

## **A Primer on Hedge Funds**

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## Abstract

In this paper, we provide a rationale for how hedge funds are organized and some insight on how hedge fund performance differs from traditional mutual funds. Statistical differences among hedge fund styles are used to supplement qualitative differences in the way hedge fund strategies are described. Risk factors associated with different trading styles are discussed. We give examples where standard linear statistical techniques are unlikely to capture the risk of hedge fund investments where the returns are primarily driven by non-linear dynamic strategies.

## 1. Introduction

Institutional investors and wealthy individuals have long been interested in hedge funds as alternative investments to traditional portfolios of assets. For over half a century of its existence, the hedge fund industry has stayed opaque to the general investing public. Increasingly, spectacular hedge fund activities in the last decade, such as the attack on the British Pound led by George Soros and the recent collapse of Long Term Capital which prompted the intervention from federal regulators, have heightened the public's interest in the hedge fund industry. The literature on the industry has grown substantially. The depth of the literature is still limited to showing readers "how" hedge funds are organized juxtaposed with stylized facts that are often hard to piece together into a coherent framework. In depth discussions can be found but are typically limited to the philosophy of a single investment style such as the work by George Soros.

In this paper, we attempt to provide a rationale on how hedge funds are organized, and provide some insight as to why one should expect hedge fund performance to differ from traditional mutual funds. Statistical differences among hedge fund styles are used to supplement qualitative differences in the way hedge fund strategies are described. Although one is constrained by space limitations, we hope to convey to the reader that hedge funds differ from each other not just because they describe themselves differently but their strategies and therefore their return characteristics do indeed differ.

## 2. A Brief History of Hedge Funds

Hedge funds are generally regarded as private investment vehicles for wealthy individuals or institutional investors. They are typically organized as limited partnerships, in which the investors are limited partners and the managers are general partners. As general partners, the fund managers usually invest in a significant portion of their personal wealth into the partnership to ensure the alignment of economic interests among the partners. Investors to the partnership are charged a performance-based fee where the potential payout to successful managers can be significantly higher than the fixed management fee. To date, this organization structure has survived for almost half a century of growing

hedge fund activities and still continues to be the dominant organization format. Before discussing the economic rationale for choosing this particular form of organization, a brief history on the evolution of hedge funds helps to motivate our analysis.

According to Caldwell (1995), the first hedge fund was formed by Albert Wislow Jones in 1949. The primary strategy used long-short equity positions and leverage. The fund also carried an incentive fee based on performance.<sup>1</sup> Hedge funds remained relatively obscure to the investment world until 1966, when an article in *Fortune* described Jones' funds to have returns (net of fee) substantially higher than the best performing mutual funds.<sup>2</sup> This led to a flurry of interest in hedge funds and many were formed in the next two years. Caldwell (1995, p. 10) stated that "the SEC found 215 investment partnerships in a survey for the year ending 1968 and concluded that 140 of these were hedge funds, with the majority formed that year."

After the rapid expansion in 1967-68, the hedge fund industry experienced a substantial setback during the bear markets of 1969-70 and 1973-74, when many funds suffered losses and capital withdrawals. Hedge funds faded back into obscurity until 1986, when an article in *Institutional Investor* reported that Julian Robertson's Tiger Fund had compounded annual returns of 43% during its first six years of existence, after expenses and incentive fee.<sup>3</sup> This reignited interests in hedge funds, with the formation of many new hedge funds.

Another group of funds that is often regarded as part of the same investment universe as hedge funds are commodity trading pools. These investment pools are often structured in a similar way as hedge fund partnerships but are typically operated by commodity trading advisors (CTAs). CTAs are firms or individuals who handle customer funds or provide advise for trading futures contracts or options on futures contracts. CTAs are required to register with the Commodity Futures Trading Commission (CFTC) through the National Futures Association, a self-regulatory body for the futures industry. Traditionally, CTA funds are distinguished from hedge funds based on a simplistic notion that they are limited to trading primarily futures contracts. However, the growth of financial derivatives, the globalization of markets, and the reduction in regulatory restraints have given CTAs the ability to take

exposure in financial instruments such as interest rates, currencies, and stock indices, in addition to commodities. Nowadays, CTAs often transact in the over-the-counter securities market especially in derivative instruments. This has blurred the distinction between hedge funds and CTA funds. Parallel to this, the growth of the futures markets globally has pushed futures contracts into the forefront as essential risk management tools for hedge fund managers. Over the years, hedge funds have become significant participants in most global futures exchanges. Consequently, many funds have found it necessary to comply with the CFTC reporting requirements and to register with the CFTC as either CTAs or commodity pool operators (CPOs). Nowadays a fund's regulatory registration is no longer a meaningful indication of a fund's activities. For instance, it was reported that Long-Term Capital Management (LTCM) was registered as a commodity pool operator. As later facts revealed, the majority of LTCM's risk exposure was in the over-the-counter (OTC) securities markets. We believe that the distinction between different categories of funds lies in their performance characteristics, not with the licenses they hold. We shall refer to both groups of funds, traditional hedge funds and CTA funds, as "Hedge Funds" and make a distinction between them only when it is economically meaningful to do so. Next, we tabulate some stylized facts that are relevant to our discussions.

Table 1 shows the rapid growth in assets managed by an increasing number of hedge funds and CTA funds in the 1990s. At the end of 1997, there were 987 hedge funds with around \$65 billion of assets under management. CTA funds have grown somewhat less rapidly. At the end of 1997, there were 291 CTA funds with \$17 billion of assets under management.

Table 2 provides the distribution of management fees and incentive fees. For both hedge funds and CTA funds, the management fee is typically 1-2%, and the incentive fee is 15-20%.

Table 3 provides the annualized returns and standard deviations of equally weighted portfolios of hedge funds and CTA funds. They have slightly lower returns than the S&P 500, but much lower volatility. In addition, they have low correlation with the S&P.

Fung and Hsieh (1997a) showed that the returns of hedge funds and CTA funds are very different from those of US mutual funds. Figure 1 reports the distribution of the  $R^2$ s of the regressions of

the monthly returns of hedge funds and CTA funds versus mutual funds on the returns of eight standard asset markets: short term interest rates, US stocks, non-US stocks, emerging market stocks, US government bonds, non-US government bonds, gold (as a proxy for commodities), and the traded weighted US Dollar (as a proxy for foreign currencies). While more than half the mutual funds have  $R^2$ s above 75%, nearly half (48%) of the hedge funds have  $R^2$ s below 25%. Figure 2 reports the distribution of the (statistically) most significant asset market in each regressions. Mutual funds are strongly positively exposed to US stocks and bonds. In contrast, hedge funds have exposures in all asset markets, and a substantial fraction (25%) of these are negative exposures (i.e. short positions).<sup>4</sup>

### 3. The Legal Environment of Hedge Funds

We believe the difference in return characteristics between hedge funds and mutual funds is primarily due to differences in their trading strategies. One fundamental difference is that hedge funds deploy dynamic trading strategies whereas most mutual funds employ a static buy-and-hold strategy. Another fundamental difference is the use of leverage. Hedge funds typically leverage their bets by margining their positions and through the use of short sales. In contrast, the use of leverage is often limited if not restricted for mutual funds. It is important to explore these differences in order to provide a rationale for the way hedge fund partnerships are organized.

In the US, three sets of regulators oversee the financial industries. The Securities Exchange Commission (SEC) oversees publicly traded securities, including the corporations that issue them, and the broker-dealers that help make markets for them. The Commodity Futures Trading Commission (CFTC) oversees the futures industry. The Federal Reserve, the Office of the Comptroller of the Currency, and the Office of Thrift Supervision oversee the commercial banking and thrift industry. These agencies were created based on the philosophy that government should regulate institutions that deal with the general public. Hedge funds do not deal with the public. They are private investment vehicles for wealthy investors and most institutional investors who are regarded as “sophisticated” and are treated differently from the general investing public. Thus hedge funds fall outside the direct

jurisdiction of these regulators.

According to the SEC's web site ([www.sec.gov](http://www.sec.gov)), the agency is responsible for enforcing federal securities laws that are designed "to protect investors in securities markets that operate fairly and to ensure that investors have access to disclosure of all material information concerning publicly traded securities." In addition, the SEC also "regulates firms engaged in the purchase or sale of securities, people who provide investment advice, and investment companies."

Specifically the SEC's authority stems from several securities laws. The Securities Act of 1933 (often called "truth in securities" law) requires firms issuing publicly traded securities to register with the SEC and file disclosure reports, to ensure that these firms provide the general public with all relevant information. Under the safe harbor provision of Rule 506 in Regulation D, a hedge fund may claim the status of a private placement, and hence be exempted from most registration and disclosure requirements. To qualify for this exemption, a hedge fund cannot have more than 35 "nonaccredited" investors and cannot engage in solicitation. The SEC's definition of "accredited" investor is an individual who has more than \$1 million in financial wealth or earns more than \$200,000 in the previous two years. The SEC's definition of non-solicitation is essentially word-of-mouth communication.

The Securities Exchange Act of 1934 gives the SEC power to regulate securities brokerage firms that face potential conflicts of interest in executing customer orders as well as trading on their own accounts. Broker-dealers are required to maintain detail records of their own trades as well as those of their customers. Hedge funds are usually exempted from registration as a broker-dealer and the associated costly reporting requirements as long as they trade only for their own investment accounts.

The Investment Advisers Act of 1940 extends the powers of the SEC to regulate investment advisors. This Act "requires that persons or firms compensated for advising others about securities investment must register with the Commission and conform to statutory standards designed to protect investors." By having less than 15 clients and by not soliciting business from the general public, a hedge fund manager may be exempted from registration as an investment advisor.

The Investment Company Act of 1940 establishes the authority of the SEC to regulate the

mutual fund industry. According to the Investment Company Institute, a national trade association of mutual fund companies, this Act "severely restricts a mutual fund's ability to leverage or borrow against the value of securities in its portfolio." (ICI, 1997). By having no more than 99 investors and by not making any public offerings, a hedge fund is not an investment company and therefore is exempt from the registration, disclosure requirements, and leverage restrictions pertaining to investment companies. Recent legislation have increased the exemption to 499 investors, provided each has more than \$5 million in assets.

In addition, hedge fund managers can receive certain types of performance-based fees that are prohibited to mutual funds. Mutual fund performance-based fee must satisfy the "fulcrum" rule. That is, gains and losses must have a symmetric effect, in the sense that the same amount of over- and under-performance relative to a benchmark must result in the same amount of positive and negative incentive fees for a mutual fund manager. Hedge fund managers are not subject to the "fulcrum" rule, or for that matter, any rules other than what the private investors would bear. Typically, hedge fund managers receive asymmetric fees in that they receive positive incentive fees for gains but are not required to rebate fees to investors for losses. This embedded "put option" remains a highly debated issue on hedge fund managers' compensation. On the one hand, the significant amount of personal wealth that hedge fund managers place at risk alongside investors inhibits excessive risk taking. On the other hand, there are extreme circumstances where the disproportional payout from the incentive fee may outweigh the risk of losing personal wealth even if reputational risks are taken into account. Thus, under what conditions hedge fund managers are enticed to take the "Hail Mary" toss and roll the dice against unreasonable odds remains an important question for future research.

We continue our discussion with the CFTC. Created in the Commodity Exchange Act of 1974 to regulate the futures markets in the US, the CFTC is mandated to "protects market participants against manipulation, abusive trade practices and fraud" in the futures markets ([www.cftc.gov](http://www.cftc.gov)). Entities that handle customer funds or provide trading advice in futures contracts must register with the National Futures Association (NFA), a futures industry self-regulatory body approved by the CFTC. In addition,

these registrants must "disclose market risks and past performance information to prospective customers." If a hedge fund trades futures and options on futures on behalf of its investors, it may be required to file as a commodity pool operator with the Commodity Futures Trading Commission. However, a hedge fund may qualify for exemption from certain requirements in registration, disclosure, and record maintenance.

Lastly, we note that bank regulators (e.g. the Federal Reserve, Comptroller of the Currency, and Office of Thrift Supervision) do not have direct authority over hedge funds, since hedge funds are not banks.

While this brief discussion may give the impression that hedge funds are free from all regulations, this is not entirely true. Hedge funds are not exempted from regulations designed to monitor and safeguard the integrity of markets. The U.S. Treasury requires traders to report large positions in selected foreign currencies and treasury securities. The SEC requires traders to report positions that exceed 5% of the shares of a publicly traded firm. The Federal Reserve has margin requirements for stock purchases that apply to all market participants. The CFTC requires traders with large futures positions to file daily reports. In addition, the CFTC and the futures exchanges set futures margins and position limits on futures contracts. These regulations apply to all market participants, including hedge funds.

#### 4. The Need for Privacy and a Regulatory-Free Environment

Having briefly reviewed the environment within which US-based hedge fund managers operate, we are now in a position to conjecture on the economics of hedge fund organizations.

Consider the problem confronting a money manager who believes that he has a set of skills that could earn above average risk adjusted returns. We are not advocating the existence of such strategies, but merely the hypothesis that the manager believes this to be so. Let us assume that the manager has a limited amount of personal wealth. In order to meet the fixed costs of a trading operation, the manager must leverage his skills and beliefs by attracting external capital. Basically, he is financing a new

venture. The choice is either equity financing, in the form of a fund, or debt financing, in the form of putting up personal assets as collateral against borrowed capital. In most cases, the manager's personal wealth is insufficient to secure sizeable debt financing. That leaves the formation of a fund as the only practical financing option. Consequently, we shall continue to discuss the organization of hedge funds as primarily consisting of the fund manager and outside investors.

An important consideration is the question of "disclosure". Fund managers who believe that they have a "winning strategy" are obviously adverse to be subjected to "full disclosure" on the functioning of the strategy. This precludes organizational forms that must meet a high level of "transparency" and "disclosure," such as mutual funds, and favors "private vehicles" that have much lower transparency and disclosure requirements. An immediate consequence of this is the lack of "publicly offered" hedge fund products which is still the case today.

Attracted by the profit potential of hedge fund type of strategies, but realizing the potential pitfalls of highly leveraged positions, investors naturally demand limited liability to the capital they are willing to place at risk. The need for protection for investors is especially important as most hedge funds disclosure documents are at best cursory and involve complex technical descriptions. To this date, a great deal of hedge fund investment decisions are still based on "recommendations from a reliable source" or on the "reputation" of the fund managers mixed together with some performance statistics that are often computer simulations. In situations like this, the commitment of personal capital and the incentive fee structure are often critical elements in the investors' decision making process. The somewhat liberal incentive fee together with the manager's personal wealth at risk thus serve the dual purposes of enticing the fund manager to favor co-investors and partners over other forms of leverage, and aligning economic interests between the manager and co-investors.

Another important consideration is taxes. The taxation of investment partnerships is particularly suitable here as it avoids double taxation which becomes an issue if the fund were formed as a limited liability corporation. Taking together the various goals of the fund managers and investors, it is perhaps not surprising that Private Limited Partnerships remain the preferred format for organizing hedge funds.

The goal of minimizing investors' tax burden also motivated the formation of offshore funds. These are investment vehicles explicitly formed for "non-US persons" typically registered in "tax free" jurisdictions. Here, the organization can take on both the limited partnership format as well as special purpose limited liability corporations. Tax reporting responsibility resides with the individual investor and is dependent on each investor's personal situation. This rules out the involvement of "US persons" which could import unnecessary US tax complications. There are other special situations where offshore and US investors can commingle their investments in an offshore vehicle organized as "Passive Foreign Investment Corporations". However, the ratio of offshore investors and US domiciled investors are straightly limited. Finally, with offshore funds, it is often possible for the managers to have their incentive fees deferred for tax purposes which provides for further incentives to establish offshore investment vehicles.

Factors outside the legal and tax consideration that influence the choice of hedge fund organizations are issues such as leverage and the trading style of the fund itself. For instance, strategies that make extensive use of the leverage available in the futures markets may find it necessary to organize themselves as CTAs or CPOs. Alliance is often forged between the fund manager and their futures broker to distribute the fund because of the mutuality of interests between the two parties. Funds whose trading are predominantly in the stock market are more likely to be organized along the limited partnership line. Here, alliance is often forged with their prime brokers for the distribution of fund to investors.

## 5. A Qualitative Summary of Hedge Fund Investment Styles

Although the institutional environment can affect the way in which hedge funds are organized, it is their return characteristics that hold the key to distinguishing between hedge fund strategies. To help investors assess the potential diversification benefits, consultants classify hedge funds and CTA funds based on their self-described investment styles.

Table 4 lists the seven main categories used by MAR and MAR/Hedge<sup>5</sup>, along with the number and assets at the end of 1997. Extracting from commonly used qualitative classifications of investment

styles, Event-driven funds refer to funds that take positions on corporate events in two basic ways. Funds that actively take positions in corporate bankruptcies and reorganizations typically through bank debt and high yield corporate bonds are often referred to as “Distressed Securities” funds. Another well known event-driven strategy is merger arbitrage. Merger arbitrage funds invest in announced mergers and acquisitions, usually by going long the equities of the targets and going short the equities of the acquirers, but occasionally in reverse if the manager believes that the deal may fail.

Global funds is a catch-all category of funds that invest in non-US stocks and bonds, including emerging market securities with no specific strategy reference.

Global/Macro funds commonly refer to those funds that relies on macroeconomic analysis to take bets on the major risk factors, such as currencies, interest rates, stock indices, and commodities. For example, George Soros' Quantum Fund reputedly made \$1 billion by betting that the British Pound would drop out of the European Rate Mechanism (ERM) in September 1992.

Market neutral funds refer to funds that actively seek to avoid major risk factors, but take bets on relative price movements utilizing strategies such as long-short equity, stock index arbitrage, convertible bond arbitrage, and fixed income arbitrage. Long-short equity funds use the classic A.W. Jones model of hedge funds, taking long and short positions in equities to limit their exposures to the stock market. Stock index arbitrage funds trade the spread between index futures contracts and the underlying basket of equities. Convertible bond arbitrage funds typically trade the embedded option in these bonds by purchasing them and shorting the equities. Fixed income arbitrage generally refers to the trading of price or yield along the yield curve, between corporate bonds and government bonds of comparable characteristics, or more generally between two baskets of similar bonds that trade at a price spread.

Sector funds refer to specialists that concentrate on investments in specific sectors of the economy. Short-sellers only take short positions in stocks. Long-Only funds take long equity positions, typically with leverage.

Table 5 provides the MAR classifications of CTA trading strategies. It shows that most CTAs are "trend followers".

These styles have distinct return characteristics in terms of means and standard deviations, given in Tables 3 and 4. The volatility ranges from a low of 2.1% in market neutral funds to a high of 16.3% in Global/Macro funds.

These trading techniques are not unique to hedge funds. Many of them are used by university endowments, pension funds, wealthy family portfolios, and proprietary trading desks of commercial and investment banks (where a number of hedge fund managers came from). For example, Harvard University endowment is operated as a hedge fund. As of June 30, 1997, it was valued at \$11.9 billion, holding \$29 billion of long positions and \$17 billion of short positions. Wall Street firms also regularly employ highly leveraged positions, especially when they use short treasury positions to hedge the corporate bonds and mortgage bonds in their inventory. Some wealthy families reportedly run their own trading operations much like those of hedge funds.

The obvious question at this point is whether there is an overall framework that allows investors to relate “descriptions” to “trading strategies” and to compare different fund’s performance on a risk adjusted basis. In order to address this question, we need to begin with a framework that relates the setting of investment targets to the asset allocation decision among different styles of investing.

Broadly speaking, there are two approaches to setting investment targets. An investor can set a “relative return” target or an “absolute return” target. Relative return targets are typically selected from the universe of asset indices such as the S&P 500 which then becomes the benchmark for judging investment performance. An important feature with the relative return approach is that the target return can be positive or negative depending on the chosen benchmark’s return. An absolute return target is fixed ahead of time and is independent of the performance of markets going forward. Similar to the relative return approach, the choice of an absolute return target must also reflect the investor’s objective and asset allocation decision. However, there is no inherent market risk level that is predetermined prior to the selection of the trading styles for investment. Typically, hedge fund styles are based on absolute return strategies. They are expected to deliver performance irrespective of market conditions.

Hedge fund managers use two main approaches to achieve absolute return targets. First, there is the Market Timing Approach (“MT”). Second, there is the Non-Directional (“ND”) approach.

The MT approach bets on the directions of markets dynamically. It will be long OR short markets attempting to capture their rise and fall. Managers in this style of trading can range from specialists in a certain sector of the market to those who attempt to capture global market trends. It is a directional, risk seeking approach that offers potentially sizable rewards. Global, Global/Macro, Sectors, Short-Sellers, Long-Only, and trend following CTAs all employ this market timing style.

In contrast, the ND approach attempts to extract value from a set of diversified arbitrage opportunities targeted at exploiting structural anomalies of market(s). It is expected to be long AND short comparable securities to capture value while eliminating the systematic risk of the market(s). Managers utilizing this ND approach range from specialists in a specific sector of a market to those who apply this method over a wide range of worldwide market(s). Consequently, the notion of systematic risk can vary depending on the range of market(s) the manager is exposed to. The ND approach has evolved over the last decade and is still in its growth stage as more complex securities are issued and markets become more global. As a non-directional approach, it is a low volatility approach, and the returns resemble that of a high yielding bond-like instrument without the equivalent interest rate or credit risk. The market neutral category is the Non-Directional style in our framework.

What are the distinguishing characteristics between the two styles? Standard statistical tools, such as correlations between the returns and market indices, are likely to convey a misleading picture. Both the MT and ND approach are likely to show low to zero correlation with most market indices. As long as markets are not in a continuous upward trend, the MT approach will periodically have a negative correlation with the standard market indices. Imagine a period where a particular market declines; a standard index will show negative returns. The MT approach may well be short the market and deliver positive performance. Over a long period of time, an MT fund’s correlation to most market indices will reflect an average of positive and negative “short run” correlations. This can easily average out to be near zero despite the fact that directional bets were placed on these markets throughout a given time

frame.

In contrast, the ND approach will yield zero correlation to market indices due to its style of investing. This is an important distinction. The ND approach strives to achieve neutrality to market(s) by delivering a steady stream of returns over a wide range of market conditions. It seeks profits without 'betting' on the market's trend. In contrast, the MT approach can deliver seemingly uncorrelated returns to market(s) over time but can be significantly correlated to market moves over a short period of time and even more so under extreme market conditions.

To summarize, both the MT and ND approach can deliver absolute returns uncorrelated to the market(s). However, not only will the quantity of risk differ (in the sense of the normal standard deviation of returns) but also the quality of risk will be different (in the sense that the MT approach's magnitude of performance swings are likely to increase much faster in extreme markets than the ND approach).

Finally, there is the hybrid style of trading used by Event-driven funds. Although the managers in this area do attempt to hedge away the systematic risk of the market as much as possible, there remain significant risks that cannot be reduced to the level of other ND strategies. Consequently, although this style of investing falls within the general category of Absolute Return investing that seeks to yield consistent returns, it is more volatile than the ND approach, but less volatile than the MT approach.

## 6. Quantitative Characterization of Hedge Fund Investment Styles

As an alternative to the qualitative style descriptions, Fung and Hsieh (1997a) provided a quantitative classification scheme based on returns alone. The idea is simple. If two managers use the same trading strategy on the same markets, their returns are correlated to each other, even if they are not correlated to the returns of asset markets. Using principal component analysis to group funds based on their correlation with each other, Fung and Hsieh (1997a) found that the first five principal components can jointly explain roughly 45% of the cross sectional variation in hedge fund returns.

By examining the funds that are correlated with the first five principal components, Fung and Hsieh (1997a) were able to associate them with hedge fund styles used by consultants. The first

component consists of funds which apply a "trend following" strategy on diversified markets. The second component represents "Global/Macro" funds. The third component is made up of Long-Only funds. The fourth component corresponds to funds which apply a "trend following" style with an emphasis on major currencies. The fifth component is made up of distressed securities funds.

These empirical results provide some useful insight. For instance, we can answer the question as to whether there are diversification benefits among the Market Timing ("MT") styles. The answer appears to be in the affirmative. Four of the five most important principal components are market timers: Trend following CTAs (the first and fourth principal components), Global/Macro, and Long-Only funds. The fact that there are different principal components means that their returns have low correlation to each other. Since the returns of all style groups are uncorrelated to standard market indices, it tells us that a different "type" of risk is associated with these investment styles. Hedge funds may transact in all of the standard markets in the world, but their returns are statistically different. In other words, what drives hedge fund performance is not "where they trade" but "how they trade".<sup>6</sup>

Interestingly, the majority of Market Neutral funds (that employ Non-Directional strategies) fall into the unexplained category in the principal component analysis. In that there is no persistent correlation with standard market indices nor with the other Market Timing styles. Finally, funds that trade distressed securities fell into a distinct component which exhibit significant correlation to the high yield bond market as proxied by the Merrill Lynch High Yield index.

These empirical findings provide us with an important step towards extending Sharpe's (1992) style model to encompass hedge fund styles. With the caveat that there are significant non-linear characteristics in the hedge fund returns, it does appear that a quantitative model on evaluating hedge fund returns can be established along these lines. As the work is still ongoing, the following sections

## 7. The Return Characteristics of Trend Following CTAs

We believe it is the dynamic nature of hedge fund trading strategies that makes their returns appear to be uncorrelated to the major asset markets despite the fact that these are the same markets

that hedge funds frequently transact in. However, there are some persistent patterns which differ across styles, and these differences can be illustrated with a graphical technique. We begin with the "trend following" style.

"Trend following" is a term used by the majority of CTAs to describe their trading style. While most trend followers regard their trading strategy as proprietary, they generally use mechanical trading rules to capture large price movements.

Trend following CTAs exhibit a very interesting return pattern, first characterized in Fung and Hsieh (1997a and 1997b). Figure 3 displays the returns of a large CTA fund versus the returns of US equities. This is done by grouping the monthly returns of US equities into five "states" or "environment" of the world, ranging from severe declines to sharp rallies. State '1' on the horizontal axis consists of the worst months in US equities. State '2' consists of the next worst months in US equities, and so on. State '5' represents the best months for US equities. The average return for US equities are calculated for each state, as well as the average return for the CTA fund in the same months. The U-shaped pattern shows that CTA fund tends to perform well during extreme down and up months in US equities, and less well during calmer times in US equities. This CTA fund behaves as if it owned straddles on US equities. This is a typical pattern for CTA funds, as shown in Fung and Hsieh (1997b).

The interesting question regarding trend following CTA funds is: how do they generate this return profile? According to Billingsley and Chance (1996), among CTAs trading only specialized markets, 41.2% trade bonds and interest rate futures, 30.9% trade currencies, 15.5% trade commodities, and 12.4% trade stock index futures. Given that the stock indices are the least popular among CTAs, it is curious how CTAs generate a persistent straddle-like return profile against the stock market.

Fung and Hsieh (1998) provide an answer to this question by using lookback straddles as a primitive trend following trading strategy. A lookback straddle consists of a lookback call and a lookback put. The former allows the owner to buy an asset at the lowest price during the life of the option, while the latter allows the owner to sell it at the highest price. Thus, the owner of the lookback straddle receives the difference between the highest price and the lowest price. Fung and Hsieh (1998) show that

lookback straddles on currencies, bonds, and commodities provide a reasonable replication of the trend following CTA style.

In the parlance of Wall Street, trend following CTA style is long "volatility" or long "gamma". They perform very well in extreme markets, and less well in calm markets. Thus, trend following CTA funds can provide good protection for equities in down markets without the performance drag of put options or portfolio insurance in up markets.

It is most unlikely that CTA returns would follow any stationary distribution. Take for example the trend following CTAs. Trends are by nature abnormal, and extreme events. It stands to reason that trading strategies which stand to benefit the most on this type of events, and on a leveraged basis, are likely to exhibit "fat tails" in most finite samples of ex-post returns. Coupled with the fact that "trends" arrive at random intervals, it would be most unlikely that CTA returns can be captured by conventional statistical measures.

#### 8. The Return Characteristics of Global/Macro Funds

Most of the large hedge funds (in excess of \$1 billion in capital) are Global/Macro funds. Included in this group are the better known funds such as those managed by George Soros' Quantum Group, Julian Robertson's Jaguar Fund, Louis Bacon's Moore Global Fund, Leon Cooperman's Omega Overseas Fund, and Mark Kingdon's Kingdon Fund. Global/Macro funds had been the focus of attention in the Asian currency crisis of 1997. A legacy of George Soros' famous attack that contributed to the devaluation of the British Pound in 1992, this style of trading has long been associated with highly leveraged speculators aiding and abetting global market turmoil. To what extent these are sustainable propositions is the subject of a future paper. What is relevant here is that these funds do take concentrated leveraged bets on major global events, frequently based on a set of fundamental economic beliefs. Consequently, their return distributions are likely to be affected by the random arrival of major economic events and the accuracy of their judgements. The resultant return patterns are unlikely to exhibit stable correlation to standard asset categories and are not amenable to the specification of

standard statistical measures.

Figure 4 graphs the average returns of a Global/Macro fund across the 5 market environments. It shows that this Global/Macro fund is positively correlated with stocks. However, it underperforms equities in up markets and outperforms equities in down markets, behaving as if it owned collars (short calls/long puts) on US equities. The outperformance of the equity index comes in the higher frequency middle range of the equity index return distribution. Presumably, the ability to take bets outside the equity markets allows these funds to generate returns during quite times in the US equity market. Global/Macro funds can be thought of as highly dynamic global asset allocators. They can replace the traditional tactical asset allocation funds.

#### 9. The Return Characteristics of Fixed Income Arbitrage

Figure 5 applies this technique to a fixed income arbitrage fund. Its return seems to be insensitive to US equities. It tends to make 1% a month, or 12% a year, with very little volatility. How can a fund produce equity-like returns with bond-like volatility? In the July-August 1998 issue of *Plan Sponsor* magazine, we offered three possible explanations. (a) Fixed income arbitrage funds are capturing true mispricings; (b) they are acting as market makers providing liquidity; (c) they sell economic disaster insurance --- where the low historical return volatility is consistent with a period over which the gathering of insurance premium has yet to be tested by a disaster payout.

The experience in September and October 1998 is consistent with the third hypothesis, when the Hedge Fund Research Index of fixed income arbitrage funds lost 6.45% and 6.09%, respectively. These are two consecutive months of 6 standard deviation events in the left tail of the return distribution. To put this in perspective, the largest monthly loss from 1990 to 1997 was 2.58%. It certainly appears to be the case that fixed income arbitrage funds, and perhaps arbitrage funds in general, are short "volatility". They perform best in calm markets, and worst in volatile markets. Just as most researchers would have grave reservation to measuring the risk of writing "disaster insurance" using standard statistical techniques, the same caution must be applied to this style of hedge funds.

## 10. The Return Characteristics of Other Styles

Figure 6 graphs the return characteristics of short-sellers against the S&P market environment. Not surprising, short-sellers perform well in down markets and poorly in up markets.

Figure 7 graphs the return characteristics of distressed securities funds against the high yield bond market environment. These hedge funds perform better in up markets, and less well in down markets. But the hedge funds outperform high yield bonds in all markets.

## 10. The Case of LTCM

Where does LTCM fit in the hedge fund world? In terms of self-described style, LTCM fits the profile of fixed income arbitrage funds, although in the aftermath of their debacle, press reports also mention merger arbitrage and the sale of straddles on stock indices. In the quantitative dimension, LTCM has low correlation to the standard asset markets. The regression of LTCM's monthly returns from 1994 to 1997 on the 8 asset classes<sup>7</sup> used in Fung and Hsieh (1997a) has an  $R^2$  of only 7%. LTCM's return profile is most comparable to MAR's market neutral funds and Hedge Fund Research's fixed income arbitrage fund. Figure 9 graphs the return to a \$1,000 investment in LTCM. LTCM has annualized average return of 26.3% and standard deviation of 9.8%. This is approximately 3-4 times more leveraged than MAR's market neutral funds (8.2% mean, 2.1% standard deviation) and Hedge Fund Research's fixed income arbitrage funds (8.5% mean, 2.7% standard deviation). We believe that neither MAR nor HFR include LTCM in their market neutral funds. This makes LTCM an outlier in terms of fixed income arbitrage funds, which are themselves only a small segment in the entire hedge fund and CTA fund industry. The question is whether the writing was on the wall?

The view that LTCM is a more highly leveraged version of fixed income arbitrage funds is confirmed by the fact that, like LTCM, most fixed income arbitrage funds suffered uncharacteristically large losses in August and September of 1998. For lack of a better description, we shall continue to refer to the events of September and October 1998 as "6 standard deviation" events (with monthly losses of 6.45% and 6.09%, respectively, for HFR's fixed income arbitrage funds). This will place LTCM's loss at

around 25% per month, not to mention the fact that actual leverage could fluctuate to be higher than this 6x level. At some critical equity level counterparties providing leverage to LTCM may begin to request liquidation of positions. This in turn will result in further losses and begins the downward spiral that we witnessed. Should one consider or plan for a “6 standard deviations” event? We do not believe this is the right question. Rather, it is more important to estimate the risk factors affecting a fund’s returns and ask the question “How likely is the nightmare scenario that all factors hit their worst estimates at the same time”. Bear in mind that it does not require “6 standard deviations” on all factors to generate a disaster.

The risk management implications are still in the process of being digested by regulators and the investment community. Recent directives from the BIS (1999a, 1999b) point to a number of qualitative “dos and don’ts” for the banking community when dealing with “Highly Leveraged Institutions”. A more formal framework for evaluating “event risk” of the LTCM kind is likely to be a subject of further research. Suffice it to say that standard value-at-risk measures based on simple, stationary distributions of asset returns are unlikely to provide insight to the risk of hedge fund investments.

## 11. Conclusion

Research has shown that hedge funds and CTA funds have returns very different from those of mutual funds. This is likely due to the difference in investment style and trading strategies, possibly due to the different regulatory environment.

This paper summarizes the regulatory environment for US hedge funds and provide brief descriptions of their major trading strategies. It also provides the return characteristics of several different styles. These style classifications can be useful in portfolio construction, risk management, and performance attribution analysis of hedge funds.

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Footnotes:

1. A.W. Jones wrote an article about his investment style "Fashion in Forecasting" in *Fortune*, March 1949, 88, 186.
2. Carol J. Loomis, "The Jones Nobody Keeps Up With," *Forbes*, April 1966, p. 237-247.
3. Julie Rohrer, "The Red-Hot World of Julian Robertson," *Institutional Investor*, May 1986, p. 86-92.
4. These results are prima facia evidence indicating that the traditional style classification scheme, as pioneered in Sharpe (1992), would not apply to hedge funds.
5. Managed Account Reports (MAR) is one of the oldest sources of global managed futures information. Its sister publication, MAR/Hedge, started to report similar information on hedge funds in 1994.
6. The exception is emerging market hedge funds, which were excluded from our principal component analysis because the limitations on short sales and leverage on emerging market securities make them not meaningfully different from mutual funds.
7. The eight asset classes are: US equities, non-US equities, emerging market equities, US bonds, non-US bonds, 1-month Eurodollar deposits, Gold, and the trade-weighted value of the US Dollar.

Table 1  
Numbers and Assets of Hedge Funds and CTA Funds

	1985	1990	1991	1992	1993	1994	1995	1996	1997
Numbers:									
Hedge funds	37	231	310	442	644	856	1027	1076	987
CTA funds	114	404	468	557	577	558	488	363	291
Assets under management (\$ billion):									
Hedge funds	na	6.5	10.1	17.9	35.8	41.3	50.4	59.4	64.6
CTA funds	5.9	34.3	36.6	41.3	49.9	41.8	22.6	12.8	17.1

Source: TASS.

Table 2  
Distribution of Management & Incentive Fees

	Tass Hedge	Tass CTA
Management Fees:		
N.A.	4%	13%
0-1%	38%	4%
1-2	40%	53%
2-3	10%	16%
3-4	6%	12%
4-5	0%	0%
5-8 (max)	2%	1%
 Incentive Fees:		
N.A.	17%	1%
0-5%	1%	0%
5-10	6%	1%
10-15	14%	10%
15-20	51%	69%
20-25	10%	16%
25-55 (max)	1%	3%

Table 3  
Annualized Mean and Standard Deviation of Returns:  
1990-1997

	Mean	Std Dev	Correlation Coefficients		
			HF	CTA	S&P
Hedge funds	15.1%	5.7%	1.00	0.75	0.37
CTA funds	14.7%	9.9%		1.00	-0.01
S&P 500	16.2%	12.3%			1.00

Source: TASS, S&P/BARRA.



Table 4  
MAR Hedge Fund Categories: December 1997

Category	Number	Assets (\$ b)	1990-1997	
			Mean	S.D.
Event-driven	120	8.6	18.9%	5.9%
Global	334	30.9	17.7%	9.4%
Global/Macro	61	29.8	28.1%	16.3%
Market Neutral	201	18.0	8.6%	2.1%
Sectors	40	1.8	29.6%	15.9%
Short-Sellers	12	0.5	7.0%	15.2%
Long-Only*	15	0.4	27.3%	15.4%

\* 1994-1997.

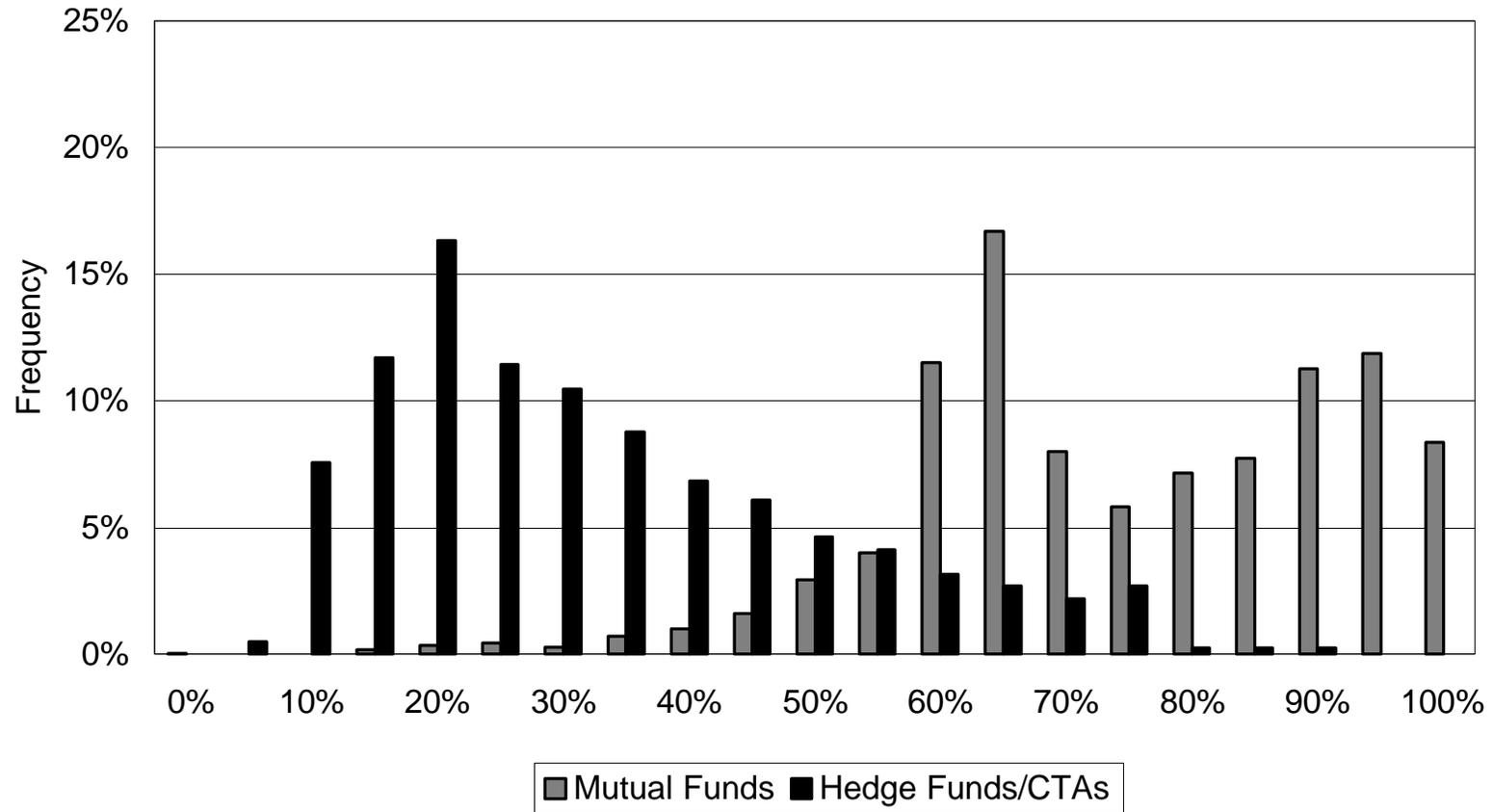
Source: Eichengreen et al (1998).

Table 5  
MAR CTA Trading Strategies

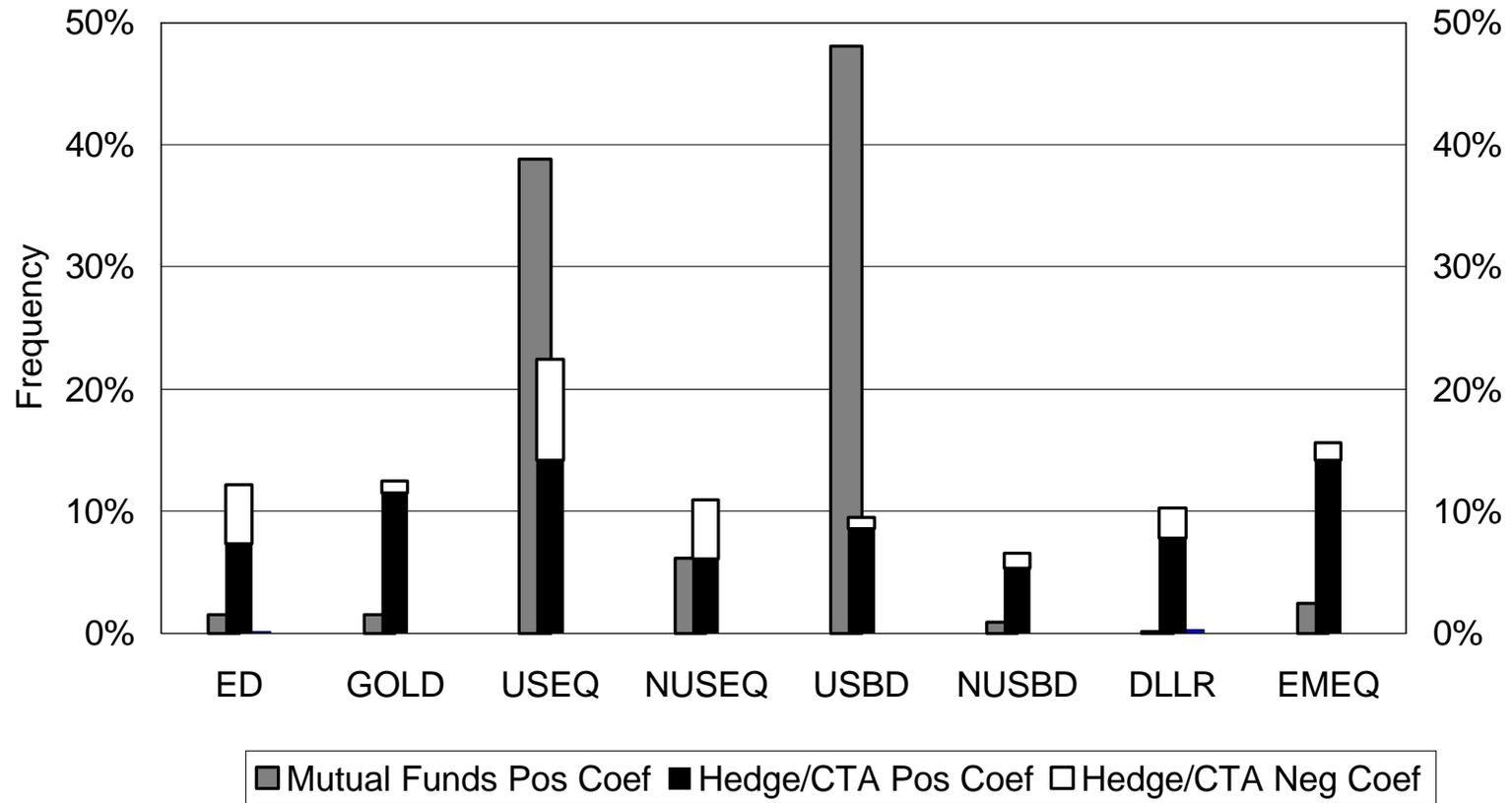
Strategies	% of Total
Arbitrage	1.1%
Discretionary	26.1%
Fundamental	0.5%
Mechanical	0.2%
Pattern Recognition	0.2%
Quantitative	4.9%
Statistical	0.9%
Stochastic	0.1%
Systematic	6.7%
Technical	1.1%
Trend Following	58.1%

Source: Billingsley and Chance (1996).

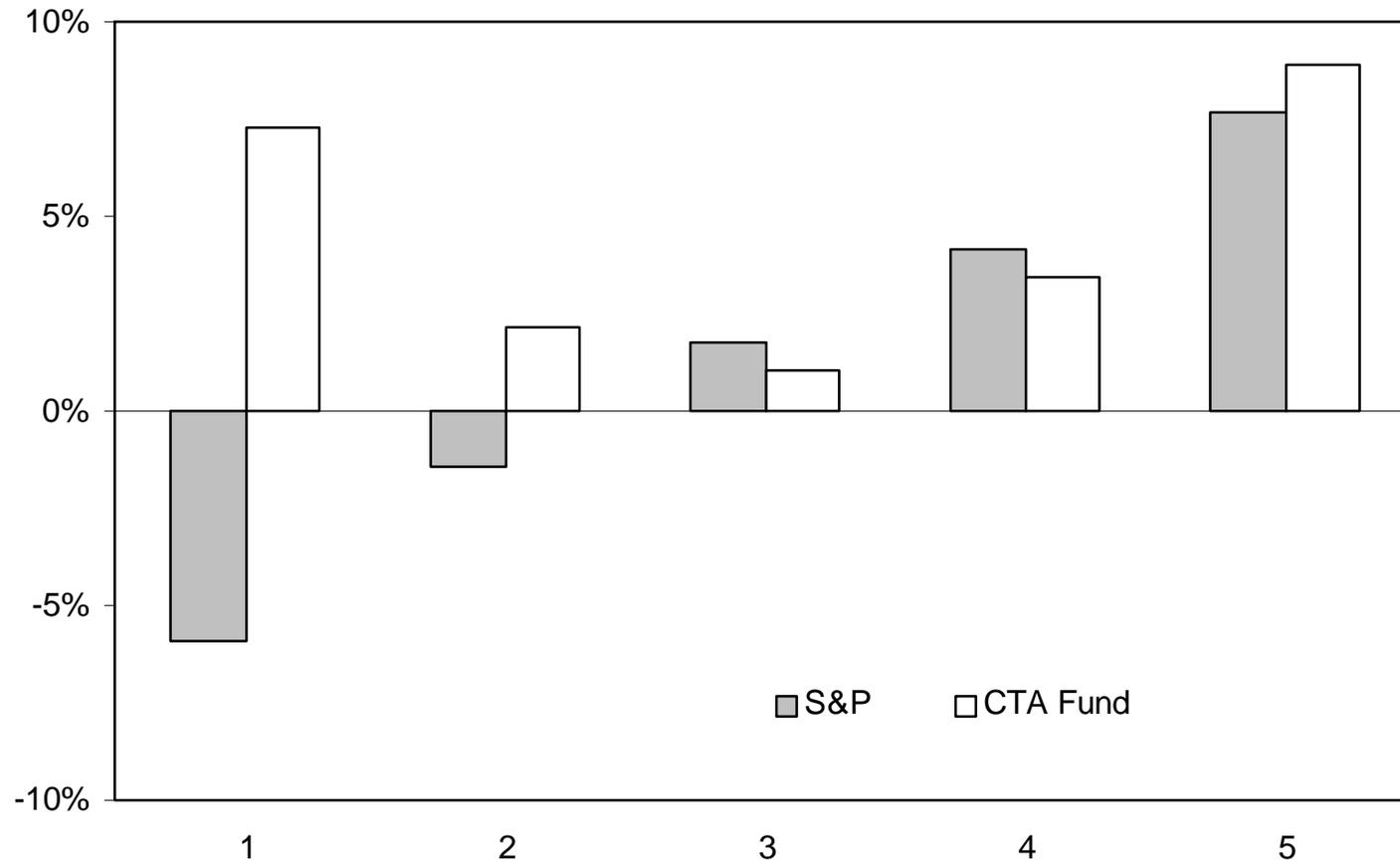
**Figure 1: Distribution of R-squares Vs Asset Classes**



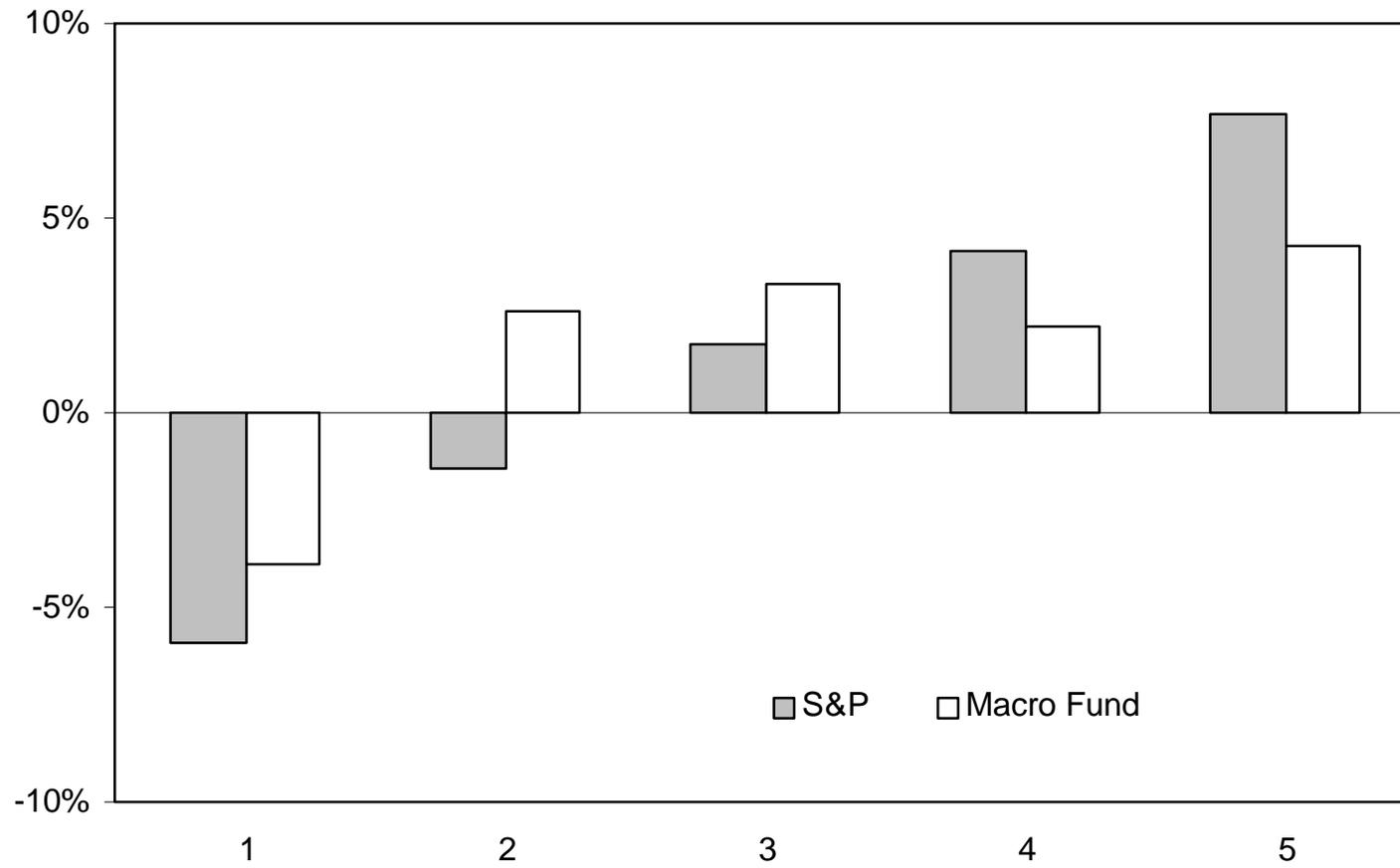
**Figure 2: Distribution of Most Significant Asset Class**



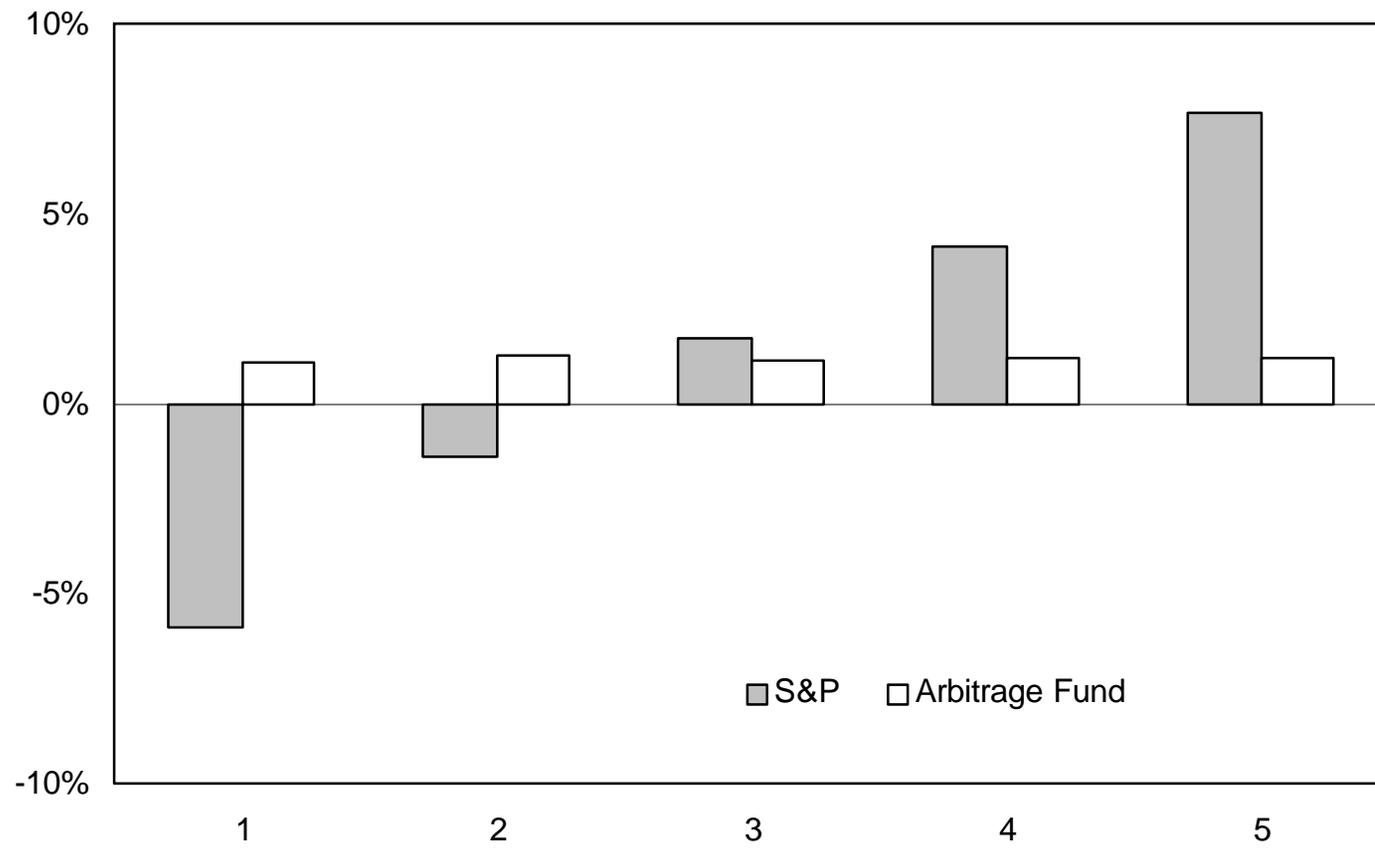
**Figure 3: CTA Trend Following Style Vs US Equities**



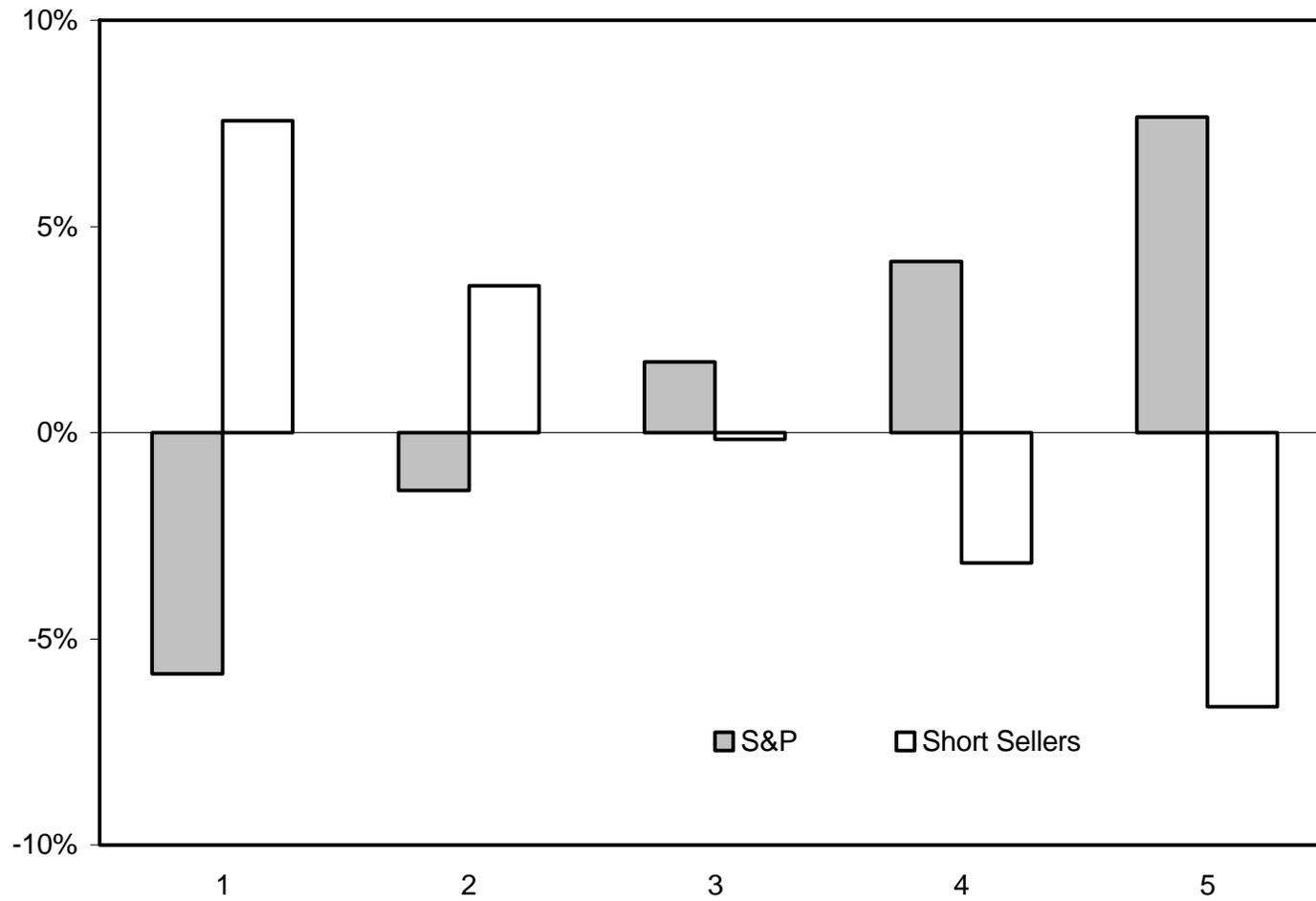
**Figure 4: Global/Macro Style Vs US Equities**



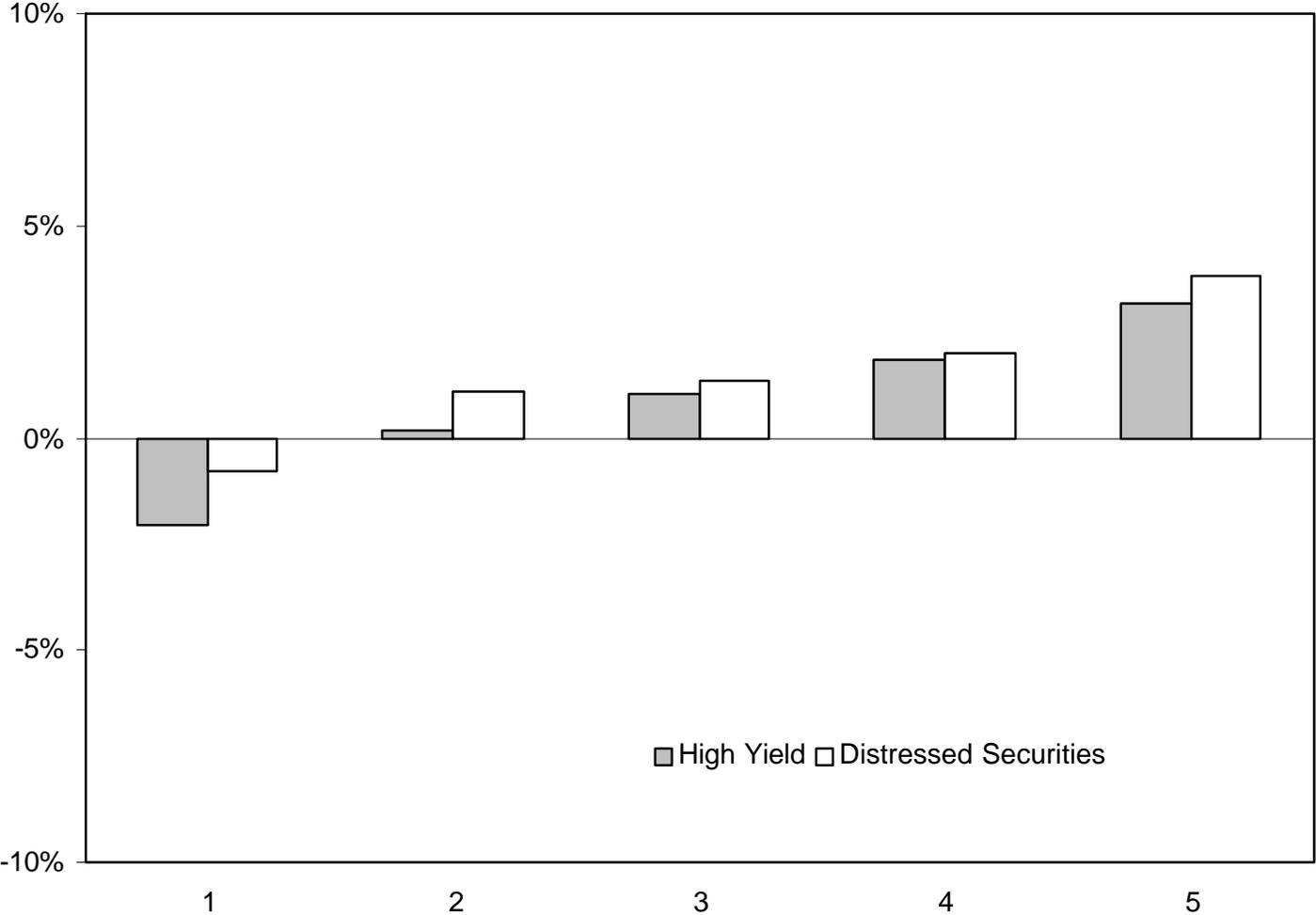
**Figure 5: Arbitrage Style Vs US Equities**



**Figure 6: Short Selling Style Vs US Equities**



**Figure 7: Distressed Securities Style Vs High Yield Bonds**



**Figure 9: Value of \$1,000 Invested in LTCM**

