hedge fund strategies. To address this issue, and more generally to mitigate the impact of performance measurement biases, several approaches have been suggested. The FoHF approach addresses the problem of biases, but it is not appropriate for assessing the performance of single strategy funds, and it does not offer a viable passive alternative. FoHF indices cannot therefore be used to design quality benchmarks. The Index of Indices approach fixes the issue of representativity and mitigates, by construction, the effect of biases. It thus provides investors with interesting yardsticks to measure the performance of hedge funds. However, this approach does not provide a viable alternative to hedge fund investing. To address the investability issue, investable hedge fund indices have recently been launched.

Section 3: An overview of investable hedge fund indices

Many investors have neither the resources nor the knowledge to invest directly into hedge funds. As a result, many of them were compelled to delegate part of the due diligence process and risk management to third parties. The collection of information on hedge funds, as well as the fund selection process with quantitative and qualitative instruments, and the portfolio construction process (i.e. strategic and tactical style allocations) were thus transferred to FoHF. Adding to an appealing value proposition, FoHF made access to hedge funds easier with lower minimum investment barriers (e.g. a minimum investment barrier in the USD 10,000 range) and greater transparency (e.g. reporting documents disclosed on a regular basis by FoHF). The bulk of investors could thus benefit from FoHF managers experience and from the diversification effect inherent in diversified pools across managers and/or styles.

However, the FoHF approach is not a panacea. FoHF suffer from a double-fee structure due to the fact that management and performance fees must be added to the fees paid to the individual hedge fund entering into the composition of the FoHF. As mentioned earlier, to make up for their double-fee structure, FoHF managers have to present excellent fund picking ability (i.e. hit ratio superior to 70%). The challenge of selecting the top FoHF managers remains, because skill, experience and other factors vary across managers. As in the case of individual funds, the existence of FoHF performance persistence is still subject to controversy. As illustrated in Kohler (2003), in the TASS database, from the end of 1997 to the end of 1998, only 16 funds out of 48 remained in the top quartile. In other words, from one period to the next, a fund can drop from the top quartile to the bottom quartile.

Paying for portfolio construction and fund picking ability is expensive, especially when 1/ FoHF managers tend to concentrate their efforts on the fund selection process (see Edhec (2003)), and 2/ an overwhelming proportion of FoHF managers do not have any fund picking ability. To address these concerns, several financial institutions have launched series of passively managed FoHF. In an attempt to provide investors with a lower-cost solution for gaining exposure to hedge fund strategies, they proposed to reduce costs by limiting the asset allocation process to the choice of the index weighting scheme, and by eliminating funds that are prone to operational risks in the future rather than striving to select tomorrow's best performers. As a result, there is no attempt to allocate funds dynamically, and funds are selected through due diligence in order to reduce extreme risks due to operational issues (e.g. fraud, bankruptcy) rather than for their hypothetical future potential returns. As a result, both management and incentive fees tend to be significantly lower¹ for investable hedge fund indices than for FoHF.

The value proposition of investable hedge fund indices is significantly different from that of actively managed FoHF. It consists of: 1/ full transparency, 2/ initial and ongoing due diligence (see table below for further details) and 3/ investability (i.e. low entry level and high redemption frequency). It is worth noting that traditional houses like S&P, MSCI or Dow Jones have signed partnerships with separated account platform

¹ We must however note that licensing fees must be added to the management and incentive fees, making investable hedge fund indices less inexpensive than appears at first sight.

managers² and other third parties (e.g. due diligence consultants) to make up for their lack of experience in the alternative arena (see Illustration 6). As a result, with investable hedge fund indices, investors can take advantage of the diversification potential of hedge fund strategies at low cost without being concerned by the lack of transparency in the alternative arena, or their lack of understanding of alternative investment strategies.

Illustration 6: Pricing Frequency and Due Diligence Process of Major Investable Hedge Fund Indices

Index Provider	Pricing Frequency	Initial Due Diligence	Ongoing Due Diligence
CSFB/Tremont	Monthly	Performed by Tremont	Data is compared to audited results once a year. Only data that is statistically aberrant is subject to verification during the year. Apollo Capital Management verifies trades and reconciles managed accounts valuations on a daily basis. Daily: separated accounts are reviewed for adherence to leverage constraints, style purity and adherence to investment guidelines / Monthly: separated accounts are subject to a quantitative analysis (VAR and Correlation matrixes) / Quarterly: indices are subject to cluster and correlation analyses / Annually: each separated account and the platform as a whole are subject to an independent audit and background checks for each management firm are updated.
Dow Jones	Daily	Performed by Lyra Capital	
FTSE	Daily	Harcourt carries out full scale reviews and checks for manager eligibility	Daily risk monitoring and underlying valuation is carried out with the prime broker and hedge fund manager. The data on which calculations are based is independently valued by Derivatives Portfolio Management Ltd. (i.e. the administrator) and MSS Capital (i.e. the platform manager) for daily risk monitoring and management.
HFRX	Daily	Performed by HFR	Performed by HFR.
MSCI	Daily	Lyxor monitors the funds' capacity and liquidity. MSCI monitors in parallel the eligibility and classification of constituent funds	Lyxor monitors and controls the investment mandate of each fund on an ongoing basis. It also conducts regular pricing of underlying positions and fund NAVs. MSCI carries out full (quarterly) and partial (intra-quarterly) index reviews.
S&P	Daily	Albourne Partners is responsible for the administration of questionnaires and manager interviews	Derivatives Portfolio Management Ltd. (i.e. Administrator) and PlusFunds (the managed account platform) verify trades and reconcile the valuations of the funds' managed accounts on a daily basis.

Source: Edhec Risk

3.1. Theoretical shortcomings

Focusing on the theoretical shortcomings of investable indices, Muhtaseb (2003) weighs up whether hedge funds constitute an asset class or not. An initial approach is that, to be considered an asset class, hedge funds have to respect several criteria. For example, “prices and composition information are readily and constantly available”. This is not the case in the hedge fund universe. Another example is the “opportunity to invest passively meaningful amounts in the asset class at quoted prices”. Since a significant share of hedge funds are closed to additional investment, this criterion cannot be respected. Following a second approach, Greer (1997) defines three broad asset classes, namely capital assets, consumable/transformable assets and store of

² Most investable hedge fund indices are made up of separated or managed accounts. Capital is thus invested in the constituents of the investable index. Another approach consists of investing capital directly in the synthetic product, not in the funds that make up the replicated index. As stressed in Grosvenor (2004), while in the first approach counterparty risk is reduced by the fact that the introduction of a fund into the investable index is generally subject to a guarantee (e.g. USD 100 million in the case of the S&P Index), the investor is exposed to counterparty risk in the second approach.

value assets. None of these asset classes can be associated with hedge funds. This leads to the conclusion that, theoretically, investable indices of hedge funds cannot be produced.

Liew (2003) finds that skilled managers, i.e. managers exhibiting statistically significant alpha, represent less than one-third of hedge fund managers. Investing in a hedge fund index where a large and increasing share of the funds do not display alpha means that the investor accepts that the performance of the top performers will be reduced by that of the bottom funds. In other words, investing in index-linked products implies buying an investment vehicle with relatively low alpha and decreasing skewness, which is contrary to investors' preferences (see Scott and Horvath (1980)).

The remarks made for non investable hedge fund indices regarding the problems posed by indices made up of managed funds are also valid for investable hedge fund indices. Since the underlying separated accounts making up the indices are actively managed by hedge fund managers, they embed alpha and beta drivers. It is thus challenging to differentiate between the manager's investment style and the manager's talent, notwithstanding the fact that we may also have an "alpha" stemming from the determination of the index style mix (i.e. composite indices weighting schemes) and through the fund selection process, even though the fund screening does not aim to maximise return (i.e. not losing money by eliminating funds with a high probability of default is the first way to add value).

3.2. Practical challenges

3.2.1. Performance measurement biases

Concerning practical challenges, investable indices, because they are constructed from similar or identical databases, suffer from the same biases as their non-investable counterparts. However, since investable hedge fund indices are passively managed FoHF, the magnitude of these biases is expected to be smaller than for single hedge funds (see section 2 for more details on FoHF biases). Instant history bias and survivorship bias, for example, tend to be mitigated by the fact that in the case of bankruptcy or the addition of a fund, the track record of the investable hedge fund indices remains the same.

The selection bias, however, is of greater concern. In the case of investable hedge fund indices, the objective is not to maximise future returns but to limit extreme risks due to operational issues (e.g. bankruptcy, fraud). The selection criteria will thus depend on subjective views. What is a sound strategy? How should a high quality infrastructure be defined? What are the upper and lower capacity limits for the different strategies? etc. Investable hedge fund indices, like their non-investable counterparts, thus have specific selection criteria (see Illustration 7). Some investable index providers may also introduce a subjective parameter by satisfying investor requirements for a certain share of top managers in the construction of the index. As a result investable hedge fund indices will be diversely affected by the selection bias.

Illustration 7: Selection Criteria of the Major Investable Hedge Fund Indices

Index Provider	Selection Criteria
CSFB/Tremont	Member of the Original Index / Accepts new investments and redemptions / Initial investment > \$100 000 / Not a US domiciled hedge fund / No lock-up period / Monthly liquidity (entry & exit) / Advance notification of maximum 1 month except for event driven and convertible arbitrage (i.e., quarterly) / Meets the reporting criteria of the Original Index / one of the 6 largest funds in the eligible funds in all ten sectors.
Dow Jones	Separated account / AUM > \$50mn / Track record > 2 years / Leverage constraint depending on the strategy.
FTSE	(unleveraged) AUM > \$50mn / Track record > 2 years / Monthly liquidity & reporting / Independently audited financial statements / Open and accepting investor subscriptions / Sufficient remaining capacity / Fund must not be part of another index product / Hedge funds that do not belong to specialist interest strategies.
HFRX	Open for investment / daily transparency / pass extensive qualitative screening and due diligence.
MSCI	Pass due diligence / agree to offer frequent liquidity and sufficient capacity / agree with MSCI on the classification / funds should have other significant investors outside of those tracking the index.
S&P	Separated account / AUM > \$75mn / Track record > 3 years / Additional investment capacity > \$100 mn.

Source: Edhec Risk

3.2.2. Additional challenges

There is also, as for non-investable indices, the debate on the relevant weighting scheme. As can be seen from the following table, some index providers have opted for equal weighted indices (e.g. S&P) while others preferred value weighted (e.g. CSFB/Tremont) or “investability weighted” indices (e.g. FTSE). Again, there is no consensus on the best way to proceed (see Illustration 8). The same lack of consensus prevails concerning the adequate frequency of rebalancing. Some index providers prefer to react to new trends and allow for quarterly style rebalancing (e.g. MSCI, Dow Jones, HFR), while others favour stability and only rebalance the index on a semi-annual or annual basis (e.g. CSFB/Tremont, FTSE, S&P).

The number of indices also varies significantly among index providers. Investors thus have to make sure that the strategies represented in the composite index correspond to their specific needs. In this respect, we can note that the set of strategies will strongly depend on the funds contained in the managed account platform on which the index is based. On the other hand, methods of classification also vary among index providers. While some of them rely on cluster and other quantitative analyses (e.g. Dow Jones, HFR, S&P), others base their decision on the results of due diligence (e.g. FTSE). For the others, self-proclaimed styles are used and validated by index committees (e.g. CSFB/Tremont, MSCI).

An investable index has to be representative of the universe of funds that are available for new investors. Consequently, to be included in an investable index, or to remain in it, a fund has to be open and has to be liquid. However, there are limits on the funds under management. After collecting a defined level of investment capital, managers close funds to new investments. If an investable hedge fund index contains funds that become closed, a part of the investable index is not investable. Anson (2003) suggests that the limits on the assets under management are justified by the fact that for certain strategies, too large a size damages

performance. As stated in Grosvenor (2004), the hedge funds in the top tier generally have a limited capacity to accept new cash flows and limited liquidity. The capacity of a fund to absorb new investments is an important parameter for inclusion in an investable index. Closed hedge funds and additions of new funds seriously complicate the construction of the index, and affect the tracking error.

The relevant number of funds in an investable index is subject to discussion (see Illustration 8). A distinction has to be made between the providers who want to increase the number of funds in their investable indices to offer a better picture of the universe, and the providers who argue that a restricted number of funds is sufficient to give an accurate picture of the universe, based on the assumption of a strategy's pure representation. Such an approach must however be implemented with caveats. Firstly, due to manager skill, there is significant heterogeneity among funds that pursue the same strategy. The assumption of a strategy's pure representation implies that to obtain average skill, bottom-skilled managers are included to mitigate the excess skill engendered by top-performing managers. Such inclusion of low skilled managers contradicts the absolute return objective in the hedge fund universe. Secondly, the assumption of a strategy's pure representation is questioned by the replacement policy employed in the investable indices.

Finally, many hedge funds are involved in sophisticated transactions or trade exotic assets. With no standardized guidelines on position pricing, hedge fund managers or even fund administrators, prime brokers and managed account platform managers have to use proprietary valuation methods, which may cause significant heterogeneity in the way net asset values are calculated. This will, in turn, strongly impact the performance of the investable index. The only way to mitigate this bias is to increase the cooperation between hedge fund managers, third parties (e.g. administrators, prime brokers) and index providers to reach data standardisation.

Illustration 8: Overview of Major Investable Hedge Fund Indices

Index Provider	Base date	Launch date	Nbr of indices	Strategy / Fund Weighting	Nbr of Funds in Database / Eligible Universe	Nbr of Funds in the Index	Rebalancing Frequency
CSFB/Tremont	Jan.-00	Aug-03	10 + composite	V.W. / V.W.	3300 / 420	60	Semi annually
Dow Jones	Jan.-02	Nov-03	5	n.a. / E.W.	300 / 100	35	Quarterly *
FTSE	Jan.-98	Apr-04	11 + composite	I.W. / I.W.	6000 / 75	40	Annual * *
HFRX	Jan.-00	Mar-03	8 + composite	V.W / *	2300 / n.m.**	n.a.***	Quarterly
MSCI	Jan.-00	Jul-03	1*	Adj. Median Asset Weighted / E.W.	105 / n.m.**	97	Quarterly
S&P	Jan.-98	May-02	5 + composite	E.W. / E.W.	3500 / 300	40	Annual * * *

* Fund weightings are optimised to maximize correlation with their group

** n.m. stands for not mentioned

***Optimal number of funds for strategy replication is determined through Monte Carlo simulation

* Additions or deletions can occur without notice at the complete and absolute discretion of Dow Jones

* * Funds may be added/deleted more frequently in response to changing market conditions or fund-specific events

* * * Annual at the strategy level and periodically on the fund level

* The composite index is made up of a number of trading strategies depending on the underlying managed account platform

Source: Edhec Risk

3.3. Heterogeneity engendered

The heterogeneity of investable indices can be considered in three ways. Firstly, investable indices have different performance. Secondly, the different investable indices have very few managers in common. Thirdly, they are differently exposed to the strategies.

To illustrate the heterogeneity of performance, we have analysed the returns of the three composite indices that have been the most successful commercially, namely the S&P Hedge Fund Index, the MSCI Hedge Invest Index and the CSFB/Tremont Composite Index. As can be seen in the following table, while the S&P and CSFB/Tremont indices present similar levels of returns, the MSCI index tends to post higher average returns (i.e. 9.75% versus 7.70% and 7.55%). This result was achieved at the cost of a higher level of annual standard deviation (i.e. 3.17% versus 2.64% and 2.76%) and Value-at-Risk (i.e. 9.75% versus 7.70% and 7.55%). Interestingly, however, the MSCI index presents a lower level of annual semi deviation than the S&P indices and CSFB/Tremont, resulting in significantly higher Sortino and Omega ratios, respectively 12.66 versus 9.65 / 10.64, and 4.91 versus 3.30 / 3.10. On the other hand, the average level of correlation is only 0.77 between the three indices, due to a coefficient of 0.64 between the MSCI and CSFB/Tremont Indices. Similarly, the maximum monthly return difference is 2.24%.

Illustration 9: The Heterogeneity of the Major Composite Hedge Fund Indices (from January 2000 through September 2004)

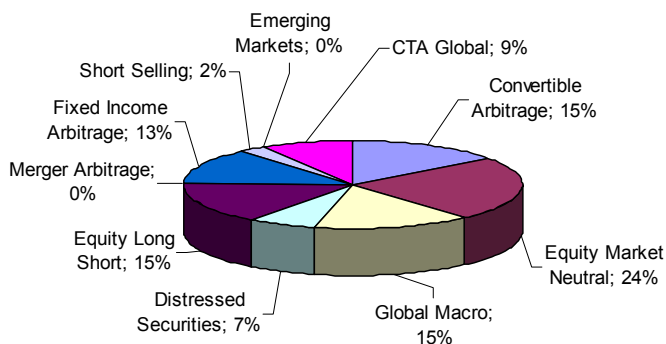
	S&P Hedge Fund Index	CSFB/Tremont Hedge Fund Index	MSCI Hedge Invest Index
Average Annual Return	7.70%	7.55%	9.75%
Min Monthly Return	-0.96%	-1.01%	-0.88%
Max Monthly Return	2.40%	2.71%	3.09%
% of Winning Months	78.95%	78.95%	75.44%
% of Losing Months	21.05%	21.05%	24.56%
Skewness	-0.01	0.47	0.27
Exc. Kurtosis	-0.46	0.06	-0.16
Annual Std Deviation	2.64%	2.76%	3.17%
Annual Semi Std Deviation	0.80%	0.72%	0.77%
VAR (95%)	7.70%	7.55%	9.75%
Sharpe Ratio	2.92	2.73	3.08
Sortino Ratio (3%)	9.65	10.54	12.66
Omega Ratio (3%)	3.30	3.10	4.91

Source: Edhec Risk

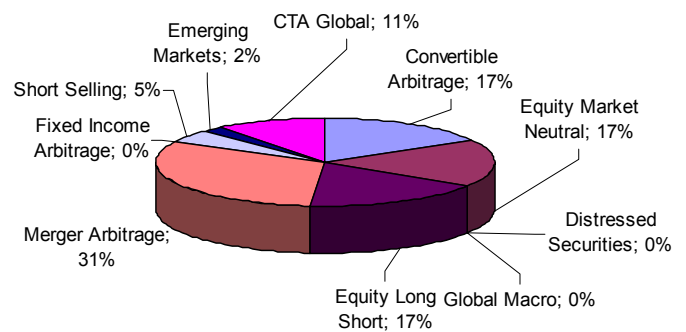
Concerning fund selection, Duc (2004) showed that out of the 159 funds contained in the S&P, CSFB/Tremont and MSCI composite indices, only 14 are part of at least two of these indices, and only 3 funds are common to all three indices. The heterogeneity of their components increases the heterogeneity of the investable indices and the impact of the heterogeneity of the components is strengthened by the fact that the number of funds contained in investable indices is lower than in non-investable indices.

Concerning the strategic exposures, we have implemented Sharpe's style analysis to determine the average style exposure of the composite indices (the results of a dynamic style analysis can be found in Appendix III). As is illustrated in the following graphics, the S&P/MSCI indices are almost perfectly balanced with exposures of 35%/34%, 37%/32%, 28%/34% respectively to Relative Value, Event Driven and Directional strategies. The CSFB/Tremont index, on the other hand, turns out to be severely biased towards Relative Value (52%) and Directional (41%) strategies. Event Driven strategies only account for 7% in this composite index. These results corroborate evidence found in Duc (2004) about the heterogeneity of indices style exposures. Note that such heterogeneity may have significant consequences in terms of diversification properties. Investors should thus pay particular attention to this issue before selecting one of these indices to gain exposure to hedge fund strategies.

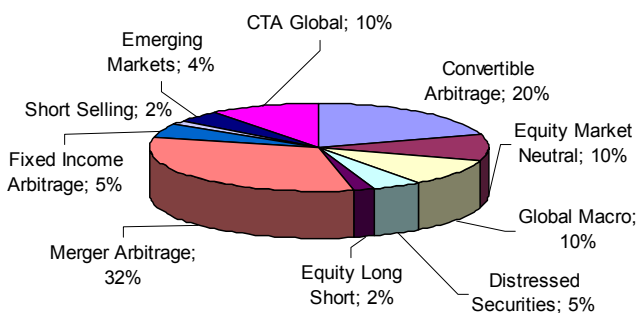
CSFB/Tremont Composite Index - January 2000 through December 2004



MSCI Hedge Invest Index - January 2000 through December 2004



S&P Hedge Fund Index - January 2000 through December 2004



3.4. An alternative approach to investable hedge fund indices: the Factor Replicating Portfolio approach

A consensual idea about representativity is that to maximise representativity an index has to cover the largest possible number of funds. From this simplistic angle, because representativity requires the inclusion of both open and closed funds, and since closed funds are excluded from investable indices because they are not investable, it seems impossible to obtain an investable index that is representative of its strategy. Under such an assumption investable indices are doomed to being FoHF only.

However, there is a different way to maximise representativity without covering the largest number of funds. A rigorous and innovative method that reconciles investability and representativity with a small number of funds has recently been proposed in Goltz et al. (2004). The construction methodology developed in this paper is based on the concept of Factor Replicating Portfolio (see Huberman, Kandel and Stambaugh (1987) for a formalization of the concept). Following Fung and Hsieh (1997), the authors try to identify implicit factors mimicking hedge fund strategies, through the use of Principal Component Analysis (PCA). They then try to replicate these factors with the following two-step approach:

- **Selection stage:** strategy by strategy, the 10 hedge funds that are most correlated with the first principal component are selected in sample. The selected funds will be the most representative of a given strategy.
- **Optimisation stage:** the weights of each fund are calculated so that the replicating portfolio returns' in-sample correlation with the corresponding principal component is maximised.

The selection phase is done on an annual basis and the optimization phases are carried out on an annual basis³. In-sample and out-of-sample correlations are greater than 0.95 for four strategies, namely Convertible Arbitrage, CTA Global, Event Driven and Equity Long/Short. It gives similar results to the average of non-investable indices, showing that investability was not obtained at the cost of representativity.

The relevance of such indices is strengthened by a conclusive robustness analysis, with regard to the number of funds (tests with 5 and 15 funds), the ranking of funds in the portfolios in terms of correlation with the first principal component (tests with 10 funds ranked after the 10th rank), the rebalancing of funds (tests without re-performing the selection stage each year, while the optimisation stage is repeated each year), the frequency with which the selection is performed and the optimisation stages (tests with a frequency of three months), and constraints on weights (weights constrained to be comprised between 5% and 20%). This confirms that representativity and investability can be achieved if both objectives are taken into account at the fund selection and portfolio construction levels.

³ To ensure the viability of this methodology, funds that suffer from style drift have to be eliminated to maintain a high level of correlation with the first principal component. A procedure has thus been developed to allow for intra-year substitutions of funds for which the coefficient correlation with the first principal component has significantly decreased over time.

Conclusion

An overview of the current literature on hedge fund indices leads to the observation that it is not an easy path to take. Hedge fund indices suffer from numerous theoretical shortcomings and practical challenges. In spite of these problems, a wide range of indices, both non investable and investable, is available on the market. Their characteristics can be very different among providers. Consequently, investors have to be very cautious when considering hedge fund indices. Both non-investable indices and investable index offerings suffer from heterogeneity, and from that angle the selection of one or the other will have significant consequences.

As stressed in this article, hedge fund indices are not created equal. While most of the indices available on the market fail to be representative of their investment universe, some of them succeed in providing investors with a true and fair representation of hedge fund strategies. This is the case of the “index of indices” approach introduced in Amenc and Martellini (2003) and Amenc et al. (2004).

However, disposing of representative indices is a necessary but not sufficient condition for constructing *quality* benchmarks. As mentioned in this article, investors are reluctant to use benchmarks that do not offer viable passive alternatives to actively managed funds, in the performance measurement process. To measure relative returns, they must thus dispose of indices that are not only representative but also investable. Unfortunately, the investable hedge fund indices available on the market turn out to be nothing more than passively managed FoHF, and fail, as a result, to be representative of hedge fund strategies.

To avoid investability coming at the cost of representativity, Goltz et al. (2004) recently proposed a methodology based on the concept of Factor Replicating Portfolios. These indices, made up of a limited number of single hedge funds, can be thought of as the best possible one-dimensional summaries of information conveyed by a variety of hedge funds following a given style, in the sense of the largest fraction of the variance explained. In other words, it is possible, provided that the representativity is taken into account at the selection and optimisation stages, to construct indices that are appropriate for the construction of *quality* benchmarks. As a conclusion, the answer to the question asked in Anson (2003) is ‘Yes’. It is now possible for investors to measure the relative returns of hedge fund strategies properly.

References

- Ackerman, Carl, McEnally, Richard, and David Ravenscraft, "The Performance of Hedge Funds: Risk, Return, and Incentives", *Journal of Finance*, Vol. 54, N°3, p.833-874, 1999.
- Agarwal, Vikas, and Narayan Y. Naik, "Multi-Period Performance Persistence Analysis of Hedge Funds", *Journal of Financial and Quantitative Analysis*, Vol. 35, N°3, p. 297-307, 2000.
- Agarwal, Vikas, and Narayan Y. Naik, "Risks and Portfolio Decisions Involving Hedge Funds", *Review of Financial Studies*, Vol. 17, N°1, p.63-98, 2004.
- Amenc, Noël, and Lionel Martellini, "The Brave New World of Hedge Fund Indices", *Working Paper*, Edhec Risk and Asset Management Research Centre, 2003.
- Amenc, Noël, Martellini, Lionel, and Mathieu Vaissié, "Indexing Hedge Fund Indexes", in *Hedge Fund Intelligent Investing*, ed. Barry Schachter, Publisher: RiskBooks, 2004.
- Amin, Gaurav S., and Harry M. Kat, "Welcome to The Dark Side: Hedge Fund Attrition and Survivorship Bias over the Period 1994-2001", *Journal of Alternative Investments*, Vol. 6, N°1, p.57-73, 2003.
- Anjilvel, Satish I., Boudreau, Bryan E., Peskin, Michael W., and Michael S. Urias, "Why Hedge Funds Make Sense", *Morgan Stanley Quantitative Strategies*, November 2000.
- Anson, Mark, "Benchmarking the Hedge Fund Market Place", *Journal of Indexes*, Third Quarter 2003.
- Asness, Clifford, Robert Krail and John Liew, "Do Hedge Funds Hedge?", *Journal of Portfolio Management*, Fall, Vol. 28, N°1, p.6-19, 2001.
- Bailey, Jeffrey, "Are Manager Universes Acceptable Performance Benchmarks?", *Journal of Portfolio Management*, Spring, Vol. 18, N°3, p.9-13, 1992.
- Baquero, Guillermo, Jenke Ter Horst and Marno Verbeek, "Survival, Look-ahead Bias, and the Persistence in Hedge Fund Performance", *Journal of Financial and Quantitative Analysis*, Forthcoming, 2004.
- Bares, Pierre-Antoine, Gibson, Rajna, and Sebastien Gyger, "Style Consistency and Survival Probability in the Hedge Funds Industry", *Working Paper*, University of Zurich, 2001.
- Barry, Ross, "Hedge Funds: A Walk through the Graveyard", *Working Paper*, Applied Finance Centre, Macquarie University, 2002.

Brooks, Chris, and Harry M. Kat, “The Statistical Properties of Hedge Fund Index Returns and their Implications for Investors”, *Journal of Alternative Investments*, Vol. 5, N°2, p.26-44, 2002.

Brown, Stephen J., William N. Goetzmann, and Roger G. Ibbotson, “Offshore Hedge Funds: Survival and Performance 1989-1995”, *Journal of Business*, Vol. 72, N°1, p.91-117, 1999.

Brown, Stephen J., William N. Goetzmann, and James Park, “Careers and Survival: Competition and Risk in the Hedge Fund and CTA Industry”, *Journal of Finance*, Vol. 56, N°5, p.1869-1886, 2001.

Capocci, Daniel P.J., Corhay, A., and Georges Hübner, “Hedge Fund Performance and Persistence in Bull and Bear Markets”, *Working Paper*, 2004

Credit Suisse First Boston, “Index Construction Rules”, 2002.

Darst, E.M., Performance Evaluation for Alternative Investments: The Effects of Firm Characteristics and Fund Style on the Performance of Hedge Funds”, Harvard University, *Senior Thesis*, 2000

Das, Nandita, “Development of an Analytical Framework for Hedge Fund Investment”, *Working Paper*, 2003

Duc, François, “Hedge Fund Indices: Status Review and User Guide”, *Alternative Asset Advisors*, January 2004.

Caglayan, Mustafa Onur, Edwards, Franklin R., “Hedge Fund and Commodity Fund Investments in Bull and Bear Markets”, *Journal of Portfolio Management*, Vol. 27, N°4, p. 97 – 108, 2001

Fung, William and David A. Hsieh, “Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds”, *Review of Financial Studies*, Summer, Vol. 10, N°2, p. 275-302, 1997.

Fung, William, and David A. Hsieh, “Performance Characteristics of Hedge Funds and Commodity Funds: Natural Versus Spurious Biases”, *Journal of Financial and Quantitative Analysis*, Vol. 35, N°3, p. 291-307, 2000.

Fung, William, and David A. Hsieh, “Hedge Fund Benchmarks: Information Content and Biases”, *Journal of Alternative Investments*, Vol. 58, N°1, p. 22-34, 2002.

Fung, William, and David A. Hsieh, “Benchmarks for Alternative Investments”, *The Security Analysts Association of Japan*, March 2003.

Fung, William, and David A. Hsieh, “Hedge Fund Benchmarks: A Risk Based Approach”, *Financial Analyst Journal*, Vol. 60, N°5, p. 65-80, 2004.

Glosten, Lawrence and Ravi Jagannathan, 1994, A Contingent Claim Approach to Performance Evaluation, *Journal of Empirical Finance*, Vol. 1, p. 133-160.

Goltz, Felix, Martellini, Lionel, and Mathieu Vaissié, “Hedge Fund Indices from an Academic Perspective: Reconciling Investability and Representativity“, *Working Paper*, Edhec Risk and Asset Management Research Centre, 2004.

Greer, Robert J., “What Is An Asset Class, Anyway?”, *Journal of Portfolio Management*, Vol. 23, N°2, p. 86-91, 1997.

Grosvenor Capital Management, “Composite Hedge Fund and Fund of Funds Indices Performance Benchmark Review”, February 2004.

Hubermann, Gur, Shmuel Kandel and Robert F. Stambaugh, “Mimicking Portfolios and Exact Arbitrage Pricing”, *Journal of Finance*, Vol. 42, N°1, p. 1-9, 1987.

Kazemi, Hossein B., Schneeweis, Thomas, and George Martin, “Understanding Hedge Fund Performance: Research Issues Revisited - Part I”, *Journal of Alternative Investments*, Vol. 5, N°3, p. 6-22, 2002.

Ko, Francis, Winston T. H. Ko, and Melvyn Teo, “Asian Hedge Funds: Return Persistence, Style, and Fund Characteristics”, Working Paper, 2003.

Kohler, Adele, “Hedge Fund Indexing: A Square Peg in a Round Hole?”, *State Street Global Advisors*, June 2003.

Kündig, Olivier, Sonia Lodeiro, Peter Meier, and Andreas Ruckstuhl, “Funds Of Hedge Funds Indices: Properties, Purpose and Representativeness”, *Institut Banking & Finance*, 2004.

Kurdas, Chidem, “Benchmarking: What Hedge Fund Indexes Can and Cannot Do”, *Tremont Capital Management Inc.*, 2004.

Lhabitant, François-Serge, “Assessing Market Risk for Hedge Funds and Hedge Funds Portfolios”, *Journal of Risk Finance*, Spring, Vol. 2, N°4, p. 1-17, 2001.

Liang, Bing, “Hedge Funds: The Living and the Dead”, *Journal of Financial and Quantitative Analysis*, Vol. 35, N°3, p. 309-326, 2000.

Liang, Bing, “On the Performance of Alternative Investments: CTAs Hedge Funds and Funds of Funds”, *Working Paper*, 2003.

Liew, Jimmy, "Hedge Fund Index Investing Examined", *Journal of Portfolio Management*, Vol. 29, N°2, p. 113-123, 2003.

Mahdavi, Mahnav, "Risk-Adjusted Return when Returns are not Normally Distributed: Adjusted Sharpe Ratio", *Journal of Alternative Investments*, Vol. 6, N°4, p. 47-57, 2004.

McFall Lamm, R., "How Reliable are Hedge Fund Performance Indexes?", *Deutsche Bank*, 2002.

Morgan Stanley Capital International Inc., "Hedge Fund Index Methodology", 2002.

Morley, Ian, "Hedge Fund Indices: A Measure of Performance or the Hangman's Noose for Hedge Funds?", *AIMA Journal*, April 2004.

Muhtaseb, Majed R., "Hedge Funds, Asset Allocation and Investable Benchmarks", *Journal of Wealth Management*, Vol. 6, N°1, p. 64-67, 2003.

Oberhofer, George, and Leola B. Ross, "What The Indexes Don't Tell You About Hedge Funds", EFMA London Meetings, March 2002.

Posthuma, Nolke, and Pieter Jelle van der Sluis, "A Reality Check on Hedge Fund Returns", in *Hedge Fund Intelligent Investing*, ed. Barry Schachter, Publisher: RiskBooks, 2004.

PlusFunds, "Hedge Fund Indexing: The Next Industry Evolution", 2002.

Schupp, Oliver, "Appetite for Alternatives", *Professional Wealth Management Magazine*, Issue 18, *Credit Suisse First Boston*, March 2004.

Schupp, Oliver, and Hong Xia, "Take the index high road", *Risk magazine*, December 2003.

Scott, R. and Horvath, P.A., "On the Direction of Preference for Moments of Higher Orders than the Variance", *Journal of Finance*, September, Vol. 35, p. 915-919, 1980.

APPENDIX I: DEFINITION OF HEDGE FUND STYLES

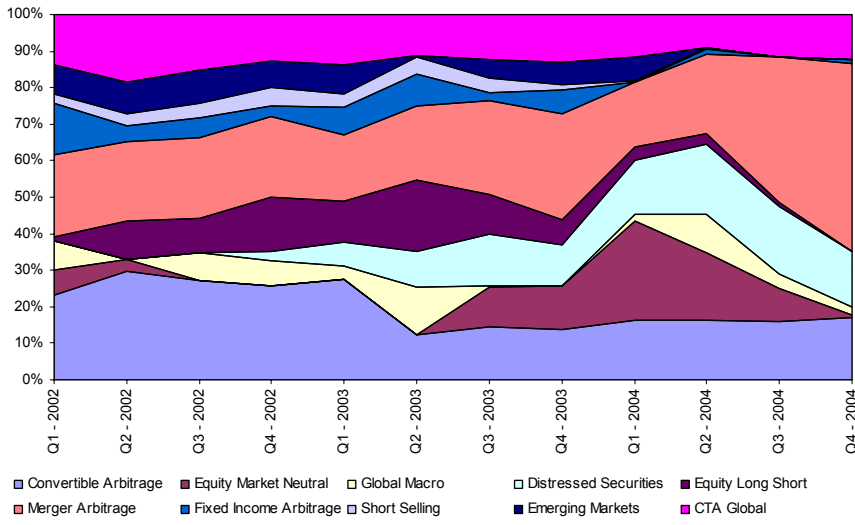
Convertible Arbitrage	Investment in convertible bonds. The strategy is to buy the convertible bond and sell short the common stock of the same company.
CTA Global	CTA Global funds invest in listed financial and commodity markets as well as in currency markets all over the world. They can follow systematic or discretionary strategies and are referred as to Commodity Trading Advisors.
Distressed Securities	Involves buying back, at a low price, the securities of companies that are experiencing financial difficulties. The securities targeted may cover a wide range, from senior secured debt (lowest risk) to common stock (highest risk).
Emerging Markets	Investment in equities or bonds from emerging markets.
Equity Market Neutral	Exploits inefficiencies in the market through balanced buying of undervalued securities and selling of overvalued securities enabling either a beta or a dollar neutral approach to be obtained.
Event Driven	Investment strategy that exploits price movements related to the anticipation of events affecting the life of the company (merger, acquisition, bankruptcy, etc.).
Fixed Income Arbitrage	The investment return is based on exploiting price anomalies related to interest rate instruments.
Funds of Funds	Consists of investing in several funds that may or may not follow the same strategy.
Global Macro	Investment strategy with a strong leverage effect on market events or developments.
Long Short Equity	Involves investing mainly in equities and derivative instruments. The manager systematically uses short selling, but takes care to maintain a permanent overall net position that is either long or neutral.
Merger Arbitrage	Merger Arbitrage funds invest in companies involved in a Merger or Acquisition process. They typically go long the targeted company and sell short the stock of the acquiring company.
Relative Value	The objective of this type of strategy is to take advantage of the relative price differentials between related instruments.
Short Selling	Maintains a net or simple short exposure relative to the market.

APPENDIX II: INDEX PROVIDERS' WEBSITES

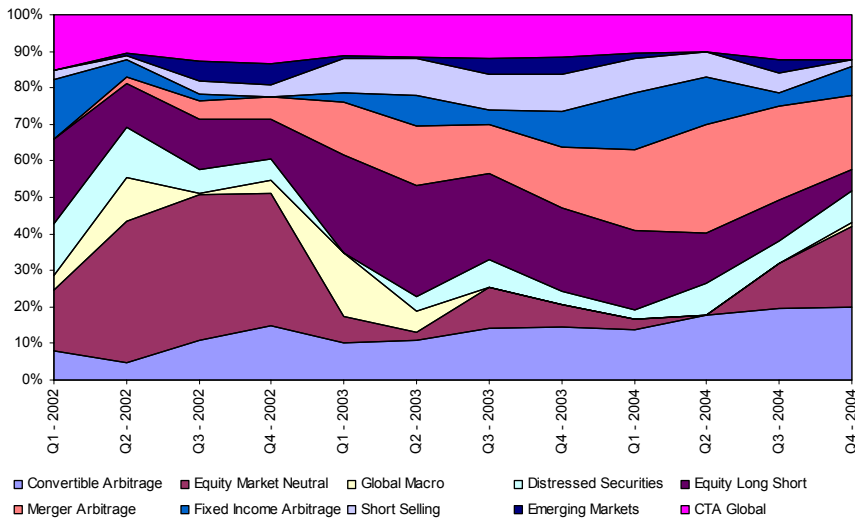
Index Providers	Web Sites
Alternative Asset Centre	http://www.aa-center.net/
ABN AMRO / EurekaHedge	eurekaHedge.com
Barclay Group / Global HedgeSource Hedge Fund Indices	barclaygrp.com/indices/ghs/
Blue Chip Hedge Fund Index	bluex.org
CISDM / MAR	marhedge.com
CSFB/Tremont Index LLC	hedgeindex.com
Dow Jones Hedge Fund Strategy Benchmarks	djindexes.com/jsp/DJHF_Index.jsp
Edhec Alternative Indices	Edhec-risk.com
Evaluation Associates Capital Markets, Inc.	eacmalternative.com
Feri Alternative Assets GmbH	feri-alta.de
FTSE Hedge	ftse.com/indices_marketdata/ftsehedge/index_home.jsp
Hedgefund.net / Tuna Indices	hedgefund.net
HedgeFundNews.com / Bernheim Index	hedgefundnews.com/
Hedge Fund Research, Inc.	hedgefundresearch.com
Hennessee Group	hennesseegroup.com
HFIntelligence / Invest-, Europe-, Asia-Hedge	hedgefundintelligence.com
Investorforce / Altvest	investorforce.com
LJH Global Investments	ljh.com
MondoHedgeIndex	mondohedgeindex.com
MSCI Hedge Fund Indices	msci.com
Standard & Poor's	spglobal.com
Talenthedge	talenthedge.com
Van Hedge Fund Advisors International, Inc.	vanhedge.com

APPENDIX III: EVOLUTION OF STYLE EXPOSURES FROM 2002 THROUGH 2004

S&P Hedge Fund Index Style Exposures - from Q1 2002 through Q4 2004



CSFB/Tremont Investable Hedge Fund Index - from Q1 2002 through Q4 2004



MSCI Hedge Invest Index - from Q1 2002 through Q4 2004

