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Do Hedge Funds Hedge?

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Summary

In addition to attractive returns, many hedge funds claim to provide significant diversification for traditional portfolios. This paper empirically examines the return and diversification benefits of hedge fund investing using the CSFB/Tremont hedge fund indices from 1994-2000. We, like many other authors, find that simple regressions of monthly hedge fund excess returns on monthly S&P 500 excess returns seem to support the claims. The regressions show only modest market exposure and positive added value. However, this type of analysis can produce misleading results. Many hedge funds hold, to various degrees, hard to price illiquid securities. For the purposes of monthly reporting, hedge funds often price these securities using either last available traded prices or estimates of current market prices. These practices can lead to reported monthly hedge fund returns that are not perfectly synchronous with monthly S&P 500 returns due to the presence of either stale or “managed” prices. Non-synchronous return data can lead to understated estimates of actual market exposure. We employ standard techniques that account for this problem and find that hedge funds contain significantly more market exposure than simple estimates indicate. Furthermore, after accounting for this increased market exposure, we find that the broad universe of hedge funds does not add value over this period. With the stock market selling near all-time high prices, investors who view their hedge funds as protection from a market correction should consider this a potentially serious issue.

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I. Introduction

A recent New York Times headline trumpets “Hedge Funds Win Year’s Bragging Rights.” In a poor year for traditional investments, so far 2000 looks to be a good year for hedge funds in aggregate and a great year for some particular hedge fund styles. This year represents a textbook example of the diversification that investors desire from hedge funds. Unlike traditional investments, hedge funds can take long and short positions, and therefore have the ability to isolate a manager’s security selection or timing skill from the asset class in which the manager trades. In this way, hedge funds not only can offer an investment with potentially attractive returns, but also can offer an investment that has low to zero correlation with most traditional portfolios.

In recent years, hedge funds seem to have delivered. From 1994-2000 the CSFB/Tremont index of hedge funds produced compound annual net returns of 13.2% with 10.0% annualized monthly volatility. Liang (1999), Agarwal and Naik (1999), Peskin, Urias, Anjilvel, and Boudreau (2000), among others, examine monthly hedge fund returns and find only moderate correlation to most traditional asset class indices. After adjusting for hedge fund equity market exposure and other sources of systematic risk, these studies find that hedge funds still produce significant excess returns or alphas. Not surprisingly, hedge funds have seen tremendous growth in assets over this period. According to TASS Investment Research, hedge fund assets have increased four-fold since 1994 and they estimate that hedge funds currently manage between \$350-450 billion.

However, we argue that these results may be misleading. Most studies analyze monthly data and many hedge funds trade, to various degrees, in difficult to price illiquid securities. Often these securities do not trade at, or even near, the end of every month. Moreover, many of these securities are not exchange traded and often hedge funds possess some “flexibility” in how they mark these positions for month-end reporting. A cynic might argue that hedge funds can use this flexibility to “manage” monthly returns. Even if hedge funds do not intentionally manage month-end pricing, illiquid securities can lead to stale prices, which artificially lower estimates of volatility and correlation to traditional indices. This type of non-synchronous price reaction has been well studied for the purpose of empirically estimating betas of small stocks and other illiquid securities and applies directly to this problem. Scholes and Williams (1977) and Dimson (1979) propose simple techniques to measure market betas by utilizing summed betas from regressions of returns on both contemporaneous and lagged market returns.

We employ these and other techniques on hedge fund returns and find that simple monthly beta and correlation estimates greatly understate hedge funds’ equity market exposure. Similarly, simple estimates of volatility using monthly returns seem to understate actual hedge fund volatility. Furthermore, when we account for a more accurate level of market exposure, we find that the broad index of hedge funds and most hedge fund sub-categories do not add value over this period versus what would be expected given their market exposure. In other words, according to our tests, the positive hedge fund returns over this period are due entirely to passive market exposure rather than alpha or manager skill.

Since our study focuses on aggregate hedge fund indices, obviously, these results may or may not apply for any individual hedge fund. A carefully chosen portfolio of hedge funds may still provide both the return and diversification benefits investors seek. However, in light of our results, we argue that at a minimum, investors should be cautious when analyzing monthly returns and, where possible, should employ the techniques discussed in this paper.

The paper is organized as follows. The next section discusses the CSFB/Tremont indices. Section III examines the risk and return characteristics of hedge funds using monthly returns. Section IV starts with a discussion of non-synchronous pricing in monthly hedge fund returns, then proposes some methods to account for this problem, and finally presents new results on the return and diversification benefits of hedge funds utilizing these methods. Section V concludes.

II. The Data

In order to examine the return and risk characteristics of the hedge fund industry we employ returns for the CSFB/Tremont hedge fund indices from January 1994 to September 2000. These indices consist of an aggregate hedge fund index designed to represent the industry as a whole and nine sub-indices designed to track the primary hedge fund investment styles.² CSFB/Tremont constructs all ten indices monthly by asset-weighting net-of-fee returns for selected funds.

To determine index constituents, CSFB/Tremont begins with funds in the TASS+ database that have at least \$10 million in assets, have provided audited financial statements, and have met CSFB/Tremont's reporting requirements. They exclude funds of funds, but include funds closed to new investment. They then separate each fund passing the criteria into the nine sub-categories based on the fund's investment style. This set of funds constitutes the CSFB/Tremont universe (as of November 15th, 2000 there were 656 funds in the universe). From this universe, CSFB/Tremont selects funds for inclusion in the indices such that each index represents at least 85% of the assets under management in the universe (as of November 15th, 2000 there were 337 funds included in the indices).³

Three potential biases may impact studies that use hedge fund indices to proxy for the unobservable market portfolio of all hedge funds.

- (1) Survivorship bias: This bias occurs when indices exclude all or part of the returns for dissolved or dead funds from the index calculation. Since dead funds typically have had very poor returns, excluding them from the index calculation will produce an unrealistically high estimate of a truly investable hedge fund portfolio. While CSFB/Tremont includes some dead funds in their index calculations, they do not include every fund that died over the period. Moreover, TASS (and Hedge Fund Research) only began collecting data on dead funds in 1994, therefore hedge fund data prior to 1994 will contain significant survivorship bias and would not be suitable for accurate estimation of hedge fund risk and return.⁴
- (2) Backfill bias: This bias occurs if database vendors backfill a hedge fund's performance when a new fund is added instead of only including its returns on a going forward basis. This will overstate index performance since inclusion in the index is voluntary and thus funds will generally only be added after very good past performance. CSFB/Tremont only includes funds on a going forward basis and therefore avoids any backfill bias.

² See Appendix A for a list and description of the CSFB/Tremont sub-indices and the CSFB/Tremont web site (<http://www.hedgeindex.com>) for more detailed information.

³ The constituents of each index are publicly available.

⁴ Please see Liang (2000) for an in depth comparison of the TASS and Hedge Fund Research databases and an analysis of survivorship bias in hedge fund returns.

- (3) Self-selection bias: This bias may occur if top or bottom performing funds lack the same incentive as other funds to report to data vendors and thus are excluded from index calculations. This bias is generally small since most funds report and even if some funds are excluded they must exhibit very strong persistence in their performance for any significant downward or upward bias to occur in index performance.

Although CSFB/Tremont attempts to minimize these biases, they are notoriously difficult to fully eliminate even with the best intentions. Therefore, performance numbers should be evaluated in the context of these biases. In all likelihood, the estimates of average returns based on these indices will be biased upwards. Additionally, since in our particular sample period the stock market was exceptionally strong, survivorship bias in the indices could upwardly bias our estimates of hedge fund market exposure since funds with high betas were more likely to survive.

III. Initial Results

Hedge Fund Summary Statistics

Table 1 presents summary statistics for monthly returns on the aggregate hedge fund index, the nine hedge fund sub-indices and the S&P 500 from January 1994 to September 2000.

Table 1
Summary Statistics for Hedge Fund Returns Based on Monthly Data
January 1994 to September 2000

Portfolio	Annualized Excess Return	Annualized Standard Deviation	Annualized Sharpe Ratio	Correlation With S&P 500	Maximum Monthly Return	Month of Maximum Return	Minimum Monthly Return	Month of Minimum Return
Aggregate Hedge Fund Index	8.0%	10.0%	0.80	0.52	8.1%	12/99	-8.0%	08/98
Convertible Arbitrage	5.4%	5.1%	1.07	0.13	3.1%	04/00	-5.1%	08/98
Event Driven	7.0%	6.7%	1.05	0.60	3.4%	01/94	-12.2%	08/98
Equity Market Neutral	6.4%	3.5%	1.85	0.48	2.8%	07/97	-1.6%	03/97
Fixed Income Arbitrage	1.6%	4.4%	0.36	0.08	1.5%	04/95	-7.3%	10/98
Long / Short Equity	11.8%	12.6%	0.94	0.62	12.6%	12/99	-11.9%	08/98
Emerging Markets	2.3%	20.8%	0.11	0.50	16.1%	08/94	-23.4%	08/98
Global Macro	7.7%	14.4%	0.54	0.36	10.1%	08/95	-11.9%	10/98
Managed Futures	-1.2%	11.1%	-0.10	0.01	9.5%	08/98	-9.8%	09/95
Dedicated Short Bias	-7.1%	18.6%	-0.38	-0.76	22.3%	08/98	-9.1%	02/00
S&P 500	14.6%	14.2%	1.03	1.00	9.3%	03/00	-14.9%	08/98

Notes: All returns are excess of the 1-month t-bill return. Annualized Excess Return is calculated by multiplying monthly excess returns by 12. Annualized Sharpe Ratio equals the ratio of the Annualized Excess Return and the Annualized Standard Deviation.

The aggregate index of hedge funds produces solid results over this period. From January 1994 to September 2000 hedge funds post 8.0% average annual excess returns over cash (13.2% compound total returns) net of fees, with 10.0% annualized monthly volatility resulting in a 0.80 Sharpe ratio. However, this period coincides with a strong bull market and some hedge funds appear to swim with the tide. Overall, the Aggregate Hedge Fund Index has a correlation of 0.52 with the S&P 500. Two of the most correlated styles are Event Driven and Long/Short Equity and these funds produce Sharpe ratios of 1.05 and 0.94, respectively. On the other hand, not every style seems to benefit from market exposure. Convertible Arbitrage funds produce impressive returns, Sharpe ratio of 1.07, with a surprisingly low 0.13 monthly correlation with the S&P 500.

The one style that appears to swim against the tide does not fare so well. As expected, Dedicated Short Biased funds produce returns that are highly negatively correlated with the market. Not

surprisingly given the strength of the market over this period, this style posts very poor absolute returns. In fact, its best month is August 1998, the worst month for the market and many of the other hedge fund styles. Managed Futures, which realizes close to zero correlation with the market over this period, also had its best month in August 1998. This is consistent with previous studies (Fung and Hsieh, 2000) that find that CTA returns exhibit a non-linear “long volatility” characteristic (beta increases in big up markets and decreases in big down markets).

Finally, note that volatility varies considerably among the hedge fund indices. Using monthly data, realized volatility ranges from 3.5% per year for Equity Market Neutral funds to 20.8% per year for Emerging Markets funds. This clearly demonstrates the need for the simple, yet crucial concept of risk adjusting returns when analyzing and comparing hedge fund performance.⁵

Table 2 below presents the monthly correlation matrix of the various hedge fund styles.

Table 2
Correlations of Hedge Fund Styles Based on Monthly Data
January 1994 to September 2000

	Hedge Fund Index	Convert. Arb.	Event Driven	Equity Market Neutral	Fixed Income Arb.	Long / Short Equity	Emerg. Markets	Global Macro	Man. Futures	Ded. Short Bias
Aggregate Hedge Fund Index	1.00									
Convertible Arbitrage	0.41	1.00								
Event Driven	0.66	0.59	1.00							
Equity Market Neutral	0.33	0.32	0.42	1.00						
Fixed Income Arbitrage	0.48	0.64	0.44	0.04	1.00					
Long / Short Equity	0.77	0.27	0.67	0.36	0.23	1.00				
Emerging Markets	0.65	0.38	0.70	0.25	0.34	0.59	1.00			
Global Macro	0.90	0.31	0.42	0.22	0.47	0.47	0.43	1.00		
Managed Futures	0.14	-0.34	-0.21	0.22	-0.24	-0.04	-0.11	0.24	1.00	
Dedicated Short Bias	-0.48	-0.25	-0.65	-0.43	-0.09	-0.77	-0.56	-0.18	0.19	1.00

Notes: All returns are excess of the 1-month t-bill return.

Given the general tendency for most hedge funds to contain some average market exposure, it is not surprising that many styles are positively correlated with one another. For instance, Emerging Markets, Event Driven, and Long/Short Equity funds exhibit an average pairwise correlation of 0.65. Moreover, this correlation is not being driven by 1998, a tumultuous period for markets. If we drop August, September and October 1998 out of the sample, the correlation only drops to 0.60. Convertible Arbitrage and Fixed Income Arbitrage also exhibit relatively highly correlated returns. However, this correlation appears more sensitive to August, September and October 1998. Removing these months, the correlation drops from 0.64 to 0.35. Not surprisingly given its negative market exposure, Dedicated Short Biased returns are negatively correlated with most of the other styles.

Adjusting Hedge Fund Returns for Market Exposure

These results suggest that market exposure plays a material role in hedge fund performance. Given the market exposure (both positive and negative) evident in hedge funds returns, it behooves investors to determine if hedge funds are adding value beyond the returns that they derive from their market exposure. How a particular hedge fund makes money is an important issue for at least two reasons:

⁵ Additionally, since these indices represent portfolios of hedge funds, those styles that contain (1) a greater number of funds and (2) more heterogeneous funds, will tend to produce indices with lower volatility.

- (1) Diversification: if a hedge fund takes on market risk, and makes money because the market goes up, it will likely lose money when the market goes down, and thus not provide the diversification benefits hedge fund investors seek.
- (2) Fees: investors should not pay hedge fund fees for exposure that they can get for index fund fees.

Many hedge funds admit that they explicitly take on market exposure, but claim that they add excess returns above and beyond that exposure. Caveat emptor. Investors should understand what this means about the pricing of these funds. These hedge funds are selling a bundled package that includes (in proportions that vary across managers) (1) an S&P 500 index fund⁶ and (2) the manager's skill. The skill needs to be good because the manager usually charges at least a 1% management fee plus a 20% performance fee on the S&P 500 index fund portion when the going rate is about 20 basis points per year from Vanguard.⁷

Unfortunately, investors cannot easily disentangle skill from market exposure. In part due to less stringent disclosure requirements, investors are rarely privy to hedge fund holdings and investment strategies. Therefore, in most cases, investors must base evaluations only on superficial strategy descriptions and historical returns. A common approach to estimating hedge fund market exposure is to run regressions of monthly hedge fund returns on S&P 500 returns of the following form:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \epsilon_{i,t}$$

$R_{i,t}$ represents the net-of-fees return on hedge fund i in excess of cash and $R_{m,t}$ represents the return on the S&P 500 in excess of cash and in excess of an annual fee of 20 basis points.⁸ Note that the above regression can be re-written as:

$$R_{i,t} - \beta_i R_{m,t} = \alpha_i + \epsilon_{i,t}$$

$R_{i,t} - \beta_i R_{m,t}$ can be interpreted as the return on a hedged strategy, where we short β_i units of the S&P 500 against our purchase of hedge fund i . Thus, α_i represents the average return for the "hedged" hedge fund (since $\epsilon_{i,t}$ has a zero mean) and can be interpreted as the managers' realized skill relative to their average market exposure. In other words, the regression intercept represents an estimate of the added value or alpha that hedge funds produce after accounting for their average market exposure or beta. Table 3 presents the results of these regressions.

⁶ For simplicity, we employ the S&P 500 as a proxy for equity market risk and ignore other potential measures of systematic risk such as value/growth, large/small, momentum, international, credit and liquidity, which may also apply to various hedge fund styles. Additionally, we consider only a linear relation between hedge fund returns and equity market risk while non-linear relations may also be appropriate for some hedge funds. Please see Agarwal and Naik (2000), Mitchell and Pulvino (2000) and Fung and Hsieh (2000) for performance evaluation of hedge funds using non-linear models.

⁷ Institutional investors can obtain even lower fees.

⁸ Since hedge fund returns are net-of-fees, our market proxy, which in this case is the S&P 500, should also be net-of-fees.

Table 3
Monthly Regressions of Excess Hedge Fund Returns
on Contemporaneous S&P 500 Excess Returns
January 1994 to September 2000

Portfolio	Monthly Regressions		
	Alpha (Annualized %)	Beta vs. S&P 500	Adjusted R-Squared
Aggregate Hedge Fund Index	2.63 (0.76)	0.37 (5.46)	26.5%
Convertible Arbitrage	4.78 (2.35)	0.04 (1.12)	0.3%
Event Driven	2.93 (1.35)	0.28 (6.62)	34.9%
Equity Market Neutral	4.69 (3.84)	0.12 (4.89)	22.2%
Fixed Income Arbitrage	1.24 (0.70)	0.02 (0.71)	-0.6%
Long / Short Equity	3.82 (0.95)	0.55 (6.98)	37.4%
Emerging Markets	-8.38 (-1.15)	0.74 (5.15)	24.2%
Global Macro	2.41 (0.44)	0.37 (3.43)	11.8%
Managed Futures	-1.30 (-0.29)	0.01 (0.12)	-1.2%
Dedicated Short Bias	7.34 (1.50)	-0.99 (-10.34)	57.0%

Notes: t-statistics are in parentheses and in bold when greater than +2 or less than -2. Annualized Alpha is calculated by multiplying regression intercept by 12. Hedge fund and S&P 500 returns used in the regressions are excess of the 1-month t-bill return.

The results in table 3 suggest that despite possessing market exposure, hedge funds do in general appear to add value.⁹ The aggregate index returns 2.63% per year net of fees above and beyond what would be expected from its estimated beta of 0.37.¹⁰ In particular, the alphas for Convertible Arbitrage and Equity Market Neutral are statistically significant which is quite impressive given the short time period. These funds return 4.78% (t-statistic of 2.35) and 4.69% (t-statistic of 3.84) per year above and beyond what is expected from their respective market exposure, which in the case of Convertible Arbitrage is near zero.

Interestingly, Dedicated Short Biased funds actually add 7.34% per year after accounting for their market exposure, although the alpha is not statistically significant due to the high return volatility. Therefore, while these managers have had rough performance in absolute terms, it is solely due to their negative market exposure. If hedge funds should not get credit for passive positive market exposure, to be fair, hedge funds should not get punished for passive negative market exposure.

⁹ The market correlations reported in Table 1 are invariant to volatility and thus they may be compared directly across funds with differing volatilities. In contrast, betas are not invariant to volatility; the higher an asset's volatility, the higher the asset's beta (for the same level of correlation). For example, Equity Market Neutral has an estimated beta of only 0.12, but since its volatility is so low (3.5% annualized) this is actually a very significant beta both economically (annual returns are reduced from an unadjusted 6.4% to an alpha of 4.7%) and statistically (t-statistic of 4.89). On the other end of the spectrum, Emerging Markets has a 0.74 beta, but its t-statistic of 5.15 is comparable to Equity Market Neutral. In the simple regression framework of Table 3 the relation between beta and correlation is as follows:

$\beta_{i,m} = \rho_{i,m} * (\sigma_i / \sigma_m)$. Therefore, the beta for an index is equal to its correlation with the S&P 500 times the ratio of the hedge fund's volatility to the S&P 500's volatility. For example, the beta of 0.12 for Equity Market Neutral can be computed from the data in Table 1 as follows: $0.47 * (3.5\% / 14.0\%) = 0.12$

¹⁰ Since volatility varies considerably among the hedge fund styles, naively comparing the magnitude of the alphas can be quite misleading. In contrast, both the t-statistic testing the hypothesis that the alpha is equal to zero and the Sharpe ratio of the "hedged" hedge fund described above (defined as $\alpha / \text{volatility} [R_{i,t} - \beta R_{m,t}]$) are comparable across portfolios with varying volatilities. See Table 6 for "hedged" hedge fund Sharpe ratios.

A hedge fund with negative market exposure provides tremendous risk reduction for most portfolios. If on top of that risk reduction they can add alpha, this makes them a valuable asset. However, one potential explanation for the strong positive alpha for Dedicated Short Biased funds is survivorship bias. During this period, given the strength of the market, the survivorship bias in Dedicated Short Biased funds may be greater than in the other categories.

IV. Mark-to-Market Problems in Hedge Fund Returns

Stale or Managed Prices

The analysis presented in Section III is typical of the type of econometric analysis that both academics and practitioners utilize to evaluate hedge fund returns. Liang (1999), Agarwal and Naik (1999), Peskin, Urias, Anjilvel, and Boudreau (2000), among others, find similar results. However, we argue that simple regressions of the type we present in Table 3 may produce misleading results.

Hedge funds often take positions in relatively illiquid securities. Since these assets do not trade frequently, obtaining accurate and timely pricing is impossible (even mild illiquidity, such as that present in small and medium-sized stocks can induce the effects we study). In some cases, hedge funds use the last available traded price and in others (often with OTC securities) they may guesstimate the price, along with broker-dealer input, in order to value their portfolio for month end performance reporting.¹¹

Given the widespread practice of computing Sharpe ratios, correlations, betas, and other summary statistics based on monthly data, hedge fund managers have a strong incentive to show monthly returns that are consistent and uncorrelated to the equity market. The presence of illiquid securities creates a potentially serious conflict of interest. A cynic might argue that letting a hedge fund manager subjectively mark his own positions is akin to letting the fox mark the hen's positions.

Stale or managed month-end prices can lead to inaccurate estimates of volatility and market exposure based on monthly returns. If hedge funds have positive market exposure, in the event the market trades up near the end of the month and an illiquid security does not trade or is not accurately marked, the increase in price will not show up until the following month when presumably the security trades or is marked correctly. In some cases the securities may be so illiquid, or the "managing" of pricing so extreme, that they do not get accurately marked for several months. Thus, there may be significant lagged relations between market returns and hedge fund returns and simple monthly regression betas will be understated, perhaps severely.¹²

¹¹ An extreme example of stale or managed pricing can be found in the "private equity" category within the alternative investment arena. Private equity suffers from a lag in mark-to-market returns that is so severe that no technique in this paper is applicable. However, this does not mean the effect does not exist. On the contrary, it is likely that most empirical estimates of private equity risk (beta and volatility) are severely understated. Anecdotally, it seems that traditional hedge fund managers have recently been crossing over more and now own some private equity-like investments. If this is the case, our techniques will not fully capture the understatement of hedge fund risk. Finally, again anecdotally, some private equity managers and investors seem to believe these investments provide tremendous diversification for traditional portfolios, sometimes going so far as calling them uncorrelated. Well, the Ostrich thinks he's uncorrelated also, but that does not fool the Lion.

¹² Non-synchronous pricing does not necessarily always decrease estimates of beta and volatility. For example, monthly volatility can be overstated for truly market neutral strategies that are long and short securities that trade in different time zones (or are illiquid). If a hedge fund is long Japan and short the U.S., then non-synchronous closing prices can lead to overstated estimates of volatility. For example, if on the last day of the month the U.S. trades off, since Japan is closed, the portfolio is marked with the U.S. move, but no concurrent Japan move. Of course the next day Japan would most likely gap down, but that would show up in the following month's return.

Longer Horizon Returns

One simple way to alleviate the effect of non-synchronous price reactions on hedge fund returns is to analyze longer horizon returns. Longer horizon returns are still subject to these marking problems, but marking problems will represent a smaller component of longer horizon returns. Thus, while not a complete solution, longer horizon returns should mitigate the effects of stale or managed prices. Table 4 below presents a comparison of volatility and correlations computed using monthly returns versus non-overlapping calendar quarterly returns. In the absence of any month-end pricing problems and if monthly returns are identically and independently distributed, annualized monthly volatility should equal annualized quarterly volatility. However, in the presence of stale or managed pricing, annualized monthly volatility should be lower than annualized quarterly volatility.

Table 4
Comparison of Monthly versus Quarterly Volatility and Market Correlations
January 1994 to September 2000

Portfolio	Annualized Excess Return	Monthly Annualized Standard Deviation	Quarterly Annualized Standard Deviation	Quarterly vs. Monthly % Difference	Monthly Correlation With S&P 500	Quarterly Correlation With S&P 500	Quarterly vs. Monthly Difference
Aggregate Hedge Fund Index	8.0%	10.0%	10.1%	0.7%	0.52	0.64	0.12
Convertible Arbitrage	5.4%	5.1%	7.2%	41.5%	0.13	0.23	0.11
Event Driven	7.0%	6.7%	8.6%	28.3%	0.60	0.64	0.05
Equity Market Neutral	6.4%	3.5%	4.2%	22.9%	0.48	0.50	0.02
Fixed Income Arbitrage	1.6%	4.4%	4.8%	9.5%	0.08	0.26	0.18
Long / Short Equity	11.8%	12.6%	13.4%	6.3%	0.62	0.76	0.15
Emerging Markets	2.3%	20.8%	26.6%	28.0%	0.50	0.44	-0.06
Global Macro	7.7%	14.4%	14.4%	-0.2%	0.36	0.41	0.05
Managed Futures	-1.2%	11.1%	10.5%	-5.4%	0.01	-0.29	-0.30
Dedicated Short Bias	-7.1%	18.6%	18.7%	0.6%	-0.76	-0.78	-0.02

Notes: All returns are excess of the 1-month t-bill return. Quarterly returns are calculated by summing monthly returns. Annualized Excess Return is calculated by multiplying quarterly excess returns by 4.

Table 4 shows that in all categories except Managed Futures and Global Macro, quarterly volatility is higher than monthly volatility and thus Sharpe ratios based on quarterly data are lower than those based on monthly data. Moreover, the difference is large for certain styles and appears related to the general liquidity of the underlying assets. Convertible Arbitrage funds, which tend to trade in illiquid OTC fixed income securities, experience the largest increase in volatility (+41.5%) while Managed Futures funds, who tend to trade in highly liquid, exchange traded securities, experience a small decrease in volatility when going from monthly to quarterly data. Correlations also increase when quarterly data is used. The aggregate hedge fund index correlation with the S&P 500 rises to 0.64 from 0.52 and most of the sub-indices also experience increases. The evidence in Table 4 supports our hypothesis that both hedge fund volatility and market risk are understated when estimated using monthly data.

Lagged Betas

In the presence of stale or managed prices, simple linear regressions of the form we conduct in Table 3 may produce estimates of beta that are biased downward.¹³ This is a common problem when estimating betas for small firms, which because of their illiquidity suffer from a similar bias. Scholes and Williams (1977) and Dimson (1979) propose a very simple technique to

¹³ This only applies for the more common case of positive market exposure. In the case of negative market exposure, as in Dedicated Short Bias funds, non-synchronous price reactions actually bias estimates of beta upward in simple regressions (i.e., estimates are less negative than actual betas).

measure market betas by running regressions of returns on both contemporaneous and lagged market returns of the following form:

$$R_{i,t} = \alpha_i + \beta_{0i} R_{mt} + \beta_{1i} R_{mt-1} + \beta_{2i} R_{mt-2} + \beta_{3i} R_{mt-3} + \dots + \varepsilon_{i,t}$$

If hedge fund returns are not fully synchronous with market returns due to stale or managed prices, then lagged market returns should also be correlated to current hedge fund returns. In this case, the summed beta (i.e., $\beta_0 + \beta_1 + \beta_2 + \beta_3 + \dots$) represents a more accurate measure of a hedge fund's true beta with the market. In other words, we are trying to capture the fact that if the market moves, then the true hedge fund return also moves instantaneously (e.g., if managers actually tried to sell their securities they would see this return immediately), but that non-synchronous or delayed pricing prevents it from showing up in the hedge fund's reported returns for that month. Instead, the move shows up slowly as securities are priced correctly in subsequent months. The regression with lagged market returns measures the magnitude and statistical significance of this effect and provides a potentially more accurate beta estimate. Table 5a below presents the details of these regressions using three months of lagged market returns and Table 5b summarizes the results.¹⁴

Table 5a
Monthly Regressions of Excess Hedge Fund Returns on
Contemporaneous and Lagged Excess S&P 500 Returns
January 1994 to September 2000

Portfolio	Regression Coefficients and t-statistics					Adjusted R-Squared	Hypothesis Testing	
	Alpha (Annualized %)	Beta with S&P 500 (t)	Beta with S&P 500 (t-1)	Beta with S&P 500 (t-2)	Beta with S&P 500 (t-3)		Sum All Betas (=0)	Sum Lagged Betas (=0)
Aggregate Hedge Fund Index	-4.45 (-1.16)	0.40 (6.21)	0.12 (1.85)	0.22 (3.37)	0.10 (1.45)	35.3%	0.84 (0.0%)	0.44 (0.1%)
Convertible Arbitrage	-0.98 (-0.46)	0.08 (2.16)	0.16 (4.31)	0.13 (3.46)	0.07 (1.82)	23.8%	0.43 (0.0%)	0.35 (0.0%)
Event Driven	-2.12 (-0.91)	0.31 (8.04)	0.18 (4.39)	0.08 (1.89)	0.05 (1.19)	47.0%	0.61 (0.0%)	0.30 (0.0%)
Equity Market Neutral	3.36 (2.32)	0.13 (5.18)	0.05 (1.95)	0.01 (0.39)	0.02 (0.84)	23.4%	0.20 (0.1%)	0.08 (10.8%)
Fixed Income Arbitrage	-3.78 (-2.08)	0.05 (1.61)	0.10 (3.23)	0.15 (4.84)	0.06 (1.83)	25.2%	0.36 (0.0%)	0.31 (0.0%)
Long / Short Equity	-2.83 (-0.61)	0.57 (7.39)	0.10 (1.25)	0.18 (2.24)	0.14 (1.76)	40.9%	0.99 (0.0%)	0.42 (0.9%)
Emerging Markets	-16.20 (-1.88)	0.79 (5.47)	0.30 (2.02)	0.10 (0.68)	0.06 (0.39)	25.3%	1.25 (0.0%)	0.46 (11.8%)
Global Macro	-6.64 (-1.08)	0.41 (3.94)	0.12 (1.12)	0.37 (3.45)	0.09 (0.83)	21.1%	0.98 (0.0%)	0.57 (0.7%)
Managed Futures	1.72 (0.32)	-0.01 (-0.15)	-0.15 (-1.58)	-0.01 (-0.10)	-0.02 (-0.19)	-1.9%	-0.19 (38.3%)	-0.17 (34.1%)
Dedicated Short Bias	11.59 (2.00)	-1.01 (-10.45)	-0.15 (-1.51)	0.02 (0.22)	-0.13 (-1.26)	57.5%	-1.27 (0.0%)	-0.25 (19.7%)

Note: T-statistics are in parentheses and in bold when greater than +2 or less than -2. The columns "Hypothesis Testing" report the sum of the contemporaneous and lagged betas ("Sum All") and the separate sum of the lagged betas ("Sum Lagged"), with p-values for the F-test vs. zero shown in parentheses (shown in bold when p-values are less than 5%). Hedge fund and S&P 500 returns used in the regressions are excess of the 1-month t-bill return.

¹⁴ Over our sample period, the S&P 500 monthly returns exhibit mildly negative, but statistically insignificant, autocorrelation at each of the first three lags.

Table 5b
Summary of Monthly Regressions of Hedge Fund Returns on S&P 500 Returns
January 1994 to September 2000

Portfolio	(1)	(2)	(3)	(4)	(4)-(1)
	Simple Monthly Regression Beta (Table 3)	Betas from Lagged S&P 500 Regressions (Table 5a)			Difference in Beta
		Contemporaneous Beta (β_0)	Sum of Lagged Betas ($\beta_1+\beta_2+\beta_3$)	Total Summed Beta ($\beta_0+\beta_1+\beta_2+\beta_3$)	
Aggregate Hedge Fund Index	0.37	0.40	0.44	0.84	0.47
Convertible Arbitrage	0.04	0.08	0.35	0.43	0.38
Event Driven	0.28	0.31	0.30	0.61	0.33
Equity Market Neutral	0.12	0.13	0.08	0.20	0.09
Fixed Income Arbitrage	0.02	0.05	0.31	0.36	0.33
Long / Short Equity	0.55	0.57	0.42	0.99	0.45
Emerging Markets	0.74	0.79	0.46	1.25	0.51
Global Macro	0.37	0.41	0.57	0.98	0.61
Managed Futures	0.01	-0.01	-0.17	-0.19	-0.20
Dedicated Short Bias	-0.99	-1.01	-0.25	-1.27	-0.28

Tables 5a and 5b show some dramatic increases in beta from Table 3. Lagged betas enter the regression strongly for the Aggregate Hedge Fund Index and for almost every hedge fund style. For the aggregate index, the beta more than doubles from 0.37 (column labeled (1) in Table 5b) in the simple monthly regressions to 0.84 (column labeled (4) in Table 5b) when we account for lagged relations.¹⁵ Perhaps most surprising, Convertible Arbitrage betas increase dramatically from 0.04 to 0.43. Other large increases include Event Driven, which increases from 0.28 to 0.61, and Fixed Income Arbitrage, which increases from 0.02 to 0.36.¹⁶ In fact, in every category the betas are magnified. The styles with positive betas produce even larger positive betas and the styles with negative betas produce even more negative betas.¹⁷

Additionally, notice that for almost every hedge fund category the adjusted R-squared increases, usually materially, from the simple regressions in Table 3. The last column of Table 5a presents F-tests of the null hypothesis that the sum of the lagged betas equal zero. The F-tests are significant for most categories and very strongly reject the null hypothesis for Convertible

¹⁵ As expected for such an influential data point, excluding the extreme four-month period, 8/98-11/98 from the regressions in Table 5a, weakens our results, but does not materially change the conclusions of our paper. For example, for the Aggregate Hedge Fund Index we find a summed beta of 0.69 when we exclude this period versus 0.84 for the full sample. The summed beta of 0.69 is still significantly higher than the comparable simple monthly regression beta of 0.41. While we are comforted that our conclusions are robust to excluding this four month period, it is extremely selective to exclude the market's biggest down period when studying the betas of hedge funds, and thus we give considerably more credence to our results garnered over the whole period.

¹⁶ Event Driven contains a fairly heterogeneous combination of risk arbitrage, distressed debt, high yield and regulation D funds.

¹⁷ It is difficult to distinguish whether lagged betas are the result of unintentional non-synchronous pricing due to illiquid securities, or due to intentional "managed" pricing, or to some of both. One potential way to shed light on this topic is to examine the lagged betas separately for up and down markets. Presumably, though not provably, if illiquid securities are primarily responsible for the lagged betas we find, the effect would be symmetrical for up and down markets. However, if intentional "managed" pricing is primarily responsible in an attempt to smooth returns, it is very possible that these managers are more concerned with smoothing downside returns than upside returns. If this is the case our the lagged betas in negative markets would be more significant than those in positive markets. We run tests (available upon request) on the aggregate CSFB/Tremont index that allows different lagged betas for positive and negative markets (i.e., instead of 3 lagged terms, there are 6 each multiplied by a dummy variable representing whether the market was up or down that month. The results are as follows. The summed lagged beta in up markets for the aggregate index is 0.11, and not at all statistically significant. The summed lagged beta in down markets is 0.84, and highly statistically significant. The test of the difference in these lagged betas (i.e., is the lagged beta in down markets truly higher than in up markets) is also highly statistically significant. While not a proof, we think this is strong circumstantial evidence that intentional manager "smoothing" is an important part of the effect we study, and a more important part than simple illiquidity.

Arbitrage, Event Driven, and Fixed Income Arbitrage (all of which are fund categories that tend to hold illiquid securities). These results are consistent with significant non-synchronous pricing in monthly hedge fund returns.¹⁸

The F-tests presented in the second to last column in Table 5a test the null hypothesis that the sum of all the betas (both the contemporaneous and lagged betas) equals zero. For every single category except Managed Futures, these F-tests strongly reject the null hypothesis that the summed beta is zero. In sum, Tables 5a and 5b suggest that when we account for non-synchronous pricing, hedge funds seem to do a lot less hedging than simple estimates might suggest.

Also, notice what happens to the intercepts from the regressions in Table 5a. The alphas, which were generally positive in Table 3, are now generally negative although not statistically significant. In Table 3 the overall index of hedge funds seemed to add about 2.6% annually when accounting for market exposure using simple monthly regressions, however when we account for the lagged betas, the hedge fund index appears to subtract about 4.5% annually. Since our summed betas are consistently higher, we expect higher hedge fund returns over this strong period for the market, and since this did not occur, the intercepts are much lower. This result is especially surprising given the likely presence of survivorship bias in the data, which should lead to higher, not lower, intercepts.¹⁹

Table 6 below summarizes the Sharpe ratios of 3 different strategies:

- (1) The simple unhedged returns to each hedge fund index (from Table 1):

$$R_{i,t}$$

- (2) A “monthly beta hedged” hedge fund index (using betas from Table 3):

$$R_{i,t} - \beta_i R_{m,t}$$

- (3) A “summed beta hedged” hedge fund index (using betas from Table 5a):

$$R_{i,t} - (\beta_{0i} + \beta_{1i} + \beta_{2i} + \beta_{3i}) R_{m,t}$$

Strategies (2) and (3) represent portfolios invested in a particular hedge fund index and short enough of the S&P 500 to reduce the in-sample beta to zero (using either the simple monthly beta from Table 3 in (2) or the summed beta from Table 5a in (3)).

¹⁸ The results are also consistent with a relation between hedge fund returns and lagged market returns that is due to underlying economics rather than non-synchronous pricing. For example, Mitchell and Pulvino (2000) find that deal failure probability for pending mergers is negatively related to lagged market returns which could induce a positive relation between merger arbitrage strategy returns and lagged market returns. While it is difficult to disentangle these two competing hypotheses, we find that across hedge fund styles the significance of the lagged betas is roughly related to the underlying illiquidity, which supports the non-synchronous pricing hypothesis.

¹⁹ If in addition to the S&P 500, we include in our lagged regression tests the excess return of small stocks over large stocks, we find that the Aggregate Hedge Fund Index, and many hedge fund styles in particular, contained a small stock bias. Since small stocks underperformed large stocks over the 1994-2000 period, this bias helps explain the negative alphas we find. In fact, when including the small stock factor, the Aggregate Hedge Fund Index has neither added nor subtracted value over this period. However, our main result that standard simple regression betas grossly understate true beta, and thus simple estimates of performance grossly overstate skill, remains unchanged. It is an open question whether to view hedge fund skill net of this small stock bias, or to count this small stock bias against them.

Table 6
Annual Sharpe Ratios of Unhedged and Hedged Hedge Fund Returns
January 1994 to September 2000

Portfolio	Unhedged and Hedged Performance		
	Monthly Unhedged Sharpe Ratio	Monthly Beta Hedged Sharpe Ratio	Summed Beta Hedged Sharpe Ratio
Aggregate Hedge Fund Index	0.80	0.31	-0.40
Convertible Arbitrage	1.07	0.95	-0.11
Event Driven	1.05	0.55	-0.27
Equity Market Neutral	1.85	1.55	1.05
Fixed Income Arbitrage	0.36	0.28	-0.56
Long / Short Equity	0.94	0.39	-0.23
Emerging Markets	0.11	-0.47	-0.82
Global Macro	0.54	0.18	-0.40
Managed Futures	-0.10	-0.12	0.14
Dedicated Short Bias	-0.38	0.61	0.89

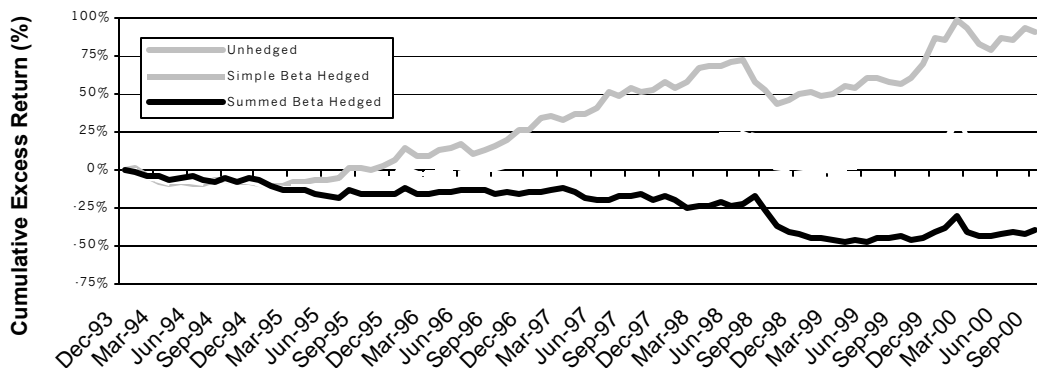
The Sharpe ratio of the overall index drops from a respectable 0.80 to a disappointing -0.40 when we account for the summed betas.²⁰ In fact, for every category except Managed Futures and Dedicated Short Bias, Sharpe ratios drop when we adjust for market exposure based on summed betas. The only styles with positive excess returns versus our summed beta estimates are Equity Market Neutral, which went from a very high unhedged Sharpe ratio of 1.85 to a still excellent 1.05, and Managed Futures and Dedicated Short Bias, which benefited significantly when their negative betas were taken into account.²¹

Figures 1-10 shown below graphically depict the results from Table 6. The cumulative excess returns for each of the three series used to calculate the Sharpe ratios in Table 6 are graphed for each of the 10 indices. Figure 11 presents the cumulative excess return on the S&P 500 for comparison.

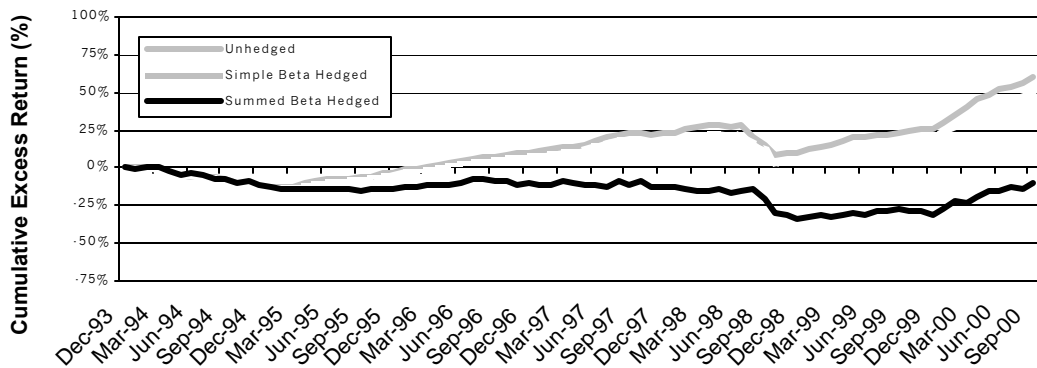
²⁰ Volatility estimates used in the denominator of the Sharpe ratios for the “summed beta hedged” strategies will be slightly overestimated due to non-synchronous pricing differences between the hedge fund returns and the S&P 500 returns. On the other hand, average return estimates are not biased and thus the Sharpe ratio will generally be slightly biased toward zero (i.e., less negative for negative Sharpe ratio strategies and less positive for positive Sharpe ratio strategies).

²¹ As a robustness check, we ran analogous tests on the HFR hedge fund index return series and found very similar results. The standard simple regression beta of the HFR aggregate hedge fund index over this period is 0.38, but jumps to 0.65 when the statistically significant lagged betas are taken into account. The “unhedged” Sharpe Ratio of the HFR aggregate index is 1.23, but drops to 0.03 when measured as excess returns vs. our summed beta. This fall in Sharpe Ratio of 1.20 is exactly the same magnitude as the fall in Sharpe Ratio of the CSFB/Tremont Aggregate Hedge Fund Index (which fell from 0.80 to -0.40), but both the pre- and post-hedging risk-adjusted returns are better for the HFR series. While many specifics may differ, the most notable difference between the two data series is that CSFB/Tremont is an asset-weighted index (i.e., bigger funds count for more), while HFR is an equally weighted series. Simple intuition points in the direction of an asset weighted index being a more realistic representation of the hedge fund world than an equally weighted index. In addition, Peskin et. al. (2000). find that smaller and newer hedge funds generally have higher returns, but they note that these funds are the most susceptible to reporting biases and the problem of not being fully investable (i.e., a large mandate could not be invested in these funds and run in a comparable style to the one that has produced the track record). While these reasons make us favor the CSFB/Tremont data, it is comforting that our central result, that hedge fund market exposure is woefully understated using simple monthly regressions and thus hedge fund risk-adjusted performance is woefully overstated, holds up so well using an alternative database. In addition, results for the comparable sub-categories in the HFR database were generally similar to those we report, with the exception of merger arbitrage. HFR provides a separate merger arbitrage index, whereas CSFB/Tremont aggregates merger arbitrage along with distressed securities, regulation D and high yield into its Event Driven index. While we find a lagged beta effect, the HFR merger arbitrage index does show quite strong and statistically significant positive risk adjusted returns over the 1994-2000 period.

**Figure 1
Aggregate Hedge Fund Index**



**Figure 2
Convertible Arbitrage**



**Figure 3
Event Driven**

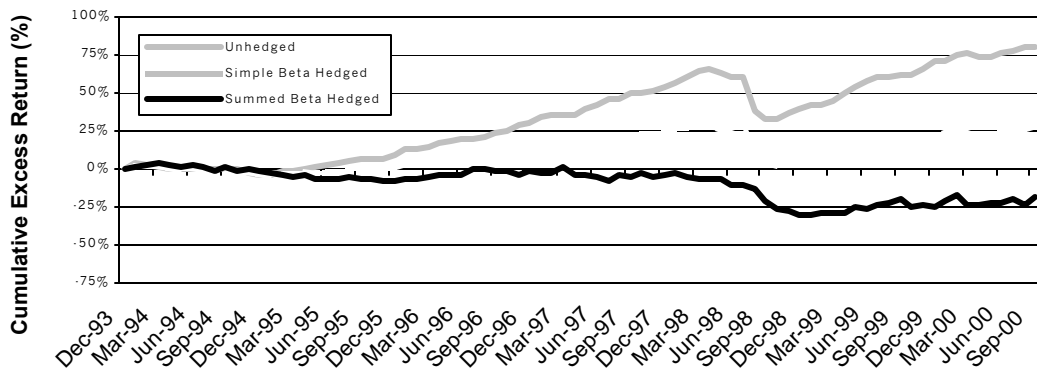


Figure 4
Equity Market Neutral

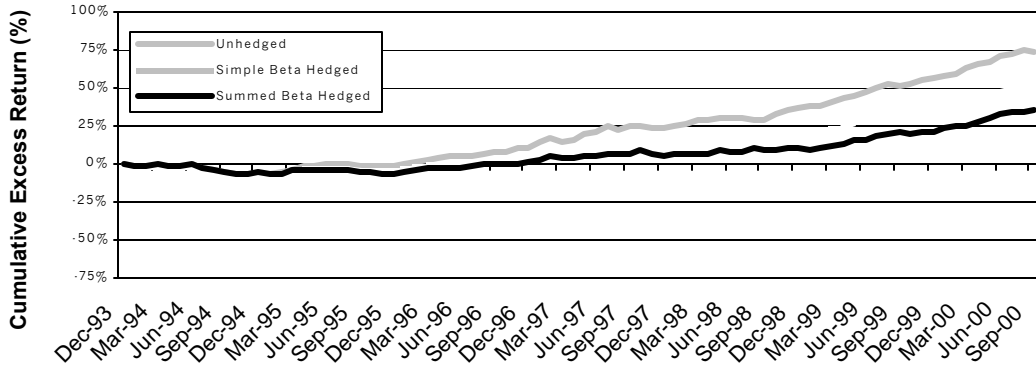


Figure 5
Fixed Income Arbitrage

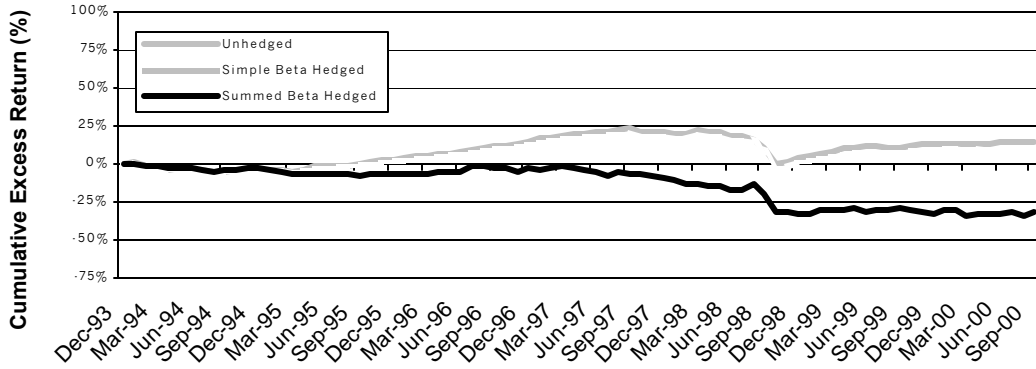
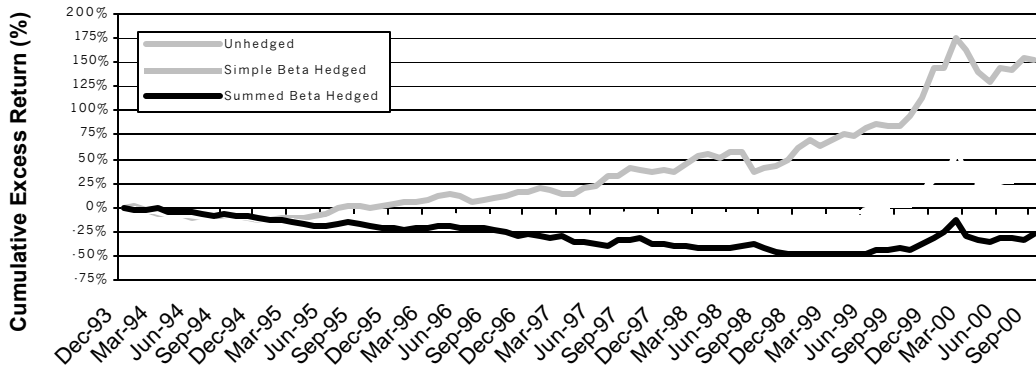
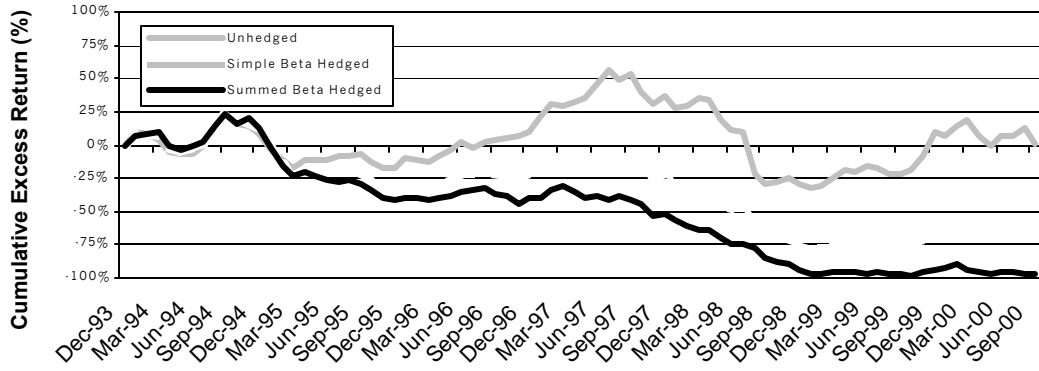


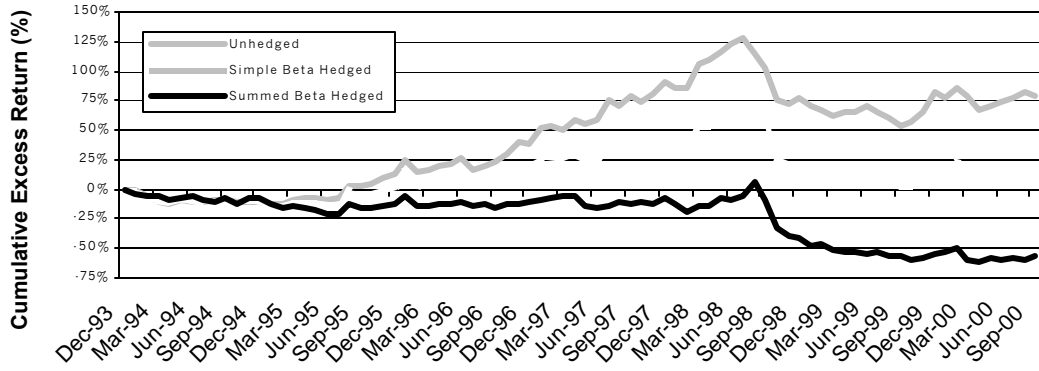
Figure 6
Long / Short Equity



**Figure 7
Emerging Markets**



**Figure 8
Global Macro**



**Figure 9
Managed Futures**

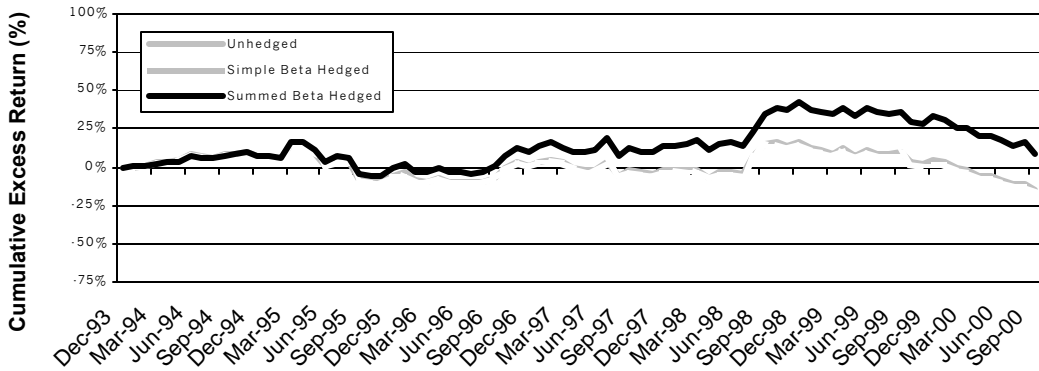


Figure 10
Dedicated Short Bias

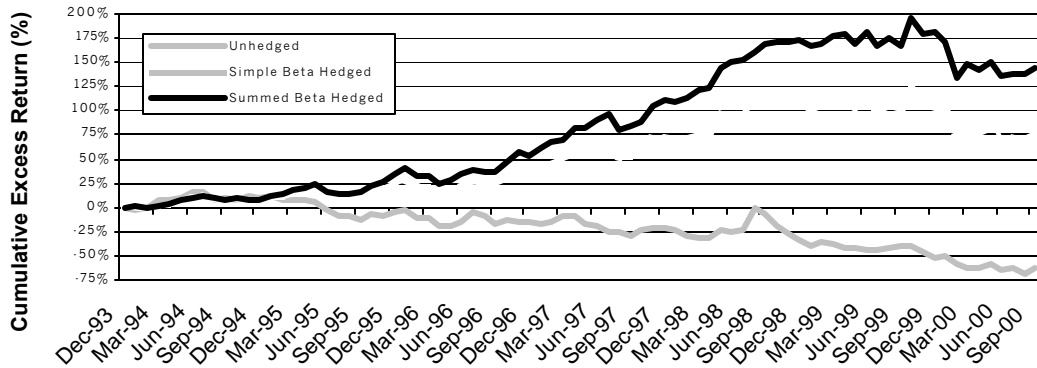
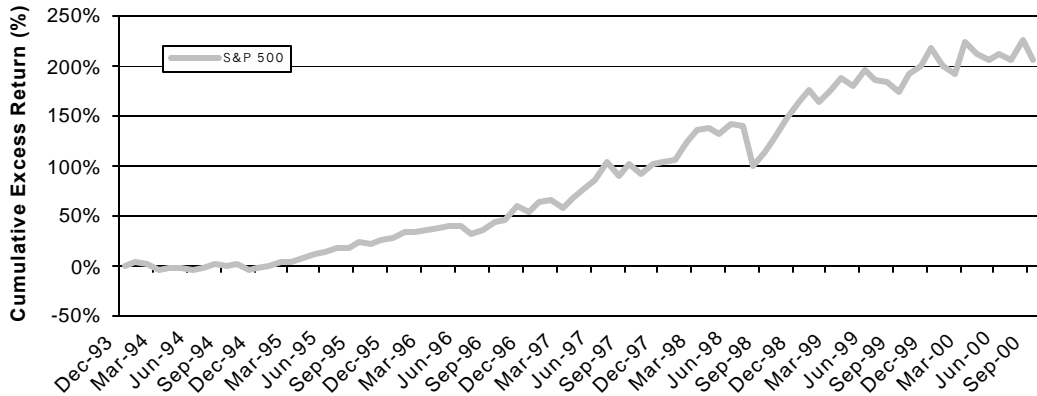


Figure 11
S&P 500



Adjusting for summed betas does not always make hedge fund managers appear less skillful. For example, so far this year (January 2000 – September 2000) hedge fund performance looks better when adjusted correctly for market exposure. While the Aggregate Hedge Fund Index was up 4.9% over this period in absolute terms, if we adjust for its positive beta using our summed beta technique, we estimate that hedge funds actually returned about 8.5% (since the S&P 500 is down on the year). In fact, it has been a banner year so far for some categories like Convertible Arbitrage. The Convertible Arbitrage style returned 24.3% unhedged, which is obviously excellent given its low volatility, but looks even better when adjusted for its summed beta, returning 26.3%. Perhaps this represents random fluctuation based on propitious conditions not to be repeated, or perhaps it represents a small harbinger that some of the lessons of this paper have already been learned (maybe from the painful 1998 experience), and there is more hedging going on in hedge funds than there used to be. Only time will tell.

Finally, while these findings suggest that hedge funds in aggregate, and some styles in particular, have far more market exposure than simple estimates would suggest, our analysis does not address whether a hedge fund's average market exposure over this period is tactical or not. Part of a hedge fund's skill and added value may come from the ability to forecast the direction of the market. Since we examine data from 1994 to 2000, it is possible that some of the hedge funds

that have maintained positive market exposure over this period, have done so tactically and correctly forecasted the bull market. To the extent that this is true, those hedge funds should get credit for their market timing ability.²² Obviously, the empirical analysis that we present here cannot determine whether the observed market exposure was passive or active.

V. Conclusion

The recent strong bull market has led to a breathtaking creation of enormous wealth. However, it has also been a democratic bargain, available for participation to all investors through index funds costing only a handful of basis points per year. Hedge funds, on the other hand, are restricted investments generally available only to the few and come with an expensive price tag. For this high cost, hedge funds generally claim to offer attractive returns that cannot be obtained by investing in index funds. To the extent that hedge funds can achieve these goals, they offer an investment that can be an important source of diversification for most investor's portfolios.

At first pass, cursory examination using monthly returns from 1994-2000 suggests that hedge fund investors have in fact received a good deal both in terms of diversification and returns. However, intentionally or unintentionally, hedge funds appear to mark their securities at a lag. These marking problems can make simple risk estimates based on monthly data severely understate the actual risk of hedge funds. We account for this effect and find that diversification and return benefits vanish for the broad hedge fund universe and many sub-categories.²³ Put simply, examined on its own, the aggregate hedge fund index has delivered a very respectable Sharpe Ratio of 0.80 over this period. However, correctly adjusted for beta, this figure falls to a disappointing -0.40.

While 1994-2000 is a relatively short sample from which to draw too strong a conclusion about the actual level of hedge funds' value added or alpha, we believe the stale and managed pricing issue with monthly hedge fund returns is real and important. The evidence presented here strongly suggests that non-synchronous pricing problems exist in monthly hedge fund data and can cause simple analyses to understate hedge fund risk. To the extent this is true, it follows directly that estimates of hedge fund value added will be overstated over any period with a rising equity market.

Perhaps the lesson of this paper is as much about discrimination as about anything else. As we only study indices, we cannot conclude that attractive uncorrelated hedge funds (or hedge funds who add value net of their market exposure) do not exist. However, many hedge funds make bold claims and some produce monthly returns that seem to support those claims. In light of the results of this paper, we believe that careful scrutiny of these claims is important and, at a minimum, that researchers and investors should employ the types of techniques that we discuss in this paper when evaluating hedge fund returns.

²² However, anecdotally, few hedge funds claim to seek significant added value from market timing.

²³ Furthermore, we do not address this issue here, but it is easy to surmise that for a taxable investor the situation is even worse, as taxes would have much more of a negative impact on hedge funds' returns than on an S&P 500 index fund. Please see Arnott and Jeffrey (1993) for an excellent discussion of the effects of portfolio turnover on after-tax performance of equity funds.

Appendix A: CFSB/Tremont Sub-Index Categories²⁴

Convertible Arbitrage

This strategy is identified by hedge investing in the convertible securities of a company. A typical investment is to be long the convertible bond and short the common stock of the same company. Positions are designed to generate profits from the fixed income security as well as the short sale of stock, while protecting principal from market moves.

Event-driven

This strategy is defined as equity-oriented investing designed to capture price movement generated by an anticipated corporate event. There are four popular sub-categories in event-driven strategies: risk arbitrage, distressed securities, Regulation D and high yield investing.

Risk Arbitrage

Specialists invest simultaneously in long and short positions in both companies involved in a merger or acquisition. Risk arbitrageurs are typically long the stock of the company being acquired and short the stock of the two companies. The principal risk is deal risk, should the deal fail to close.

Distressed Securities

Fund managers invest in the debt, equity or trade claims of companies in financial distress and generally bankruptcy. The securities of companies in need of legal action or restructuring to revive financial stability typically trade at substantial discounts to par value and thereby attract investments when managers perceive a turn-around will materialize.

Regulation D, or Reg. D

This sub-set refers to investments in micro and small capitalization public companies that are raising money in private capital markets. Investments usually take the form of a convertible security with an exercise price that floats or is subject to a look-back provision that insulates the investor from a decline in the price of the underlying stock.

High Yield

Often called junk bonds, this sub-set refers to investing in low-graded fixed-income securities of companies that show significant upside potential. Managers generally buy and hold high yield debt.

Equity Market Neutral

This investment strategy is designed to exploit equity market inefficiencies and usually involves being simultaneously long and short matched equity portfolios of the same size within a country. Market neutral portfolios are designed to be either beta or currency neutral, or both. Well-designed portfolios typically control for industry, sector, market capitalization, and other exposures. Leverage is often applied to enhance returns.

²⁴ Reproduced from the CFSB/Tremont web site (<http://www.hedgeindex.com>)

Fixed Income Arbitrage

The fixed income arbitrageur aims to profit from price anomalies between related interest rate securities. Most managers trade globally with a goal of generating steady returns with low volatility. This category includes interest rate swap arbitrage, US and non-US government bond arbitrage, forward yield curve arbitrage, and mortgage-backed securities arbitrage. The mortgage-backed market is primarily US-based, over-the-counter and particularly complex.

Long/Short Equity

This directional strategy involves equity-oriented investing on both the long and short sides of the market. The objective is not to be market neutral. Managers have the ability to shift from value to growth, from small to medium to large capitalization stocks, and from a net long position to a net short position. Managers may use futures and options to hedge. The focus may be regional, such as long/short US or European equity, or sector specific, such as long and short technology or healthcare stocks. Long/short equity funds tend to build and hold portfolios that are substantially more concentrated than those of traditional stock funds.

Emerging Markets

This strategy involves equity or fixed income investing in emerging markets around the world. Because many emerging markets do not allow short selling, nor offer viable futures or other derivative products with which to hedge, emerging market investing often employs a long-only strategy.

Global Macro

Global macro managers carry long and short positions in any of the world's major capital or derivative markets. These positions reflect their views on overall market direction as influenced by major economic trends and/or events. The portfolios of these funds can include stocks, bonds, currencies, and commodities in the form of cash or derivatives instruments. Most funds invest globally in both developed and emerging markets.

Managed Futures

This strategy invests in listed financial and commodity futures markets and currency markets around the world. The managers are usually referred to as Commodity Trading Advisors, or CTAs. Trading disciplines are generally systematic or discretionary. Systematic traders tend to use price and market specific information (often technical) to make trading decisions, while discretionary managers use a judgmental approach.

Dedicated Short Bias

Dedicated short sellers were once a robust category of hedge funds before the long bull market rendered the strategy difficult to implement. A new category, short biased, has emerged. The strategy is to maintain net short as opposed to pure short exposure. Short biased managers take short positions in mostly equities and derivatives. The short bias of a manager's portfolio must be constantly greater than zero to be classified in this category.

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