

STANDARD
& POOR'S

Standard & Poor's Hedge Fund Index

Structure

Methodology

Definitions

Practices

January 2003



Standard & Poor's Hedge Fund Index

Structure, Methodology, Definitions, and Practices

January 2003

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Executive Summary

The S&P Hedge Fund Index is constructed to offer investors a standardized and investable benchmark that is representative of a broad cross section of hedge funds. The index enhances transparency of hedge fund investments as it requires an independent verification of the portfolio positions for all the constituent hedge funds within the index. In addition, the Standard & Poor's index construction methodology is designed to ensure reliable and timely reporting, standardized due diligence, and transparency of rules.

The S&P Hedge Fund Index consists of three styles that broadly represent hedge fund investing: Arbitrage, Event-Driven and Directional/Tactical. Each style in turn consists of three strategies.

S&P Hedge Fund Index construction uses rigorous quantitative and qualitative methods to determine fund selection. The index construction process involves two complementary procedures. The first procedure determines the number of funds required to construct a representative and investable index. Standard & Poor's has used stratified sampling and bootstrap simulation techniques to conclude that a portfolio of 30 to 40 hedge funds represents the risk/return characteristics of broader portfolios of hedge funds. The S&P Hedge Fund Index is thus representative.

The second procedure determines a universe of suitable candidates for inclusion in the index. This process begins with an examination of strategy consistency, screening the hedge fund sample for self-reporting bias and inconsistency to create a candidate pool cohesively defined in terms of styles and strategies. The candidate pool is then further screened for length of track record, assets under management, and investment capacity to ensure investability. The remaining investable funds undergo a rigorous due diligence process to verify management experience, investment philosophy, risk management policy, and operational capabilities. Hedge funds in the pool are investable and have passed the due diligence evaluation. The S&P Hedge Fund Index is thus investable.

The S&P Hedge Fund Index equally weights the styles and strategies, providing investors a convenient means to achieve broad diversification across the major hedge fund strategies. The rules governing construction and maintenance of the index—annual rebalancing to equal weights and the procedure to change index constituents—are clear and publicly announced.

Standard & Poor's believes it is the first leading index provider to introduce an investable hedge fund index. Standard & Poor's has led continuous innovations in indexing and in investable index products for U.S. and international financial markets. For instance, the S&P 500 is recognized worldwide as the premier U.S. equity index, and the S&P Global 1200 is the first real-time global equity index. Additionally, Standard & Poor's participation in the American Stock Exchange's launch in 1993 of SPDRs, which are based on the S&P 500, spearheaded development of the exchange-traded fund (ETF) market.

1. Introduction

Hedge funds have been in existence for many years, but the hedge fund industry experienced rapid growth over the last decade in terms of size, number of participants, and prominence. Academics and practitioners have generally concluded that supply and demand factors will remain favorable to continued growth of the industry.

Some studies call for greater transparency within the hedge fund industry in order for it to realize its growth potential. A series of market and compliance challenges in recent years have also prompted interest in greater transparency. Benchmarks serve as a cornerstone of enhanced transparency by providing timely and reliable pricing information. In addition, benchmarks promote the growth of markets by establishing a performance standard.

1.1 Characteristics of S&P Hedge Fund Index

This document introduces the Standard & Poor's Hedge Fund Index (S&P HFI), the first hedge fund benchmark produced by Standard & Poor's, the global leader in index development. The S&P HFI has characteristics that make it a suitable benchmark for broad hedge fund performance, as outlined in Table 1.1.

The S&P HFI is designed to be standardized, representative, and investable, with independent verification of its constituents' portfolio holdings. The index values are published daily, based on verified information received from managed accounts with selected hedge fund managers. A due diligence process vets actual and potential constituents on several dimensions, including management experience, investment philosophy, risk management policy, and operational capabilities. Finally, the index is governed by transparent guidelines.

TABLE 1.1 CHARACTERISTICS OF S&P HEDGE FUND INDEX

Feature	Description
Representative	The S&P HFI is representative of the investment opportunity in the broad range of hedge fund strategies, without being optimized or biased to particular criteria. Rigorous quantitative and qualitative methods are used to construct a representative index as well as select constituent funds.
Investable	The constituents of the index are required to grant capacity for new investment at the time of their inclusion in the index. The capacity of the hedge funds within the index is assessed frequently.
Independent Verification	Index values are based on the administrator's independently verified valuations from managed accounts. The daily valuations are reconciled every month with the hedge funds' valuations.
Accurate and Timely Reporting	Daily publication enables timely, detailed information for performance measurement and analysis of correlations with other asset classes.
Defined Due Diligence and Monitoring Process	Consistent quantitative and qualitative screenings and due diligence are performed before inclusion and an ongoing monitoring process is in place to minimize single manager risk.
Transparent Index Maintenance	Rules governing construction and maintenance of the index, e.g., weightings, rebalancing frequency and changes to index constituents, are clear and publicly announced.

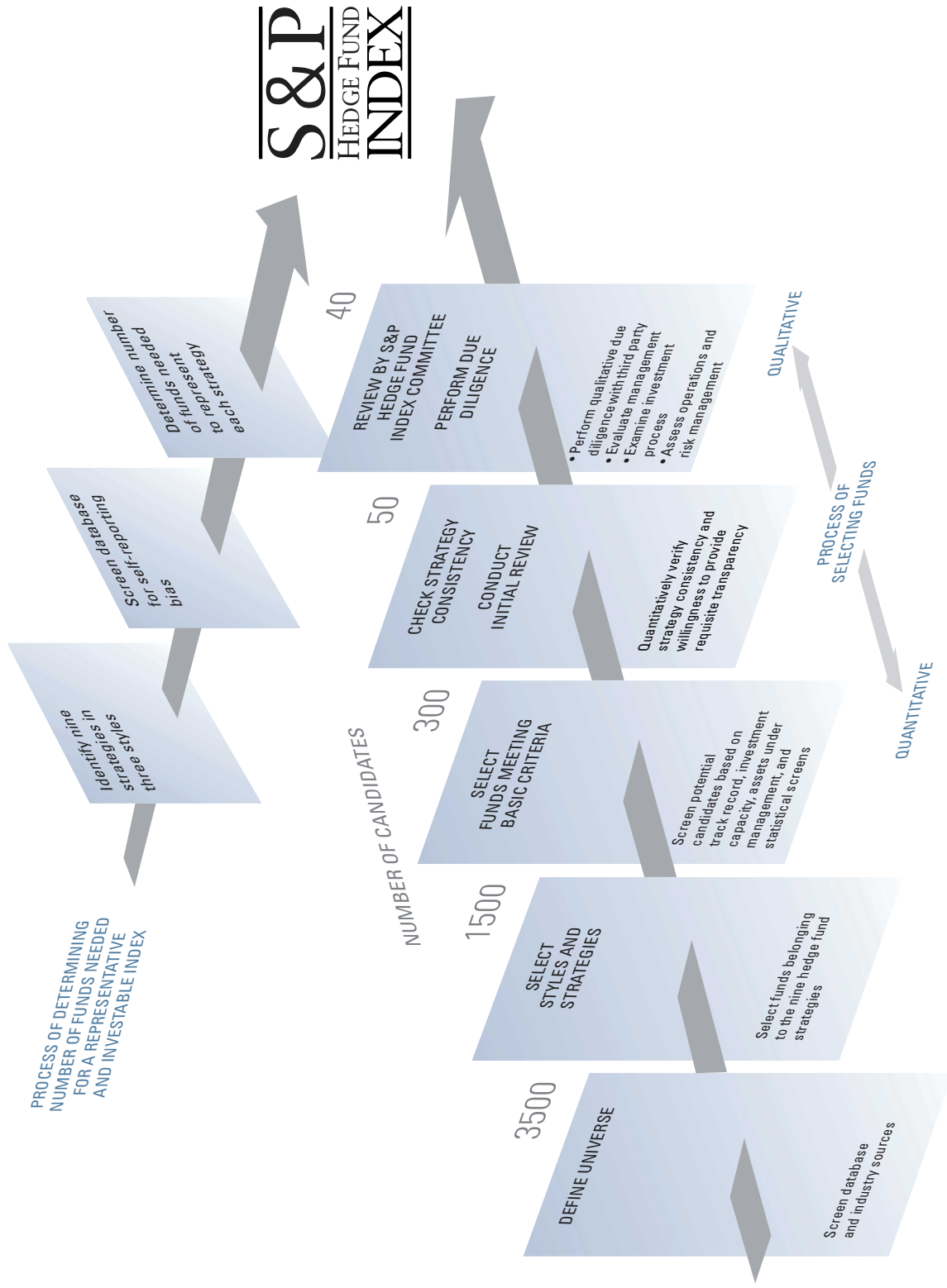
1.2 S&P Hedge Fund Index Construction

The index construction process begins by establishing an empirical framework. Graph 1.1 shows the systematic process used to construct the S&P HFI.

Section 2 describes the merits of alternative statistical techniques for fund selection. The statistical analysis focuses on four risk/return characteristics—annualized return, annualized standard deviation, Sharpe ratio, and correlation with the S&P 500. We show that the range of the four statistics is narrow for samples of 30 to 40 funds selected at random. Stratified sampling narrows the range of outcomes even further, which is a desirable characteristic of a representative index.

Section 3 provides details on index construction, beginning with the selection of representative hedge funds with capacity to accept investment. We describe the processes used to screen for operational risk, to ensure transparency, and to minimize single manager risk through initial due diligence and ongoing monitoring. Section 3 also gives details of index calculation and maintenance.

Section 4 presents pro forma performance of the S&P HFI that shows it is representative of the major hedge fund investment strategies that comprise a significant percentage of the hedge fund




Graph 1.1
S&P Hedge Fund Index Design
 Transparent Index Construction

2. S&P Hedge Fund Index Design

The requirements of representation and investability exert conflicting pressures on the number of funds required in the index. Representation requires a larger number of funds, but this often includes large numbers of inaccessible funds that are not investable. Furthermore, investability demands fewer funds because each fund requires additional administration, due diligence, ongoing monitoring, and operational coordination.

Table 2.1 demonstrates the trade-off between representation and investability. The arrow in Table 2.1 shows where other hedge fund indices tend to be positioned—either high on representation and low on investability or low on representation and high on investability. The S&P HFI is designed to be positioned in the top right-hand quadrant, to be both highly representative and readily investable.

TABLE 2.1 TRADE-OFF BETWEEN REPRESENTATION AND INVESTABILITY

REPRESENTATION	HIGH	<ul style="list-style-type: none"> • Broader benchmarks encompassing larger numbers of funds • Potential verification and data issues • Often characterized by self-classification • Monthly data • Typically large numbers of inaccessible funds • Higher turnover due to fund reporting practices 	<ul style="list-style-type: none"> • Ideal positioning for indices • Requires high-quality data from stratified sampling of funds to ensure strategy representation • Qualitative due diligence and “appropriateness” overlay to create investable product • Has capacity to accept new investment 	
	LOW	<ul style="list-style-type: none"> • Customized benchmark baskets • Typically not a useful benchmark or investment vehicle 	<ul style="list-style-type: none"> • More indicative of a quantitative fund of funds • Smaller number of funds that are accessible to the investor, but without sufficient style or qualitative analysis for benchmarking purposes 	
		LOW	HIGH	INVESTABILITY

Standard & Poor’s evaluated a number of statistical techniques to construct a representative and investable hedge fund index. Section 2.1 shows that the distribution of risk and return characteristics of portfolios of hedge funds selected at random stabilizes once the number of funds rises above 20. This result is consistent with previous research. We note, however, that the range of risk/return characteristics of portfolios generated by random sampling is broad. That is, two portfolios of 40 hedge funds generated by random sampling may experience very different risk and return levels, possibly because they are subject to different risk exposures. We use the stratified sampling technique to construct hedge fund portfolios with balanced risk exposures to narrow the range of risk/return characteristics.

The analysis presented in detail in Sections 2.2 through 2.6 shows that a portfolio of 30 hedge funds generated at random with stratified sampling is representative of a balanced portfolio of investments in the broader hedge fund universe, as its risk/return characteristics stabilize within a narrow range.

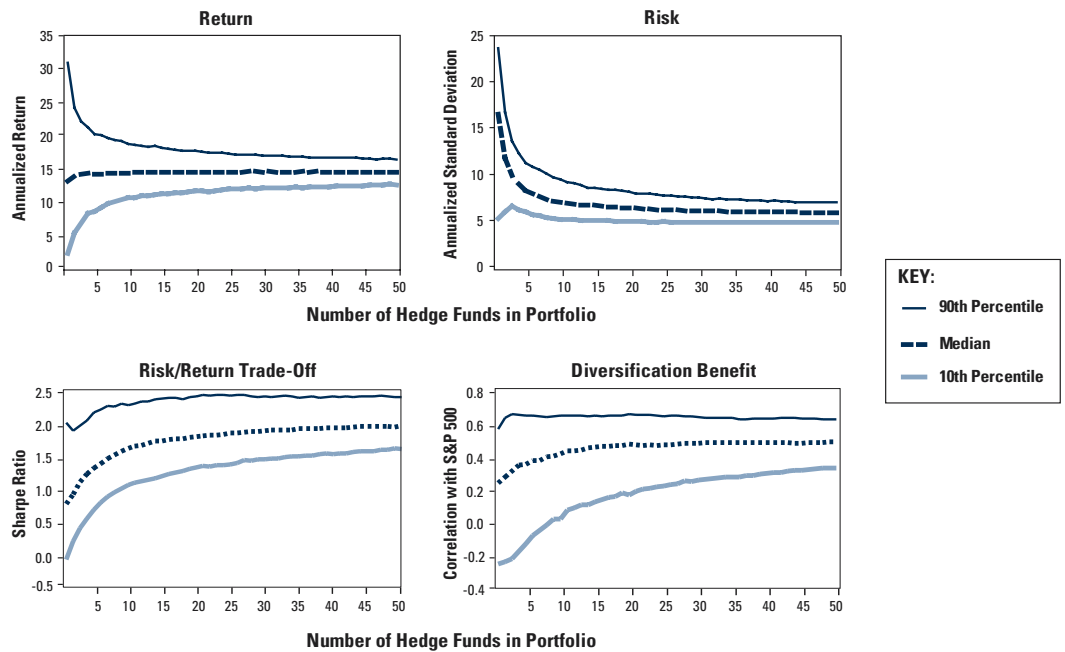
2.1 Number of Hedge Funds Needed to Construct a Representative Portfolio: Random Sampling

We begin by replicating findings of previous studies and confirm that the risk/return characteristics of randomly selected hedge fund portfolios stabilize as the number of funds increases beyond 20. We perform simulations consisting of 1000 randomly selected portfolios of a predetermined number of funds. Four statistics are calculated for each simulated portfolio: annualized return, standard deviation, Sharpe ratio, and correlation with the S&P 500.

Graph 2.1 shows the 10th, median, and 90th percentile values for each statistic as a function of the number of funds. Note in each panel that the median values for the four statistics stabilize with as few as 20 hedge funds in the portfolio.

The range of risk/return characteristics of randomly selected samples of hedge funds is wide—for example, the difference between 10th and 90th percentile values of annualized standard deviation of portfolios of 45 hedge funds selected at random is 2.2 percentage points. A principal source of the differences in the risk/return patterns of randomly generated portfolios is differences in the strategy concentration; portfolios with different hedge fund strategies will exhibit different risk/return profiles.

**GRAPH 2.1 DIMINISHING BENEFITS OF HEDGE FUND DIVERSIFICATION
RISK/RETURN CHARACTERISTICS OF PORTFOLIOS OF RANDOMLY SELECTED HEDGE FUNDS**



2.2 Number of Hedge Funds Needed to Construct a Representative Portfolio: Stratified Sampling

To limit the variation in risk/return characteristics generated by portfolio concentration, we use the stratified sampling technique, described in detail in Sections 2.3 through 2.6. Table 2.2 shows the reduction in variance and correlation with the S&P 500 for portfolios of hedge funds selected by stratified sampling.

For instance, for portfolios of 45 funds, the difference between the 10th and 90th percentile of variance is 2.2 and 0.9 percentage points for random and stratified sampling, respectively. This improvement shows an additional advantage of stratification over random sampling in relation to constructing representative hedge fund portfolios.

TABLE 2.2 DIMINISHING BENEFITS OF HEDGE FUND DIVERSIFICATION FOR A STRATIFIED SAMPLE**STRATIFIED SAMPLING REDUCES VARIANCE AMONG RANDOM SAMPLES OF HEDGE FUND PORTFOLIOS**

Number of hedge funds	Random sampling			Stratified sampling		
	10%	50%	90%	10%	50%	90%
9	5.2	7.1	9.7	3.6	4.3	5.2
18	4.9	6.4	8.3	3.0	3.7	4.3
27	4.8	6.1	7.6	2.8	3.4	3.9
36	4.8	5.9	7.2	2.7	3.2	3.7
45	4.8	5.9	7.0	2.7	3.2	3.6

CORRELATIONS BETWEEN PORTFOLIOS OF HEDGE FUNDS AND S&P 500

Number of hedge funds	Random sampling			Stratified sampling		
	10%	50%	90%	10%	50%	90%
9	0.0	0.4	0.6	-0.1	0.2	0.5
18	0.2	0.5	0.7	0.0	0.3	0.5
27	0.2	0.5	0.6	0.0	0.3	0.5
36	0.3	0.5	0.6	0.1	0.3	0.5
45	0.3	0.5	0.6	0.1	0.3	0.5

STRATIFIED SAMPLING REDUCES RANGE OF RETURNS AMONG HEDGE FUND PORTFOLIOS

Number of hedge funds	Random sampling			Stratified sampling		
	10%	50%	90%	10%	50%	90%
9	10.5	14.5	19.2	9.0	11.9	15.0
18	11.6	14.6	17.8	9.8	11.9	14.0
27	12.1	14.6	17.2	10.2	11.8	13.5
36	12.3	14.7	17.0	10.4	11.9	13.3
45	12.6	14.6	16.6	10.6	11.9	13.2

Table 2.2 also shows that our index methodology of equal weighting the risk dimensions captured by hedge fund strategies provides greater diversification and hence a better risk/return trade-off.

2.3 Stratified Sampling

Stratified sampling is frequently applied in portfolio construction and index replication to efficiently minimize tracking error along important risk dimensions by selecting the appropriate size of sample along each dimension.

The first step in our application of stratified sampling techniques to construction of the S&P HFI is to identify risk dimensions. There are two principal approaches. The first approach examines the systematic market exposures of the particular investment philosophy, while the second statistically examines the returns history of specific investments.

The advantage of classification based on investment philosophy is simplicity; one can translate style classifications into investments. This approach, however, suffers from inconsistencies in strategy reporting as well as possible self-reporting bias, given that the investment philosophy or style is classified by the funds themselves. The statistical approach has the advantage of rigor, but suffers from the standard statistical problems associated with inferences from historical return analysis, as well as the difficulty of translating the analysis into a transparent investment process.

Our style classification methodology capitalizes on the advantages of both approaches, while minimizing their disadvantages. The starting point is the investment styles, described in Section 2.4. While we realize the practical advantages of such classification, we also recognize that self-reported investment styles impart a bias to index construction. We restrict our sample of analysis to single-strategy funds. We then use the rigorous statistical methods described in Section 2.5 in an effort to ensure that each fund retained in the pool really belongs to the index candidate strategy according to its return profile. Section 2.5 shows that these statistical screens improve the cohesiveness of hedge fund returns within a strategy.

A potential criticism of our focus on single-strategy funds is that our index is not representative of the hedge fund universe as it leaves out the prominent multi-strategy approaches. The research shows, however, that returns of multi-strategy funds can be replicated by a combination of single-strategy fund returns using a factor decomposition model. The advantages of our focus on single-strategy funds include consistency of classification, transparency of performance attribution, and construction of an index portfolio with appropriate risk exposures.

2.4 Styles and Strategies

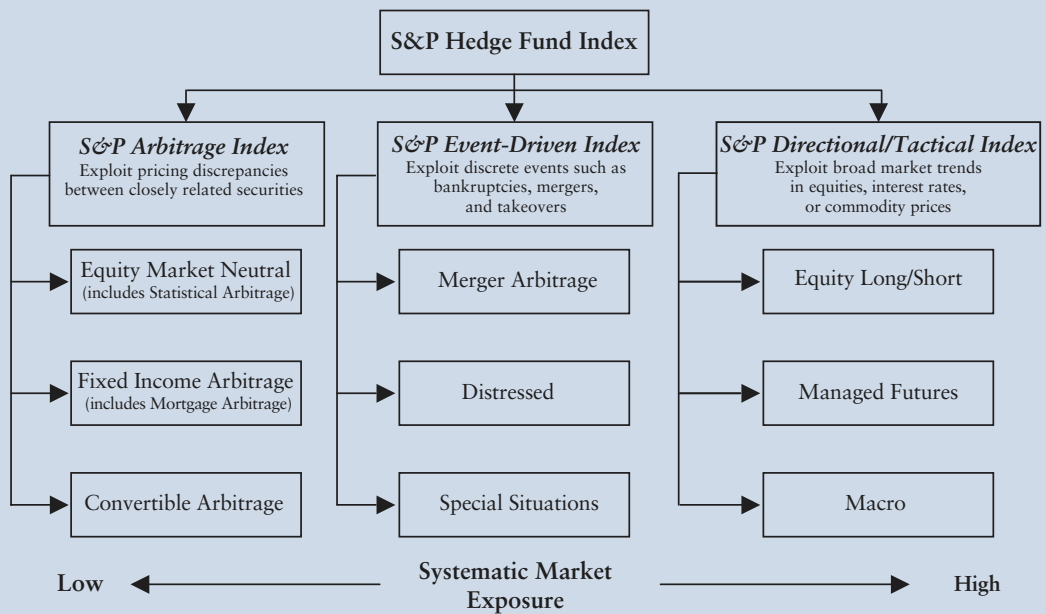
The literature on hedge funds categorizes the different investment approaches to hedge fund investing into three broad styles: Arbitrage, Event-Driven, and Directional/Tactical. These are represented by the corresponding sub-indices of the S&P HFI. Graph 2.2 shows the three primary styles arranged in increasing order of systematic market exposure. For example, Arbitrage has a low systematic market exposure, while Directional/Tactical has a high systematic market exposure. Each style consists of three strategies, mostly reflecting the style's specific markets and/or instruments.

While the nine strategies are not an exhaustive list of investment styles and asset classes used by hedge funds, they represent a large portion of hedge fund activities, as well as most of the liquid, transparently priced activities. Of the major strategies not included in the S&P HFI, long-only strategies in traditional asset classes such as equities or fixed income can be accessed via other indexing sources and are not needed in a hedge fund index. Regulation D Arbitrage is an example of a niche, illiquid strategy where price transparency can be difficult to establish, so it also is not included. Short-only approaches are niche strategies that are used within a variety of other strategies.

While reflective of the general characteristics of their respective strategy, the nine S&P HFI strategy baskets are not designed to be used as separate sub-indices. Standard & Poor's plans to expand coverage of certain strategies to create additional indices, constructed similarly to and overlapping with the S&P HFI.

Appendix 1 provides a detailed description of the nine strategies. Appendix 2 lists hedge fund strategies and index providers to illustrate the variety of classification schemes in this marketplace.

GRAPH 2.2 STYLES AND STRATEGIES IN S&P HEDGE FUND INDEX



Source: Standard & Poor's. Adapted from Alexander Ineichen, *In Search of Alpha*, UBS Warburg, October 2000.

2.5 Cohesiveness Within Hedge Fund Strategies

The second step in our application of stratified sampling to the construction of the S&P HFI is to examine the cohesiveness of the hedge fund sample. Because there is inconsistency in style reporting, funds from different strategies are blended, so the cross-sectional dispersion of returns within a strategy is high. Such a spectrum of returns necessitates a larger sample of hedge funds for a given level of sampling precision.

Graph 2.3 presents a standard measure of dispersion within the nine strategies based on analysis of variance (ANOVA), described in Appendix 3.

To improve strategy cohesiveness, we use four quantitative screens:

1. For each fund in the proprietary database compiled by Standard & Poor's from a number of commercially available databases and industry sources, we compute two correlation distributions: correlations with funds in the same strategy, and correlations with funds in all other strategies. We compute the Kolmogorov-Smirnov p-statistic, described in Appendix 3, to test whether the two correlation distributions are different.
2. We then test whether the median of the correlations with funds in the same strategy is higher than the median correlation with funds in all other strategies.
3. We evaluate the degree of correlation of the individual funds with the appropriate hedge fund indices similar to the strategy in question.
4. Finally, we compare the standard deviation of a fund to its peer group.

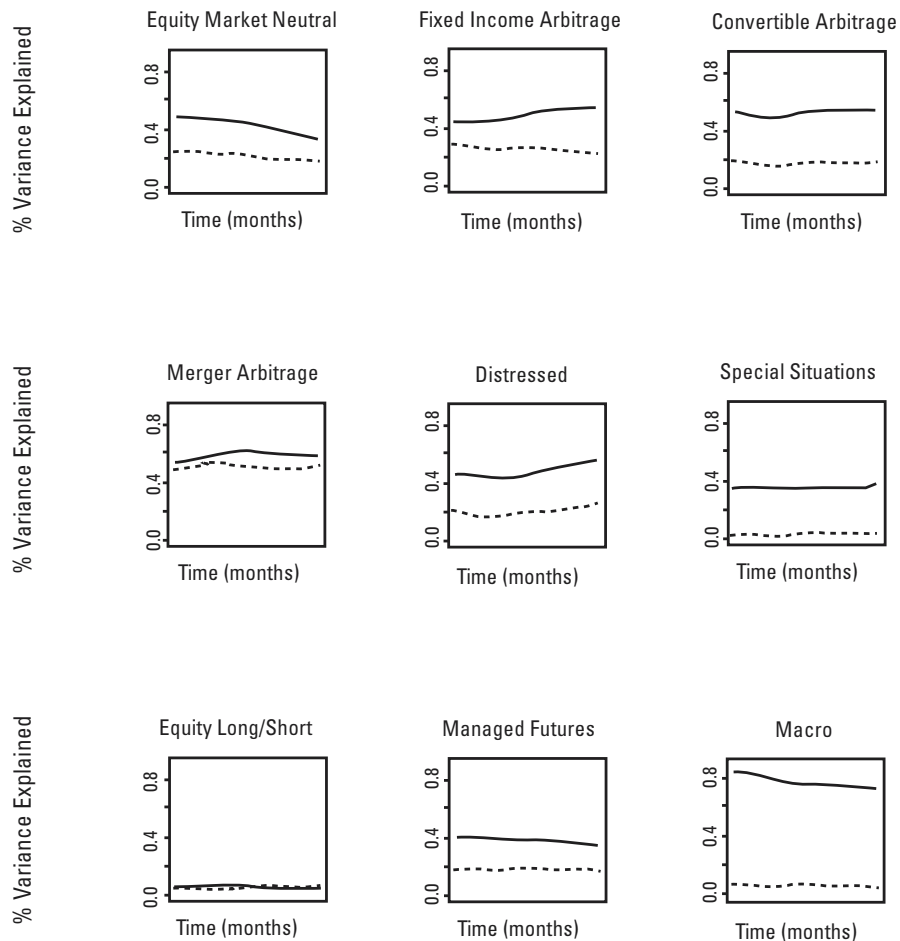
To reflect differences within a small group of strategies, we make several strategy-specific adjustments to the quantitative screens. The funds in the Macro strategy are extremely diverse, and take risks in currencies, bonds, equities, and commodities markets. To account for this diversity, we focus on the funds' volatility and lack of correlation with the other eight strategies. Many of the funds in the Special Situations strategy exhibit similarity with funds in the two other strategies in the Event-Driven style (Merger Arbitrage and Distressed) over short periods of time. We prioritize funds in the Special Situations strategy that have a low correlation with either Merger Arbitrage or Distressed strategies over two equal sub-periods.

We divide certain strategies into their specialties where comparisons need to be finer, including: Equity Long/Short (Geographic Regions); Market Neutral (Quantitative and Fundamentally-Driven Equity Market Neutral, Statistical Arbitrage); Fixed Income Arbitrage (Mortgage, Fixed Income); and Distressed (Long-Only and Long/Short).

The solid lines in Graph 2.3 show that the variance explained by strategy classification improves significantly after implementation of the statistical screens. For example, for Convertible Arbitrage, the proportion of variance explained is 0.2 when all funds are included, and the variance explained improves to 0.6 when funds not adhering to the strategy criteria are screened. The proportion of variance explained for Equity Long/Short does not improve after the screens because of the diversity within the strategy. Merger Arbitrage funds, on the other hand, already have strategy cohesiveness, resulting in only a marginal improvement in the variance explained after the screens.

GRAPH 2.3 EVIDENCE OF SELF-REPORTING BIAS IN THE HEDGE FUND SAMPLE

Proportion of variance explained by strategy classification is negligible when all funds are considered. The variance explained increases significantly after statistical screens select the funds adhering to the strategy (rolling 24-month average).



Key
 ——— Proportion of variance explained when the sample is screened for self-reporting bias.
 Proportion of variance explained when all funds in a given strategy are included.

2.6 Simulated Bootstrap Model: How Many Funds Are Needed Per Strategy?

To determine the number of funds needed to represent each strategy, we analyze simulation samples generated by a bootstrap. For each strategy, we run 600 simulations—100 each of sample sizes ranging from one to six funds. Each simulation draws 50 samples of the given size, and computes the inter-quartile range of 36-month returns.

Graph 2.4 plots for each strategy the 600 simulated inter-quartile ranges as a function of the number of funds. The graphs show that the inter-quartile ranges for three- to five-fund samples are similar for all nine strategies.

GRAPH 2.4 CONVERGENCE IN RETURN DISPERSION AS NUMBER OF FUNDS WITHIN STRATEGY INCREASES

Fund sample corrected for self-reporting bias.

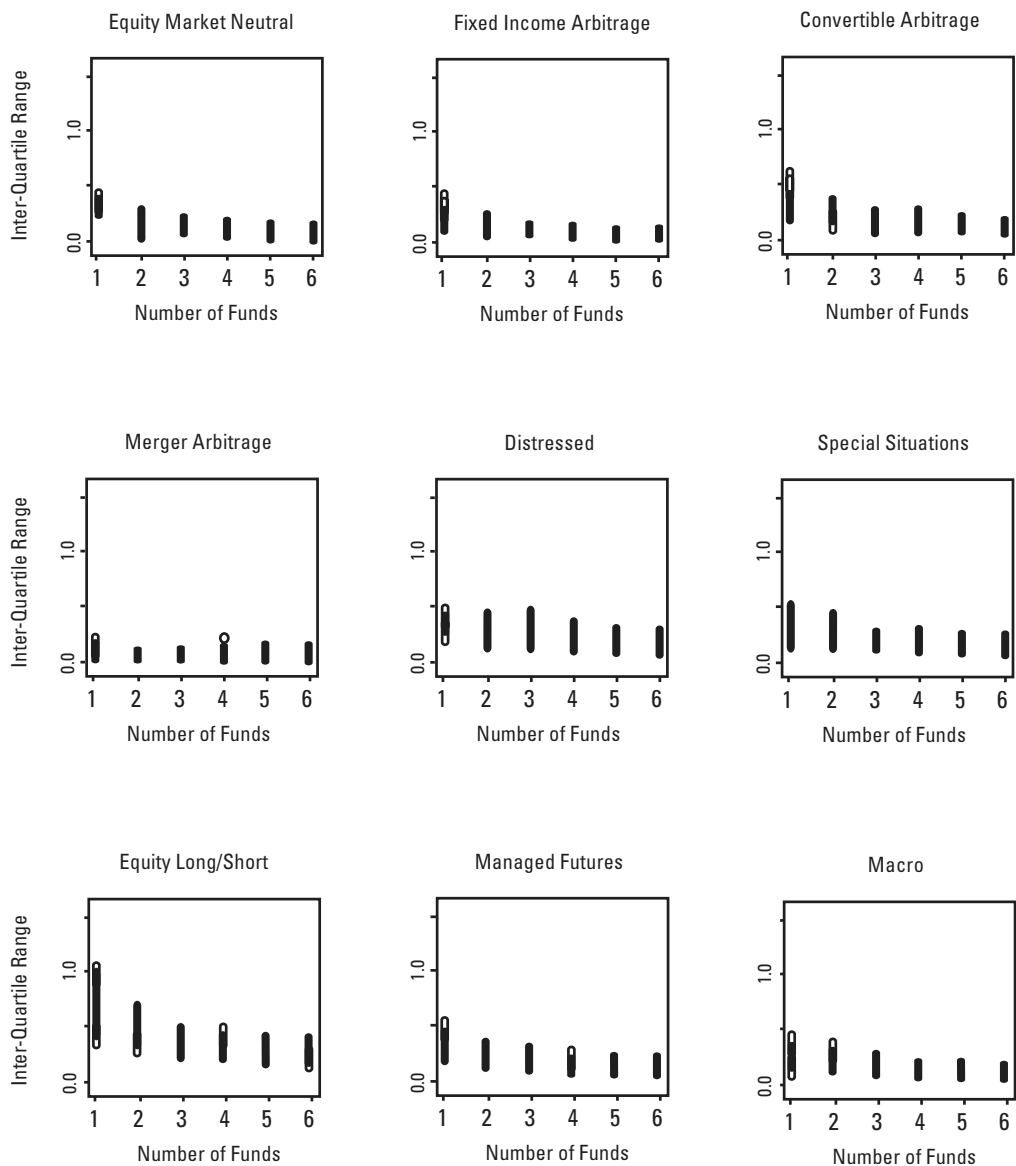


TABLE 2.3 NUMBER OF FUNDS SELECTED PER STRATEGY

Style	Strategy	Number of funds
Arbitrage	• Equity Market Neutral	5
	• Fixed Income Arbitrage	5
	• Convertible Arbitrage	5
Event-Driven	• Merger Arbitrage	3
	• Distressed	4
	• Special Situations	5
Directional/Tactical	• Equity Long/Short	5
	• Managed Futures	4
	• Macro	4

The determination of the number of funds selected per strategy is based on a quantitative assessment of the simulation results presented in Graph 2.4 and qualitative considerations such as the number of specialties within a strategy. Table 2.3 summarizes the number of funds needed to obtain most of the benefits of diversification within each strategy.

Our analysis shows that selecting portfolios of 30 to 40 funds by rigorous statistical techniques narrows the range of risk/return characteristics. Stratified sampling helps narrow the range of returns, standard deviations, Sharpe ratios, and correlations with more well-established asset classes. ■

3. S&P Hedge Fund Index Construction

To evaluate the framework for the S&P HFI empirically, we developed a sample of strategy-consistent hedge funds and showed that a stratified sample of 40 hedge funds from the nine hedge fund strategies is representative (Graph 2.3). Here we describe the index construction process. Section 3.1 explains the quantitative screens, and Section 3.2 discusses the due diligence process. Sections 3.3 and 3.4 present the process to ensure independent verification of portfolio holdings and the steps to ensure accurate and timely reporting of returns. Section 3.5 describes the index calculation and index maintenance processes.

3.1 Quantitative Screens

Construction of the S&P HFI begins by calculating an aggregate quantitative score of a fund, generally following the four quantitative screens described in Section 2.5. The first two statistics measure whether correlations of hedge fund returns with other funds in a strategy are different from correlations with funds in other strategies. The third statistic evaluates the correlation of the hedge fund return with an appropriate hedge fund sub-index. The fourth statistic compares the risk taken by a fund to the risk taken by comparable funds, as determined by historical volatility. Other analyses may be conducted to better understand the nature of a particular strategy.

Our initial index candidate pool consists of the hedge funds with higher quantitative scores within each strategy.

3.2 Due Diligence

Due diligence is a critical requirement for investing in the hedge fund market. The scale and complexity of investment strategy risks, the diversity of investment instruments, the demands on operational infrastructure, and a lack of transparency regarding portfolios all require that investors perform substantial due diligence on an ongoing basis. The S&P HFI Committee stipulates that an independent, rigorous, and standardized due diligence be conducted on all index candidates. Members of the S&P HFI Committee participate in the formal review of the hedge funds.

The formal review involves an interview with the hedge fund manager regarding the fund's style purity, trading strategy and practices, infrastructure, and operations. Albourne Partners Limited,¹ an outside consulting firm, has been engaged to perform these analyses.

The due diligence process has three main components:

1. Screens of funds to select funds with sufficiently long track records to give an initial indication of their trading performance and funds with sufficient assets under management to attest to their appeal to investors and the likely sustainability of their strategy and business.
2. An initial due diligence examination of the track record, operating setup, strategy, and personnel of the fund to determine, among other things, the quality of management, the nature of the trading strategy used, risk management, operating controls, and the likely capacity of the fund to accept further investment.
3. Ongoing due diligence to monitor the fund's trading strategy to ensure that it continues to conduct its business in line with the strategy established, and to detect any significant changes in how the fund is being operated, including style drift, large changes in returns, volatility, and instruments traded.

¹Albourne Partners Limited, founded in 1994, is a leading investment consultancy on alternative investments. It advises on the construction, management, and monitoring of hedge fund portfolios, as well as performs risk analysis and due diligence services.

The initial due diligence is achieved through questionnaires and interviews with key personnel at the funds. Ongoing due diligence consists of a combination of periodic visits with fund personnel and monitoring of trading positions and results. The due diligence process addresses areas of concern as follows:

- General questions about the fund;
- Management team and company background;
- Investment strategy-specific questions;
- Risk policies;
- Portfolio composition;
- Systems and infrastructure;
- Service providers;
- Performance analysis; and
- Degree of strategy cohesiveness.

3.3 Independent Verification of Portfolio Holdings

The S&P HFI is constructed to maintain a high level of integrity of portfolio return calculations. Integral to this is independent verification of portfolio holdings. Ensuring this level of transparency can be difficult for hedge fund investments. To maintain consistency and control throughout the process, each fund in the index is represented by a managed account that is generally run in parallel to that fund, unless otherwise noted. In some cases the managed account's mandate may vary from the main fund to maximize strategy purity. A third-party administrator, DPM (Derivatives Portfolio Management),² verifies trades and reconciles valuations of the funds' managed accounts on a daily basis. PlusFunds Group, Inc.³ maintains the managed accounts.

3.4 Timely Reporting

Standard & Poor's publishes daily values of the S&P HFI and conducts regular performance and correlation reviews of the funds and the associated strategies. Constituent net asset values are transmitted through DPM and PlusFunds Group, Inc. to Standard & Poor's, which monitors their movements for any anomalies and computes the daily index values.

To allow for initial pricing checks, daily index values will be published with up to a two-day lag. As certain instruments that may be included in the S&P HFI or sub-indices may not trade or price on a daily basis, the daily index values published by Standard & Poor's should be considered indicative only. After each month end, the month's returns are reviewed to produce a finalized month-end index value that, as a result of the finalization process, may differ from the daily series. Daily indicative index values will not be restated to match finalized month-end index values. Index values will not be calculated on days the New York Stock Exchange is closed; nor will values from two days prior be published on exchange holidays.

Both daily and monthly index values for the S&P HFI and its three sub-indices are published on the Standard & Poor's website.⁴ In addition, a number of data vendors distribute daily indicative and monthly finalized values, including Bloomberg and Reuters:

	Bloomberg	Reuters (daily, monthly)
S&P Hedge Fund Index	SPHG	.SPHG, .SPHGM
S&P Arbitrage Index	SPHGARB	.SPHGARB, .SPHGARBM
S&P Event-Driven Index	SPHGEVT	.SPHGEVT, .SPHGEVTM
S&P Directional/Tactical Index	SPHGDIR	.SPHGDIR, .SPHGDIRM

² Established in 1993, DPM offers a portfolio of integrated services that include: investment accounting, financial reporting, multiple broker and trader reconciliation, risk transparency, and fund administration services to fund managers, asset allocators, institutional investors, and proprietary traders whose portfolios cover almost all asset classes and instruments traded worldwide.

³ Founded in 2002, PlusFunds Group, Inc. provides information and investment services to hedge funds and their investors. PlusFunds Group, Inc. has been exclusively licensed to create a fund of fund product which tracks the S&P HFI using managed accounts.

⁴ Standard & Poor's is not responsible for errors in daily or monthly S&P HFI or sub-index values.

3.5 Index Calculation and Maintenance

We provide here an overview of the index calculation. The calculations are explained in greater detail in Appendix 4.

3.5.1 Equal Weighting of Styles and Strategies

The S&P HFI gives equal weightings to each major style. Within the three styles, the strategies are also equally weighted. This is consistent with creating a representative index that reflects a passive investment approach that diversifies both hedge fund strategy risk and single manager risk over time.

An equally-weighted index avoids favoring large funds or strategies that are attracting significant capital flows. The hedge fund market is prone to flows of capital chasing recent historical results in different funds and strategies, and a market capitalization-weighted index tends to reflect the impact of these capital flows. Funds are selected for inclusion in the index on the basis of their ability to represent a style or strategy. Apart from a minimum size requirement, hedge fund size does not influence its weight since funds are equally weighted within strategies. To minimize frictional costs for investors replicating the index, the weightings of styles in the index are rebalanced to equal weightings annually.

Table 3.1 summarizes the S&P HFI weights for styles and strategies.

TABLE 3.1 INDEX CONSTITUENT WEIGHTS

Index Weights:

The three styles and the three strategies within each style are equally weighted, although the number of funds in each strategy may vary because of the correlation characteristics of the strategy.

Fund share weights are calculated as follows:

1. Styles: Equal Weighted.
2. Strategies: Equal Weighted.
3. Funds within a specific strategy: Equal Weighted. Funds within a specific strategy may not have the same weights as funds in other strategies, depending on the number of funds in each strategy.

Example: 100% in the index

- a) 33.3% per style ($100\% / 3$).
- b) 11.1% per strategy ($100\% / 9$).
- c) Strategy with 3 funds: 3.70% per fund ($100\% / 9 / 3$).
- d) Strategy with 5 funds: 2.22% per fund ($100\% / 9 / 5$).

3.5.2 Performance Fees and High-Water Marks

Table 3.2 illustrates the fee structure governing funds within the S&P HFI.

TABLE 3.2 S&P HEDGE FUND INDEX CONSTITUENT FEE STRUCTURE

Fees	Description
Hedge Fund Expense	The fee charged to hedge funds for trading and credit activities.
Manager Fee	The flat management fee charged by the hedge fund manager.
Performance Fee	The fee charged by the hedge fund, which may use the concept of the high-water mark.

The gross asset value (GAV) is the total performance less the hedge fund expense and the flat manager fee. The net asset value (NAV) is the GAV less the performance fee.

Performance fees are calculated on the increase in the gross asset value (GAV) of a fund. Many performance fee calculations use the concept of a high-water mark. The high-water mark is the highest GAV for the fund that has been used in calculating the performance fee. Further performance fees can be charged only on a GAV that exceeds this high-water mark. To facilitate index level calculations, the high-water marks are initially set at the price at which constituents enter the index. They are reset each year based upon price appreciation.

Suppose an investor invests in a fund with a GAV of 100, and the GAV, before performance fees, grows to 115 in a year. If we assume the performance fee is 20% of the increase in GAV, then the performance fee to be paid to the manager is equal to 3. The year-end GAV, after performance fees are paid, is then 112 (115-3) and this becomes the high-water mark for the start of the following year.

3.5.3 Fund Removals and Additions

Funds in the index are required to undergo regular due diligence reviews. Representativeness analyses are periodically repeated on the “universe” which includes new qualifying funds as appropriate.

Removal of a Fund

A fund can be removed from the index if it becomes closed to new investment, if it fails to continue to represent its respective strategy, or if it does not continue to pass the due diligence reviews. The decision to remove a fund from the index is made by the S&P HFI Committee. Reasons for removal consideration include:

- Violation of qualitative due diligence standards
- Non-cooperation with reporting process or major valuation concerns
- Significant departure from original mandate and stated strategy
- Legal, regulatory, or compliance issues
- Major team changes, managerial changes, or business continuity
- Concerns about excessive growth or redemptions

Addition of a Fund

A fund can be added to the index if it meets all the qualifications and is considered to produce a more representative group of funds for a strategy or will increase the investment capacity of the index. This may occur with or without the removal of another fund, at the discretion of the S&P HFI Committee.

A decision by the S&P HFI Committee to add or remove a fund from the S&P HFI does not constitute a buy or sell recommendation. Funds are chosen based on overall index representation. ■

4. Historical Performance of the Pro Forma Index

We reconstruct the S&P HFI based on the index constituents as of September 30, 2002,⁵ using monthly performance data from January 1998 through September 2002. The pro forma index is equally weighted across the styles and strategies and is rebalanced annually. All references to the S&P HFI performance in this section refer to the S&P Hedge Fund Pro Forma Index.

Past performance of the pro forma index is based on backtested results that do not represent the results of actual trading but are achieved instead through retroactive application of an index strategy designed with the benefit of hindsight.

4.1 Index Performance and Volatility Summary

Table 4.1 compares annual return and volatility performance for the pro forma index and other prominent benchmarks for the time period January 1998 through September 2002.

	1998 (%)	1999 (%)	2000 (%)	2001 (%)	2002 (9 Months) (%)	57-Month Return (%)	Avg. Ann. Return (%)	Excess Over		Annualized Std. Dev. (%)	Sharpe Ratio
								S&P 500 (%)	U.S. T-Bills (%)		
S&P HFI	4.5	15.4	13.5	9.4	2.2	52.8	9.3	11.6	5.1	3.2	1.6
S&P Arbitrage Index	-0.2	13.2	14.5	13.0	4.8	53.2	9.4	11.7	5.2	4.5	1.1
Equity Market Neutral	11.6	6.2	18.4	7.3	0.5	51.3	9.1	11.4	4.9	5.7	0.9
Fixed Income Arbitrage	-18.6	18.3	5.8	14.1	8.5	26.0	5.0	7.3	0.8	10.7	0.1
Convertible Arbitrage	6.6	15.0	20.0	17.8	5.5	82.9	13.5	15.8	9.3	4.3	2.2
S&P Event-Driven Index	0.3	15.5	13.4	8.5	-2.5	38.9	7.2	9.5	3.0	5.3	0.6
Merger Arbitrage	7.3	14.5	17.8	0.5	-5.1	38.0	7.0	9.3	2.8	5.4	0.5
Distressed	-1.8	8.2	7.0	18.4	2.2	37.4	6.9	9.2	2.7	6.3	0.4
Special Situations	-5.0	24.0	15.4	7.3	-4.9	38.7	7.1	9.4	2.9	6.9	0.4
S&P Directional/Tactical Index	13.5	17.3	12.3	6.7	4.2	66.3	11.3	13.6	7.1	5.8	1.2
Equity Long/Short	4.6	36.1	9.6	7.5	-8.9	52.8	9.3	11.6	5.1	11.6	0.4
Managed Futures	18.4	4.1	13.4	5.1	16.3	70.8	11.9	14.2	7.7	12.6	0.6
Macro	16.4	11.5	12.3	8.0	5.5	66.0	11.3	13.5	7.0	7.4	0.9
U.S. T-Bills	4.8	4.7	5.9	3.4	1.3	21.6	4.2	6.5	—	0.4	—
Lehman Aggregate Bond	8.7	-0.8	11.6	8.4	8.6	41.6	7.6	9.9	3.4	3.3	1.0
Merrill U.S. High Yield	2.9	2.5	-5.2	4.5	-8.2	-4.0	-0.8	1.4	-5.1	8.6	-0.6
S&P 500	28.6	21.0	-9.1	-11.9	-28.2	-10.4	-2.3	—	-6.5	18.6	-0.4
S&P Global 1200	24.6	25.1	-10.8	-15.0	-25.6	-12.0	-2.7	-0.4	-6.9	17.4	-0.4

⁵ Actual S&P HFI values begin as of September 30, 2002 and are available daily on www.sp-hedgefundindex.com. For purposes of analysis, Standard & Poor's aggregated the historical self-reported returns of the constituents and defines this as the historical pro forma version of the S&P HFI. The S&P Hedge Fund Pro Forma Index is based on the index constituents as of September 2002 using monthly performance data from January 1998 through September 2002 from the fund companies themselves. Returns for some constituents may not extend back to January 1998. The pro forma versions of the S&P HFI and its sub-indices were rebalanced to original equal weights annually in August.

Standard & Poor's cannot verify the validity or accuracy of the self-reported constituent returns. Standard & Poor's does not guarantee the accuracy of these pro forma returns and does not recommend any investment or other decision based on their results or on any other index calculation. Pro forma index returns do not take into account loads or certain fees and commissions. If the foregoing had been factored in, the pro forma index returns would have been lower. Past performance is not necessarily indicative of future results.

4.1.1 Returns

The pro forma index has an annualized return of 9.3% over the period January 1998 through September 2002.

Its best-performing year was 1999, when it returned 15.4%. April 1999 was the best month. From Table 4.2, it is also clear that the index performance is stable, with negative returns for 11 of the 57 months, including July through October 1998, the worst performing four-month period.

**TABLE 4.2 MONTHLY RETURNS OF S&P HEDGE FUND PRO FORMA INDEX
TOTAL NUMBER OF MONTHS: 57**

S&P HEDGE FUND PRO FORMA INDEX

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1998	0.8%	1.2%	1.8%	0.2%	1.0%	0.5%	-0.2%	-2.1%	-0.3%	-1.4%	2.0%	1.0%	4.5%
1999	1.3%	1.1%	1.1%	2.8%	1.1%	1.9%	0.9%	-0.3%	0.8%	-0.5%	2.1%	2.1%	15.4%
2000	1.3%	2.0%	0.8%	0.7%	0.7%	1.5%	0.3%	1.4%	0.3%	0.3%	1.3%	2.0%	13.5%
2001	2.4%	0.7%	1.2%	0.2%	0.8%	0.1%	0.4%	1.3%	-0.3%	1.5%	-0.3%	0.9%	9.4%
2002	0.6%	-0.3%	1.1%	0.5%	0.9%	-0.2%	-0.9%	0.3%	0.2%				2.2%

Number of months return is negative is 11 of 57.

S&P ARBITRAGE PRO FORMA INDEX

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1998	0.4%	0.7%	1.8%	0.9%	1.5%	-0.4%	0.0%	-0.8%	-0.8%	-6.9%	2.6%	1.1%	-0.2%
1999	1.4%	1.7%	0.8%	1.6%	1.9%	0.8%	1.0%	-0.2%	0.8%	1.4%	0.9%	0.4%	13.2%
2000	1.0%	0.8%	1.1%	2.9%	2.0%	1.0%	1.0%	1.0%	2.0%	0.4%	0.3%	0.4%	14.5%
2001	3.5%	0.6%	1.4%	2.2%	0.5%	0.2%	1.2%	1.3%	-0.1%	0.4%	0.8%	0.3%	13.0%
2002	1.1%	0.3%	0.6%	0.8%	0.6%	0.4%	0.0%	0.3%	0.5%				4.8%

Number of months return is negative is 6 of 57.

S&P EVENT-DRIVEN PRO FORMA INDEX

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1998	0.6%	1.9%	0.9%	0.9%	0.2%	1.1%	-0.2%	-6.4%	-1.8%	0.4%	2.1%	0.9%	0.3%
1999	1.9%	0.7%	1.0%	3.0%	1.7%	2.0%	0.8%	-0.3%	0.4%	-0.2%	2.2%	1.3%	15.5%
2000	1.7%	2.5%	1.2%	1.0%	0.8%	2.0%	1.3%	1.3%	0.6%	0.2%	-0.2%	0.2%	13.4%
2001	2.0%	1.0%	-0.4%	0.9%	2.1%	-0.4%	0.6%	1.1%	-2.6%	1.4%	1.3%	1.3%	8.5%
2002	1.1%	-0.2%	1.9%	0.8%	0.2%	-3.1%	-2.5%	0.3%	-0.9%				-2.5%

Number of months return is negative is 13 of 57.

S&P DIRECTIONAL/TACTICAL PRO FORMA INDEX

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1998	1.3%	1.1%	2.6%	-1.2%	1.4%	0.7%	-0.5%	0.9%	1.7%	2.3%	1.5%	1.0%	13.5%
1999	0.7%	0.8%	1.4%	3.8%	-0.2%	2.8%	0.9%	-0.3%	1.2%	-2.5%	3.1%	4.7%	17.3%
2000	1.2%	2.6%	0.1%	-1.6%	-0.6%	1.6%	-1.4%	1.9%	-1.6%	0.4%	3.8%	5.4%	12.3%
2001	1.8%	0.5%	2.5%	-2.2%	-0.1%	0.6%	-0.5%	1.6%	1.9%	2.6%	-2.9%	1.0%	6.7%
2002	-0.5%	-1.1%	0.9%	-0.2%	1.9%	2.1%	-0.3%	0.2%	1.1%				4.2%

Number of months return is negative is 17 of 57.

4.1.2 Correlations with Other Asset Classes

In general the pro forma index has low correlations with other asset classes. The pro forma index has the highest correlation of 0.56 with the Merrill Lynch U.S. High Yield Bond Master II Index (Merrill U.S. High Yield) as seen in Table 4.3, demonstrating the consistency and stability of the returns. With other hedge fund indices the correlation is fairly high. The pro forma index has a correlation of 0.74 with the HFR Fund of Funds and 0.67 with the HFR Fund Weighted Composite (Table 4.4).

TABLE 4.3 CORRELATION OF RETURNS OF S&P HEDGE FUND PRO FORMA INDEX STRATEGIES AND STYLES WITH OTHER ASSET CLASSES

	S&P HFI	S&P ARBITRAGE	Equity Market Neutral	Fixed Income Arbitrage	Conv. Arbitrage	S&P EVENT-DRIVEN	Merger Arbitrage	Distressed	Special Situations	S&P DIRECTLY/TACTICAL	Equity Long/Short	Managed Futures	Macro
S&P 500	0.30	-0.03	0.31	-0.17	-0.07	0.56	0.54	0.31	0.59	0.02	0.77	-0.40	-0.48
Lehman Aggregate Bond	-0.05	-0.02	-0.19	0.06	0.03	-0.29	-0.10	-0.32	-0.31	0.20	-0.21	-0.38	0.14
U.S. T-Bills	0.29	0.16	0.25	-0.01	0.21	0.20	0.38	-0.04	0.21	0.16	0.17	0.01	0.10
Merrill U.S. High Yield	0.56	0.34	0.31	0.14	0.30	0.70	0.57	0.65	0.60	0.01	0.56	-0.38	-0.20
S&P Global 1200	0.35	-0.05	0.28	-0.19	-0.07	0.58	0.53	0.36	0.61	0.08	0.81	-0.40	-0.40

TABLE 4.4 CORRELATION OF RETURNS OF S&P HEDGE FUND PRO FORMA INDEX STRATEGIES AND STYLES WITH OTHER HEDGE FUND INDICES

	S&P HFI	S&P ARBITRAGE	Equity Market Neutral	Fixed Income Arbitrage	Conv. Arbitrage	S&P EVENT-DRIVEN	Merger Arbitrage	Distressed	Special Situations	S&P DIRECTLY/TACTICAL	Equity Long/Short	Managed Futures	Macro
HFR Equity Market Neutral	0.33	0.12	-0.06	0.09	0.23	0.22	0.32	0.02	0.24	0.25	0.19	0.09	0.12
HFR Fixed Income Arbitrage	0.39	0.64	-0.02	0.67	0.40	0.26	0.03	0.43	0.20	-0.08	0.03	-0.09	-0.09
HFR Convertible Arbitrage	0.69	0.56	0.23	0.28	0.79	0.73	0.51	0.63	0.74	0.04	0.59	-0.36	-0.24
HFR Statistical Arbitrage	0.32	0.14	0.41	-0.07	0.08	0.45	0.49	0.32	0.36	0.01	0.37	-0.23	-0.14
HFR Merger Arbitrage	0.56	0.17	0.44	-0.11	0.21	0.82	0.87	0.44	0.81	0.06	0.69	-0.42	-0.25
HFR Distressed Securities	0.67	0.30	0.07	0.19	0.38	0.81	0.46	0.77	0.82	0.13	0.77	-0.37	-0.29
HFR Event-Driven	0.76	0.23	0.24	0.05	0.30	0.88	0.69	0.66	0.91	0.27	0.90	-0.35	-0.22
HFR Equity Hedge	0.60	0.05	-0.01	0.00	0.14	0.64	0.53	0.38	0.71	0.37	0.87	-0.20	-0.18
Barclay Managed Futures	-0.02	-0.17	-0.19	-0.03	-0.19	-0.44	-0.38	-0.34	-0.43	0.51	-0.32	0.73	0.45
HFR Macro	0.70	0.13	-0.23	0.20	0.21	0.40	0.20	0.31	0.49	0.68	0.58	0.26	0.21
HFR Fund of Funds	0.74	0.26	-0.07	0.25	0.30	0.71	0.45	0.56	0.78	0.37	0.80	-0.17	-0.14
HFR Fund Weighted Composite	0.67	0.13	-0.05	0.05	0.20	0.74	0.56	0.50	0.81	0.33	0.91	-0.26	-0.24

Table 4.5 presents the correlation of the pro forma index with other hedge fund indices such as the EACM 100 Index, Hennessee Hedge Fund Index, Altvest Hedge Fund Index, and CSFB/Tremont HFI. All the correlations are reasonably high. Although the S&P HFI is constructed differently, these correlations show that it has similar directional movement as the other hedge fund indices.

TABLE 4.5 CORRELATION OF RETURNS OF S&P HEDGE FUND PRO FORMA INDEX WITH OTHER INDICES

	S&P HFI	S&P 500	Lehman Aggregate Bond	EACM 100 Index	Hennessee Hedge Fund Index	Altvest Hedge Fund Index	CSFB Tremont HF Index	HFR Fund of Funds	HFR Fund Weighted Composite
S&P HFI	1.00	0.30	-0.05	0.77	0.69	0.69	0.67	0.74	0.67
S&P 500	0.30	1.00	-0.25	0.49	0.70	0.67	0.41	0.50	0.73

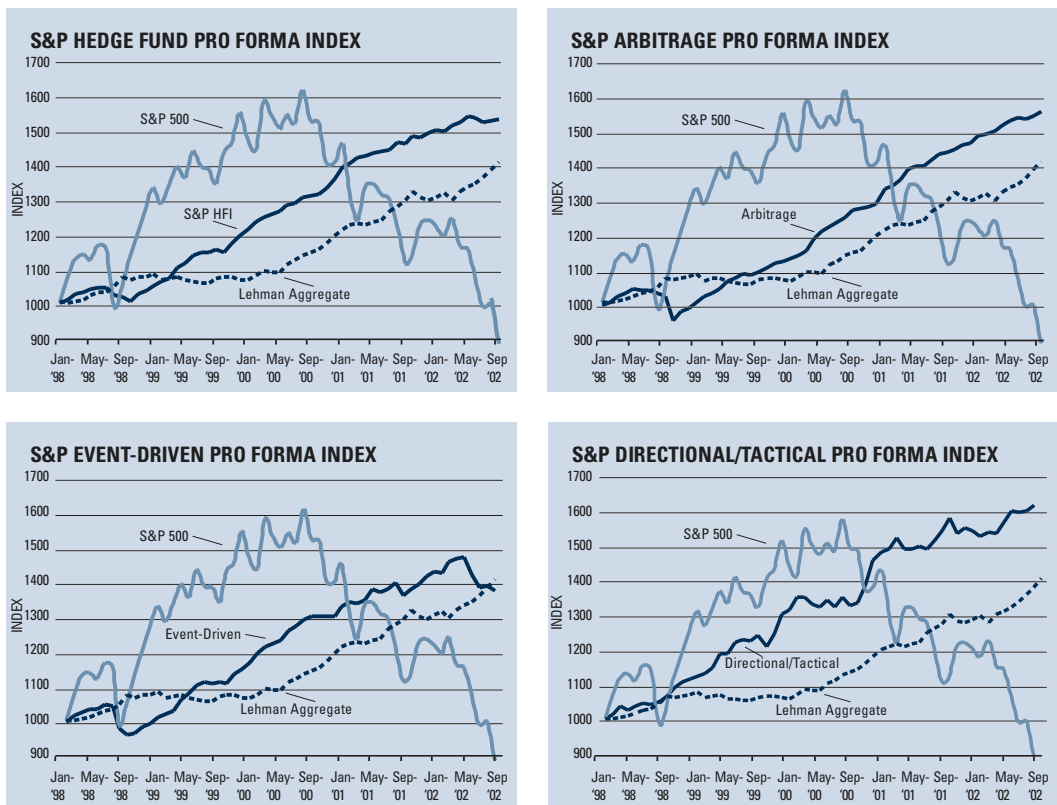
4.1.3 Comparison with Other Indices

The pro forma index produced an average of 11.6 percentage points excess return per year over the S&P 500 during the period. This large excess return was generated at an extremely low annualized standard deviation of 3.2%, compared to 18.6% for the S&P 500, yielding a Sharpe ratio of 1.6 for the pro forma index. The high volatility of the S&P 500 may be attributable to the particular time period.

The pro forma index has less volatility than the other benchmarks shown in Table 4.1, except for U.S. T-bills with 0.4%. However, U.S. T-bills have a low annual return, 4.2%, over the period.

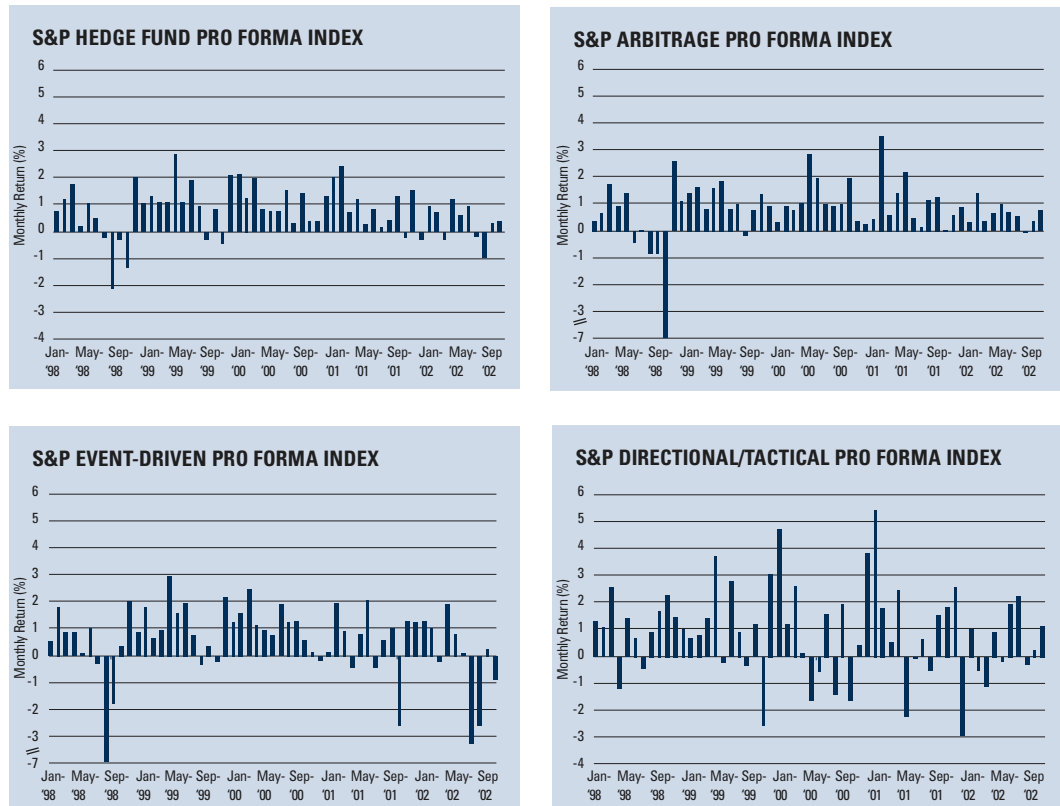
Graph 4.1 illustrates the consistency of the performance. The slope of the pro forma index is almost constant throughout the period, compared to the volatile S&P 500 and the lower-yielding Lehman Aggregate Bond Index.

GRAPH 4.1 CUMULATIVE RETURNS OF S&P HEDGE FUND PRO FORMA INDEX AND OTHER ASSET CLASSES



Graph 4.2 displays the monthly returns of the pro forma index. Once again, one can see that returns are mostly positive and reasonably consistent, especially in the composite index.

GRAPH 4.2 RETURNS OF S&P HEDGE FUND PRO FORMA INDEX AND SUB-INDICES



4.2 Performance by Style and Strategy

4.2.1 Returns and Volatility

The S&P Directional/Tactical Pro Forma Index produced the best returns of the three sub-indices (Table 4.1), with 66.3% over the entire period or 11.3% annualized. Standard deviation for the period was 5.8% with a Sharpe ratio of 1.2. On the basis of risk-adjusted returns, the S&P Arbitrage Pro Forma Index also had a Sharpe ratio of 1.1, but returns were 53.2% for the period.

The Convertible Arbitrage strategy was the best performing of the nine strategies, returning 82.9% for the period or 13.5% annualized. It also had the highest Sharpe ratio with 2.2.

4.2.2 Comparison with Other Strategy Indices

The S&P HFI strategies are in most cases highly correlated with other strategy indices (Table 4.4). For instance, the Event-Driven style has a correlation of 0.88 with the HFR Event-Driven Index, and the three strategies in the style have correlations of 0.66 to 0.91 with the HFR Event-Driven Index.

There are two exceptions to these high correlations.

S&P HFI Macro Strategy

The S&P HFI Macro strategy has a correlation of 0.21 with the HFR Macro Index. We believe that the reason for this lies in the very definition of the Macro strategy. Macro funds are a heterogeneous group with a wide dispersion of returns between individual funds. The heterogeneity arises from the opportunistic nature of the investment styles and the differing skills and specialties of the managers. Also, funds for this strategy are selected for the S&P HFI for their lack of correlation with other strategies.

The most recent 12-month correlation of the S&P HFI Macro strategy and the HFR Macro Index is 0.58, indicating possibly that there is a growing consensus among managers, and they are potentially involved in the same types of trades.

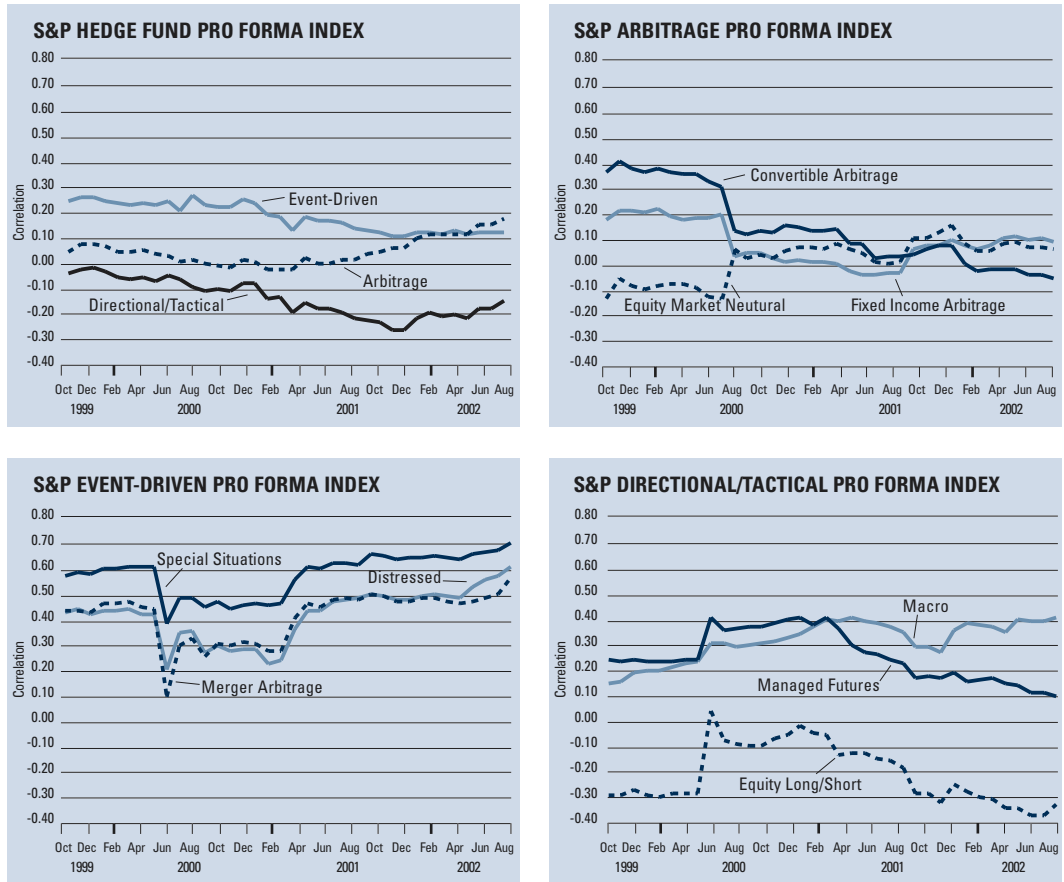
S&P HFI Equity Market Neutral Strategy

The S&P HFI Equity Market Neutral strategy has a negative correlation of -0.06 with the HFR Equity Market Neutral Index. The reason again relates to the definition of the S&P HFI Equity Market Neutral strategy. Namely, it includes both Quantitative and Fundamentally-Driven Equity Market Neutral and Statistical Arbitrage funds. Statistical Arbitrage usually relies on individual stock mean reversion, while other Equity Market Neutral strategies can often require a degree of market trending (usually with some exposure to value and momentum factors.) Note that the S&P HFI Equity Market Neutral strategy has a positive correlation of 0.41 with the HFR Statistical Arbitrage. Depending on market conditions, these two specialties might diverge. For instance, for the period under consideration, the correlation between HFR Equity Market Neutral and HFR Statistical Arbitrage is 0.37.

4.2.3 Cross-Correlations of Styles and Strategies

Graph 4.3 shows the 36-month rolling correlations of monthly returns of styles and strategies. The four graphs present the correlations of the three styles among themselves and the three strategies in each style among themselves. The correlation for any particular style is calculated as the average of the correlations of that style with the other two styles in the index. The correlations for the strategies are calculated similarly.

GRAPH 4.3 36-MONTH ROLLING CROSS-CORRELATIONS AMONG STYLES AND STRATEGIES IN S&P HEDGE FUND PRO FORMA INDEX



The rolling correlations are reasonably stable and persistent. Until recently, the Event-Driven style was the most correlated with the other two styles. Correlations among styles decline over time due to divergence in returns.

The rolling correlations of the Equity Market Neutral strategy exhibit a jump, and the Fixed Income Arbitrage and Convertible Arbitrage strategies exhibit dips, in August 2000. This is attributable to inclusion of July and August 1998 in the 36-month rolling correlation; these months exhibited return anomalies for these strategies. If these two months are excluded, the correlations are stable.

The rolling correlations of the Equity Long/Short strategy with Managed Futures and Macro strategies decline over the time period. One reason could be the changing exposures of Equity Long/Short managers, from significantly net long at the beginning to far less net long. ■

Appendix 1. Description of Hedge Fund Strategies

For each strategy included in the S&P HFI we describe the investment approach, the specialties within the strategy, and some of the implementation details for index construction. In certain cases, the index construction for some of the strategies might differ from the implementation details discussed here.

1.1 Style: Arbitrage

1.1.1 Strategy: Equity Market Neutral

Funds take both long and short positions in equities. Stock positions are usually diversified, so that no one position has a disproportionate effect on the portfolio. Related short positions hedge out much of the systematic risk in the long positions on either a dollar- or beta-adjusted basis so that the overall portfolio has a limited exposure to market moves.

Stocks are selected for inclusion in market neutral equity portfolios according to fundamental company-specific factors, factor characteristics and the expectation of future returns to the factors, and statistical modeling of short-term anomalies created by supply and demand factors for individual stocks.

Specialties

- Statistical Arbitrage: Anomaly-driven, quantitative, double-alpha strategy. Statistical Arbitrage usually engages in very short-term trading and usually focuses on residual mean reversion.
- Quantitative: A quantitative application of fundamental analysis, using Barra factor and other models, that are often momentum, earnings, or valuation based. Quantitative Equity Market Neutral is a longer-term strategy.
- Fundamental: A bottom-up, fundamentally driven stock picking approach with a longer time horizon.

Index Implementation

Statistical Arbitrage, Quantitative, and Fundamental strategies.

1.1.2 Strategy: Fixed Income Arbitrage

Fixed Income Arbitrage funds exploit the relative values of fixed income instruments. The manager takes positions in government bonds and investment-grade corporate bonds, government agency securities and swap contracts, and futures and options on fixed income instruments. The manager generally constructs the portfolio on a market neutral basis and often constrains it to be duration neutral within a given country (often developed countries).

A distinct sub-specialty within Fixed Income Arbitrage is U.S. Mortgage Arbitrage, where the manager takes positions in mortgage-backed securities such as residential pass-through securities and derivatives, and commercial mortgage securities. The manager attempts to neutralize the impact of interest rate changes and prepayment behavior of borrowers by combining long and short positions in mortgage securities with different characteristics and other hedging positions such as shorts in U.S. Treasuries and interest rate options and swaps.

Specialties

- Fixed Income Arbitrage.
- Mortgage Arbitrage.

Index Implementation

Both Fixed Income and Mortgage Arbitrage are included.

1.1.3 Strategy: Convertible Arbitrage

Convertible bonds range from investment-grade credits to busted convertibles, and a fund may concentrate on one or more of the high-delta, middle-delta, and low-delta convertible strategies. Convertible Arbitrage funds attempt to exploit the mispricing in convertible securities. As the mispricing in convertible securities is typically small, this strategy will usually employ leverage.

A convertible bond's valuation is dependent on the stock price and volatility of the underlying share, the credit rating of the issuer, the maturity and coupon of the bond, the expected future dividends of the underlying share, and the interest rate. A convertible manager takes an exposure to the volatility and/or the credit risk of the bond, hedging out the other factors. The stock exposure is typically hedged out with a short position in the underlying company shares. The strategy is thus typically market neutral.

Specialties

By region and type of strategy:

- Geographic: Global, U.S., Japan, and Europe.
- Delta Spectrum:
 - High-delta: deep in-the money convertibles (a synthetic put strategy);
 - Middle-delta: optionality/volatility exposure;
 - Low-delta: busted converts (high yield).

Index Implementation

Selection from middle-delta or multiple convertible strategy funds, which may or may not hedge credit, interest rate, and other risks, with a regional mix to include U.S. and global strategies. The majority of the strategies are middle-delta strategies with the flexibility to participate in the other strategies, creating the most general exposure possible.

1.2 Style: Event-Driven

1.2.1 Strategy: Merger Arbitrage

The Merger Arbitrage strategy involves taking positions in companies that are either currently or likely to be engaged in corporate mergers and acquisitions. Merger Arbitrage funds typically buy shares in the target and sell an appropriate quantity of shares in the acquirer in a merger deal. In a completed deal they will typically have an equal and opposite position in the acquirer, and will have earned a spread in the meantime. Factors that affect returns include the extent of the spread that can be earned through this transaction, the likelihood of a deal coming to fruition (it may break for regulatory, financial, or company-specific reasons), and the likely date of completion of the deal. Variations occur when the acquirer is bidding for the target with cash, or when the ratio of shares of the acquirer to be offered is dependent on the price of the shares.

Specialties

Geographic.

Index Implementation

Strategies are primarily U.S. focused, with some global exposure. Because of close correlations, it is not critical to highly stratify this sampling.

1.2.2 Strategy: Distressed

Distressed security funds generally invest in securities of financially troubled companies (companies involved in bankruptcies, exchange offers, workouts, financial reorganizations, and other special credit event-related situations). These managers may identify distressed securities in general or focus on one particular segment of the market (e.g., senior secured debt). Investments may be accumulated with a view to an exit via the secondary market, or with the expectation that the company will be recapitalized, restructured, or liquidated, where the fund manager may either seek to be actively or passively involved in the process.

High-yield funds price more easily and have more long/short activity; thus they have reasonable transparency. Bankruptcies, which are not necessarily correlated with other events in the market, form a major portion of this strategy class. Long-Only funds seek capital gains by holding long-term stakes in bankrupt or financially distressed (or stressed) firms, while Long/Short funds take positions either within the capital structure of a firm or long and short positions in the debt of different companies, seeking to both add value and hedge out some market/systematic risk. Managers may receive equity after the restructuring of a distressed company.

Specialties

- Distressed (bankruptcies, workouts/restructuring).
- Long/Short corporate debt.
- High-yield.

Index Implementation

The index has representation from all three specialties.

1.2.3 Strategy: Special Situations

Special Situations encompasses funds that seek profit opportunities from a broad range of corporate events. Managers are either generalists, who engage in trading keyed to corporate events such as a merger, distressed finances or share prices, and changes to an index, or specialists who concentrate on a specific niche they can exploit. Value-oriented funds invest in undervalued obligations including bank debt, high-yield bonds, trade claims, and equity securities created by discrete and often extraordinary events. Niche strategies include Capital Structure Arbitrage (which includes investing long and short in different parts of the capital structure of the same firm) or other relative-value trades, such as trading between ADRs and local shares or voting versus non-voting shares, as well as strategies involving trading a holding company versus positions in its listed subsidiaries (a “stub” trade). It also includes Closed End Fund Arbitrage, which involves the purchase and hedging of closed-end funds that may be trading at a significant difference from their net asset values.

Specialties

- General event-driven investing.
- Restructuring/Balance sheet.
- Value-oriented.
- Other (such as Index Arbitrage).

Index Implementation

Funds are sought that are not correlated with Distressed or Merger Arbitrage, implying a diverse or changing set of exposures such as transactions in corporate credit quality, reorganizations, and corporate capital structures, as well as value-oriented funds.

1.3 Style: Directional/Tactical

1.3.1 Strategy: Equity Long/Short

Equity Long/Short funds take long and short stock positions. The manager may attempt to profit from “alpha” generation on both long and short stock positions independently, or profit from the relative outperformance of long positions against short positions. The stock picking and portfolio construction process is usually based on bottom-up fundamental stock analysis, but may also include top-down macro-based views, market trends, and sentiment factors. Equity Long/Short managers specialize by region (e.g., global, U.S., Europe, or Asia) or by sector.

Specialties

- Geographic: Global, U.S., Europe, and Asia.
- Sector/Industry.

Index Implementation

Global and regional funds are included; sector-specific funds are excluded.

1.3.2 Strategy: Managed Futures

Managed Futures programs take long and short positions in liquid commodity or financial futures, such as currencies, interest rates, or stock market indices. Investment decisions are typically based on strict quantitative methods, notably, trend-following models.

Specialties

- Systematic: Quantitative and trend-following.
- Discretionary.

Index Implementation

Funds are selected from only the systematic bucket as it tends to add non-correlated characteristics and has less similarity to other strategies.

1.3.3 Strategy: Macro

Macro funds take long and short positions in currencies, bonds, equities, and commodities. The manager tries to exploit perceived divergences between and within these various asset classes. The investment decisions are based on a manager’s top-down or macro views of the world, economy, government policy, interest rates, inflation, market dynamics, and sentiment. The manager may also base investment decisions on relative valuations of financial instruments within or between asset classes.

Specialties

As these strategies cover global asset allocation using a variety of methods, a specialty classification here does not apply.

Index Implementation

Funds are selected with low correlations with other strategies to obtain exposures unique to an asset class that has maximum investment flexibility.

Appendix 2. Strategy Classification Differences Among Indices

	S&P HFI	CSFB	HFR	Zurich	EACM	Hennessee	HF.Net	Van Hedge	Investor Force	MAR
Equity Market Neutral	X	X	X			X	X	X		X
Fixed Income Arbitrage	X	X	X			X	X	X		
Convertible Arbitrage	X	X	X	X	X	X	X			
Merger Arbitrage	X		X	X	X	X	X		X	X
Distressed	X		X	X	X	X	X	X	X	X
Special Situations	X						X	X		
Equity Long/Short	X	X	X	X	X		X		X	
Managed Futures	X	X					X			X
Macro	X	X	X			X	X	X	X	X
Event-Driven		X	X	X	X	X	X		X	X
Relative Value			X		X		X		X	
Aggressive Growth							X	X		
Emerging Markets		X	X			X	X	X	X	X
Energy			X				X			
Financial			X	X	X	X	X	X		
Fixed Income - High Yield			X			X				
Fund of Funds			X	X			X	X	X	X
Health Care			X			X	X	X	X	
International						X				X
Market Timing			X				X	X		
Opportunity					X	X	X	X		
Regulation D			X			X	X			
Short Selling			X		X	X	X	X	X	X
Statistical Arbitrage			X				X			
Technology			X			X	X	X	X	
Value						X	X	X		

X refers to the presence of a strategy classified by an index provider.

Source: Standard & Poor's. Adapted from Noël Amenc and Lionel Martellini, "The Brave New World of Hedge Fund Indexes," June 14, 2002.

1. There is considerable overlap between the S&P HFI Special Situations strategy and the other providers' Event-Driven indices, since the S&P HFI Special Situations strategy comprises a broad mix of Event-Driven specialties.
2. CSFB/Tremont has an investable product, but only minimal information is publicly available.
3. HFR has Daily Transparent Indices that are investable, but the number and composition of funds are not publicly available.
4. Zurich Capital Markets has an investable product that captures five of the nine strategies represented in S&P HFI.
5. EACM, HF.Net, and MAR often use "risk arbitrage" for what other index providers refer to as "merger arbitrage."
6. The broad Event-Driven and Relative Value categories could include some or all of the nine S&P HFI strategies.

Appendix 3. Statistical Concepts

3.1 Kolmogorov-Smirnov Test Procedure

The Kolmogorov-Smirnov (K-S) test is a non-parametric test for differences between cumulative distributions. For a K-S test, we create a sample cumulative distribution of correlations of a fund with funds within its strategy and compare this to the cumulative distribution of correlations of the fund with funds not in its strategy. The K-S test accepts or rejects the hypothesis that they belong to the same distribution, depending on the maximum vertical distance between the two distributions. The K-S test is generally more efficient than the chi-square test for goodness of fit for small samples and can be used for very small samples where the chi-square test does not apply.

The K-S test procedure is as follows. Let X_1 to X_n be a random sample from a population with cumulative distribution function $F(x)$ corresponding to the distribution of a continuous random variable. Suppose $F_0(x)$ denotes a completely specified cumulative distribution function (CDF) such as, for example, $N(10, 4)$ or $M(1, 1/2)$.

Suppose we wish to test Hypothesis₀: $F(x) = F_0(x)$ for all x versus Hypothesis₁: $F(x)$ not = $F_0(x)$ for at least one x . Let $F_n(x)$ denote the empirical CDF of the random sample, i.e., $F_n(x) = (\text{number of } X\text{s in the sample } \leq x) / n$. The empirical CDF is a step function that has jumps at $X(i) = 1$ to n each of size $1/n$. Then, $F_n(x) \rightarrow F_0(x)$.

Consider the test statistic $D = \sup_{-\infty < x < \infty} \{ |F_n(x) - F_0(x)| \}$, where \sup denotes supremum. If we plot $F_n(x)$ and $F_0(x)$ on the y axis versus x on the x axis, D will represent the value of the greatest vertical distance between $F_n(x)$ and $F_0(x)$. The supremum on the right-hand side of the equation for D occurs either at an $X(i)$ value, i.e., at a jump-point of $F_n(x)$, or at a value just to the left of one of the $X(i)$. $F_0(x)$ is the true distribution of X , so $F_n(x)$ must be close to $F_0(x)$. Therefore, the greatest vertical distance between $F_n(x)$ and $F_0(x)$ must be small under H_0 . At level of significance α , we reject H_0 if $D \geq d_\alpha$, where $H_0(D \geq d_\alpha) = \alpha$. The critical values d_α can be obtained from statistical tables.

3.2 Analysis of Variance

We use analysis of variance (ANOVA) to cross-validate the statistical consistency of the nine strategy groupings. The essence of the technique is to test whether the standardized distance within groups is less than the standardized distance between groups.

For a sample of N observations divided into g groups and n_i observations in each group,

$$N = \sum_{i=1}^g n_i$$

The overall sample mean is

$$\bar{x}_{00} = \sum_{i=1}^g \sum_{j=1}^{n_i} x_{ij} / N$$

The sample mean within group i is

$$\bar{x}_i = \sum_{j=1}^{n_i} x_{ij} / n_i$$

An ANOVA procedure decomposes the sum of the squares of the sample into two parts—the sum of the squares of observations in each group around the group means (within-group variance) and the sum of the squares of group means around the overall sample mean (between-group variance).

The total sum of the squares can be represented as

$$\begin{aligned} \text{TSS} &= \sum_{i=1}^g \text{TSS}_i \\ &= \sum_{i=1}^g (\text{MSS}_i + \text{ESS}_i) \end{aligned}$$

where

TSS is the total sum of squares;

MSS is the mean sum of squares (within-group variance); and

ESS is the error sum of squares (between-group variance).

The equation for the total sum of squares is

$$\text{TSS} = \sum_{i=1}^g \sum_{j=1}^{n_i} (x_{ij} - \bar{x}_{00})^2$$

The equation for the mean sum of squares is

$$\text{MSS} = \sum_{i=1}^g \sum_{j=1}^{n_i} (x_{ij} - \bar{x}_i)^2$$

The equation for the error sum of squares is

$$\text{ESS} = \sum_{i=1}^g \sum_{j=1}^{n_i} (\bar{x}_i - \bar{x}_{00})^2$$

Consider the ratio of ESS to TSS. This ratio represents the proportion of cross-sectional variance explained by the group membership. If a particular strategy classification is robust, more of the proportion of variance is explained by group membership. Thus, the higher the ratio, the sharper the group definition, and the lower the ratio, the poorer the group definition.

Appendix 4. Calculation Algorithm for S&P Hedge Fund Index

We describe the S&P HFI calculation algorithm under five different scenarios. The Index value is calculated from the NAVs of the underlying funds as follows.

4.1 Index Level Calculation

Index calculations for the NAV and GAV index are performed when the constituent funds do not change.

Composite Index

NAV Index: $\sum_{1 \text{ to } F} (\text{Shares}_i)(\text{NAV}_i / \text{Divisor})$

GAV Index: $\sum_{1 \text{ to } F} (\text{Shares}_i)(\text{GAV}_i / \text{Divisor})$

where

F = Number of funds in the index;

Shares_i = Number of shares allocated to fund at last rebalancing to initiate index participation at the appropriate weight;

NAV_i = NAV of the fund;

Divisor = Initial translation factor to start index at 1000;⁶

GAV_i = GAV of the fund.

Sub-indices

NAV Index: $\sum_{1 \text{ to } S} (\text{Shares}_i)(\text{NAV}_i / \text{Divisor})$

where

S = Number of funds in sub-index;

Shares_i = Number of shares allocated to fund at last rebalancing to initiate index participation at the appropriate weight;

NAV_i = NAV of the fund;

Divisor = Initial translation factor to start index at 1000.⁶

4.2 Annual Rebalancing

Calculations are performed for the composite index and sub-indices during annual rebalancing.

Composite Index

I (index capital) = $\sum_{1 \text{ to } F} (\text{Shares}_F)(\text{NAV}_F)$

S_r (rebalanced strategy capital) = I (1 / number of strategies) *currently nine*

For all funds within a strategy: Shares_{ra} = (S_r / F_s) / NAV_F

where

F = Number of funds in the index;

Shares_F = Current fund shares;

NAV_F = NAV of fund at annual finalization;

Shares_{ra} = Fund shares after rebalance;

F_s = Number of funds in the strategy.

⁶ The S&P HFI tracks a hypothetical portfolio of its constituents without capital inflows or outflows, which keeps the divisor constant.

Sub-indices

SI (sub-index capital) = $\sum_{1 \text{ to } F} (\text{Shares}_F)(\text{NAV}_F)$

S_r (rebalanced strategy capital) = SI (1 / number of styles) *currently three*

For all funds within a strategy: $\text{Shares}_{ra} = (S_r / F_s) / \text{NAV}_F$

where

F = Number of funds in the sub-index;

Shares_F = Current fund shares;

NAV_F = NAV of fund at annual finalization;

Shares_{ra} = Fund shares after rebalance;

F_s = Number of funds in the strategy.

4.3 Swapping a Fund

When a fund is replaced by a new fund, both the composite and the sub-indices are recalculated. The original fund is dropped and the new fund is added.

$\text{Shares}_n = (\text{Shares}_{rb})(\text{NAV}_r / \text{NAV}_n)$

where

Shares_n = Shares of new fund;

Shares_{rb} = Fund shares before rebalance;

NAV_r = NAV of current fund to be replaced;

NAV_n = NAV of new fund.

4.4 Addition of a Fund

When a new fund is added to the index, capital is taken from the funds in the existing strategy proportionate to their current weights. This procedure does not involve the deletion of any current fund.

S (strategy capital) = $\sum_{1 \text{ to } F} (\text{Shares}_i)(\text{NAV}_i)$

New fund: $\text{Shares}_n = [S / (F + 1)] / \text{NAV}_n$

For all existing funds in the affected strategy: $\text{Shares}_{ra} = (\text{Shares}_{rb})[F / (F + 1)]$

where

F = Number of funds in strategy pre-rebalance;

Shares_i = Number of shares allocated to fund at last rebalancing to initiate index participation at the appropriate weight;

Shares_n = Shares of new fund at addition;

Shares_{ra} = Fund shares after rebalance;

Shares_{rb} = Fund shares before rebalance;

NAV_n = NAV of new fund at time of addition.

4.5 Deletion of a Fund

When a fund is deleted from the index, its capital is allocated to the remaining funds in the strategy proportionate to their current weights. This procedure does not involve the addition of any new fund.

$$S \text{ (strategy capital)} = \sum_{1 \text{ to } F} (\text{Shares}_i)(\text{NAV}_i)$$

$$S_{\text{rm}} = (\text{Shares}_{\text{rm}})(\text{NAV}_{\text{rm}})$$

$$\text{For all existing funds in the affected strategy: } \text{Shares}_{\text{ra}} = \text{Shares}_{\text{rb}} [S / (S - S_{\text{rm}})]$$

where

F = Number of funds in strategy pre-rebalance;

S_{rm} = Capital invested in the removed fund;

$\text{Shares}_{\text{ra}}$ = Fund shares after rebalance;

$\text{Shares}_{\text{rb}}$ = Fund shares before rebalance;

$\text{Shares}_{\text{rm}}$ = Shares of removed fund;

NAV_{rm} = NAV of removed fund.

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