Quantitative Analysis of Hedge Fund and Managed Futures Return and Risk Characteristics

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Abstract

Recent research has shown that, for stock and bond mutual fund investors, multi-factor models often provide improved explanatory power regarding the return structure of these investment vehicles. While the sources of return to actively managed assets in the mutual fund industry have been extensively studied, little research exists on the factors explaining the performance of managed futures investment or hedge funds. Hedge funds and commodity trading advisors have different trading styles and trading opportunities than traditional stock and bond mutual fund managers. As a result, factors that incorporate the possibility of returns to trending prices, short sales, and volatility may better capture their relative return movement. Previous studies have focused on explanatory factors unique to a particular asset class. In this study the same set of factors is used to describe return movement across each of the asset classes studied. Results indicate that a different set of factors explains returns to mutual funds, hedge funds and managed futures, and that each can contribute to a diversified investment portfolio.

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Quantitative Analysis of Hedge Fund and Hedge Fund Return and Risk Characteristics

Introduction

The past decade has witnessed a dramatic increase in the use of stock and bond mutual funds as stand-alone investments or as part of an investor's diversified portfolio. Moreover, recent research [Sharpe, 1992; Elton et al., 1995] has shown that for stock and bond mutual fund investors, multi-factor models often provide improved explanatory power regarding the return structure of these investment vehicles. While the sources of return to actively managed assets in the mutual fund industry have been extensively studied, little research exists on the factors explaining the performance of alternative investments such as hedge funds[1] or managed futures investment[2].

This is important for several reasons. First, hedge funds and commodity trading advisors have different trading styles (e.g., long and short positions and leverage) and trading opportunities (e.g., commodity and currency markets) than traditional stock and bond mutual fund managers. As a result, factors which incorporate the possibility of trending prices (up or down) may better capture their relative return movement. Second, previous studies have focused on explanatory factors unique to a particular asset class. In this study the same set of factors is used to describe return movement across each of the asset classes studied. Previous research [Lintner, 1983; Schneeweis, 1996] has indicated the potential benefits to including alternative investments in stock and bond portfolios. However, the factors that explain the differences in the return of managed futures, hedge funds, and traditional stock and bond funds have not been explored.

Sources of Return to Hedge Fund and Managed Derivative Investments

Much of the previous research on managed futures [Elton et al, 1992; Edwards and Ma, 1988; and McCarthy et al., 1996] compares historical CTA returns to the realized returns of public commodity funds or CTAs,

[1] Hedge funds invest in futures and options as well as cash commodity, currency, and security markets.

with the goal of identifying the usefulness of historical returns in forecasting future performance. This study uses factors designed to capture the trading opportunities available to a CTA or hedge fund (e.g., arbitrage, overvalued markets) as a means of forecasting of return performance.

Previous research employs historical CTA performance as a proxy for the source of return. Irwin et al. [1994] use a simple managed futures benchmark as the best forecast of an individual CTA's return, while McCarthy et al. [1997] propose a single index benchmark with a Bayesian risk adjustment designed to capture differences in leverage relative to the underlying benchmark. While this research sheds light on how CTAs perform relative to one another it does not address the underlying source of CTA return. , Mitev [1996] suggests a five-factor model for CTAs that emphasizes the differential CTA trading strategies. Mitev concludes that the CTAs in his sample fall primarily into 1) trend following strategies, 2) surprise or stop-loss control models, 3) agricultural markets, 4) spread-strategies (primarily interest rate) and 5) fundamental economic factors or global markets.

Academic research on the sources of hedge fund returns is less well developed than for CTAs. Fung and Hsieh [1996] use factor-analytic approaches to determine the common factors that help explain hedge fund return patterns. Fung and Hsieh identify five general investment approaches (distressed, global/macro, systems, systems/opportunistic, and value) that are shown to explain most hedge fund return variation. Of these five groups, global/macro, systems, and systems/opportunistic were shown to have factors not easily explained by the factors common to stock funds, bond funds, distressed funds, or value funds. Fung and Hsieh do not determine if the difference is due primarily to differences in trading strategy or to differences in asset markets traded, but conclude that the differences occurred in time periods when rallies or severe declines were experienced. Like Mitev, Fung and Hsieh use factor analysis to identify funds with common factors, but does not conduct multi-factor regression aimed at determining what those factors are.[3]

CTAs and many hedged funds derive much of their return from derivatives. However, the derivatives market is, by definition, a zero-sum game. In order for these strategies to offer returns that exceed the cost of capital the other players in these markets, principally hedgers, must experience returns on their derivative transactions that are

[2] Investments managed by commodity trading advisors (CTAs), who trade primarily futures and options.

[3] The use of derived variables which attempt to replicate the factor loading in multi-factor regression models is consistent with research conducted in equity research [Chen and Jorden, 1993].

less than the riskless rate of return. Empirical research [Schneeweis, 1996; Schneeweis and Spurgin, 1998] that studies the historical performance of CTAs and hedge funds clearly demonstrates that these assets have offered positive, risk-adjusted returns. Theoretical studies of derivative market structure have identified many potential sources of this risk premium in trading derivative-based products.

- Futures and options investors may simply hold positions that mimic the return of the underlying cash asset, which would yield a positive expected return if, as with stock index futures, the underlying asset had an expected return greater than the cost of financing.

- Speculative traders offer liquidity to hedgers. An imbalance between hedging demand from long hedgers and short hedgers may create opportunities to earn returns by purchasing (providing) the excess supply (demand) from the hedging community.

- Transaction costs in futures and options markets are generally lower than for comparable cash instruments. Low transactions costs may allow derivatives traders to exploit information about an asset's value that is too small for investors in cash instruments to utilize profitably.

- Many academic studies [Chan et al, 1996, Silber, 1994] have shown that momentum-based trading strategies are profitable over time. While most of these studies were conducted on equity markets, such that the momentum profits may not be large enough to cover the cost of transacting the trades, derivative markets may offer the opportunity to earn these returns because of their low transactions costs and high leverage.

- Options traders may be able to create positions that offer a risk premium in exchange for accepting exposure to certain portions of the return distribution of the underlying security.

- Options traders also have the ability to create positions that may profit from changes in expected volatility of the underlying asset. Investors in cash instruments can only profit from changes in the value of the underlying asset.

Thus, for the hedge funds and managed futures funds, theoretical and empirical models of return estimation may necessarily be based on the anticipated trading style of the hedge fund manager. For instance, hedge funds focusing on pure zero-risk arbitrage positions will have the risk free rate as a benchmark. If the hedge fund focuses on long international equity then international equity benchmarks similar to that used for traditional international mutual funds may be regarded as standard [Fung and Hsieh, 1996]. Many factors have been proposed to explain the higher risk-adjusted returns earned by hedge funds in recent years as compared to mutual funds that trade similar assets [Ackermann, 1998]

- Hedge funds have a larger set of potential investments available to them than mutual funds. For instance, hedge funds can purchase restricted stock and debt, use short sales to profit from overvalued

securities, and are better suited to influence the management of companies in which they hold debt or equity stakes.

- Hedge funds can use leverage to amplify returns to a particular strategy. If a mutual fund manager and a hedge fund manager identify the same mispriced security, the mutual fund can only allocate a portion of the available investment capital, while the mutual fund manger can allocate several times the invested capital base. Furthermore, if the mispriced security is overpriced, the mutual fund manager cannot take advantage because of short sale restrictions.

- Hedge funds are not required to offer daily liquidity, and often have lockup provisions longer than a year. This allows hedge funds to take illiquid positions that may be very difficult to mark to market, but will offer positive risk-adjusted returns.

Thus, to the degree that different factors explain the returns to managed futures, hedge funds, and stock and bond fund returns, each may provide investors exposure to unique sources of return, and, provide an important source return to a diversified investment portfolio.

Data and Methodology

Returns for all data series are expressed as monthly holding period returns. The test period, covering six years from January 1990 through December 1995, was chosen because several managed futures and hedge fund indexes started in 1/90. Monthly data are used because most CTAs and hedge funds report results monthly.

Hedge fund indexes are supplied by Hedge Fund Research (HFR) and Evaluation Associates Capital Management (EACM). CTA indexes are provided by Managed Accounts Reports (MAR), Barclay Trading (Barclay), and EACM. Mutual fund returns are from Morningstar. The asset class benchmarks employed are the Standard and Poors 500 stock index (SP500), the Salomon Brothers government bond index (SBBI), the Goldman Sachs Commodity Index (GSCI), and the US Dollar trade-weighted currency index (USDX). The Mount Lucas Management index (MLM) is used as a proxy for timing skill. Other indexes employed in the study include the MSCI World Equity index, the Salmon World Government Bond index, the US producer price index (PPI) and the return on US 30-day Treasury bills. The source for the benchmark data is Datastream.

To understand the differences between top performing, average, and bottom performing managers in each class, indexes were created from returns to individual managers. The top five, median, and bottom five CTA, hedge fund and Growth & Income mutual funds were selected. An equally weighted portfolio of their performance was computed. For CTAs and hedge funds, a subset was also selected. The CTA subset consists of all CTAs that

identified themselves as Diversified (a total of 66 CTAs) and the hedge fund subset consists of funds that identified themselves as Opportunity funds (15 funds). Portfolios of the top five, median, and bottom five for each subset were constructed.

Statistical tests include descriptive risk and return characteristics and a number of return correlations. These correlations include each asset's correlation with nominal and absolute value of factor indexes, with the intramonth standard deviation of the indexes, and with the maximum intramonth drawdown and drawup as well. Multiple regression analysis is conducted using CTA, hedge fund, and stock and bond fund indexes as the dependent variables and the nominal, absolute value, and intramonth standard deviation of indexes as explanatory variables.

Returns to active management of stock, bond, CTA, and hedge fund investments are assumed to flow from four sources:

1. *A natural return to owning financial and real assets*. This is modeled by including the nominal value of stock (SP500), bond (SBBI), commodity (GSCI), and currency (USDX) index returns.

2. *Flexibility to use both long and short positions to benefit from market timing skill.* This is captured with the absolute value of the monthly returns of the underlying asset markets.

3. *Intramonth volatility*. Managers can profit from intramonth volatility either by using option strategies or through intramonth timing strategies. Returns to this factor are modeled by the intramonth standard deviation of the indexes and by computing the maximum drawup and drawdown of the index for each month.

4. *Market inefficiencies that result in temporary trends in prices*. A proxy for this is the MLM index, which captures the return to a moving average strategy using 20 active commodity and financial futures.

This common set of factors is used to explain the returns to active management of hedge funds, stock and bond mutual funds, and CTAs.

Results

A. Managed Futures, Hedge Fund, Stock and Bond Indices: Descriptive Statistics

Table 1 gives descriptive statistics of the data used in this study. Included are the average annual return, standard deviation, maximum and minimum monthly return, the information ratio[4], and the Sharpe ratio for each of

[4] The information ratio is the ratio of average return to standard deviation. It is similar to the Sharpe ratio, but does not adjust the return by the Treasury Bill rate. We employ this measure in addition to the Sharpe ratio because the Sharpe ratio implicitly assumes a US investor whose risk-free rate is accurately described by the Tbill rate. The information ratio is a purely statistical measure of variability and assumes nothing about the behavior of investors.

the CTA, hedge fund, and stock and bond fund indexes as well as the unmanaged indexes. Figure 1 shows a subset of the indexes plotted in return/standard deviation space.

---------- Insert Table 1 and Figure 1 about here ----------

Results in Table 1 and Figure 1 are generally consistent with the hypothesis that stock and bond funds, hedge funds, and managed futures investments have different risk and return structures. For the period of analysis, fixed income and market-neutral hedge fund strategies dominate in terms of risk/return tradeoff, while hedge fund styles which concentrated primarily on equity short selling joined passive commodity investment (GCSI) and certain managed futures strategies in providing the lowest return/risk ratios. Figure 1 shows that during the test period studied, most of the hedge fund categories offered higher risk-adjusted returns higher than that available by allocating assets to the SP500 and cash. However, most mutual fund indexes are clustered very close to this line. CTA performance measures are more widely scattered, but are generally a bit below the line.

While results in Table 1 provides evidence that these assets have different historical risk/return tradeoffs, it does not explain what the determinants of that return are. The following section describes the results of multivariate analysis of the returns. Results indicate that certain asset management strategies derive their return primarily from the nominal value of assets (e.g., mutual funds), while others derive their return primarily from the absolute value and intramonth volatility of the same indexes (e.g. hedge funds and managed derivative strategies).

B. Managed Futures, Hedge Fund, Stock and Bond Indices: Simple Correlations

Tables 2A-2C present the correlations among broad-based CTA indices and subindices from each of the three CTA index groupings (MAR, Barclay, and EACM) and between those indices and the nominal and absolute values of the primary indices (GSCI, SP500, Tbond, MSCI, WorldBond, USDX) and the nominal values of the MLM, PPI, and Tbill. There is a highly significant (99% confidence) correlation between overall CTA indices (MAR CTA and Barclay CTA) and most CTA subindices. The only correlations that are not highly significant are the energy and agricultural CTA subindices. The correlation of systematic/trendfollowing CTAs with the broad-based indexes is higher than for discretionary CTAs. These results indicate that systematic/trendfollowing strategies are the

dominant strategies followed by CTAs.

The potential impact of the explanatory variables is also shown in Tables 2A-2C. The MLM index had statistically significant positive correlations for most of the CTA indexes.[5] Two other variables show statistically significant correlations among broad-based indices, the absolute values of the Salomon World Bond and the US Dollar indexes. Among CTAs that focus on a particular market, financial CTAs are correlated with both the World Bond and USDX indexes, and energy CTAs are correlated with the energy-heavy GSCI index.

Insert Tables 2A-2C about here

Hedge Fund Correlations with Commodity, Stock, Bond and Currency Indices

Tables 3A-3B show the correlation between each of the HFR and EACM hedge fund indexes and the set of explanatory factors. Of interest, are the differences, if any, in the correlations patterns of the HFR and EACM hedge fund performance indices given in Tables 3A and 3B compared to those in Tables 2A-2C. Three primary differences can be observed. First, in contrast to the CTA tables, EACM subindexes are not highly correlated with the broad-based EACM 100 index. Second there exists a relatively low correlation between hedge fund indices and the variable designed to capture trend-following strategies, the MLM index. Third, also in contrast to CTA indices, hedge fund indices are positively correlated with nominal stock and bond returns. None of the CTA indices had statistically significant correlations SP500, but the majority of the EACM and HFR hedge fund indices had statistically significant correlations with the this index. The principal similarity between CTA and hedge fund performance indices is that both are groups are positively correlated with the absolute value of the USDX. Except for this, CTAs and hedge fund advisors seem to be capturing differing return patterns.

Insert Tables 3A-3B about here

[5]There is little evidence that the MLM index captures return patterns in the currency, energy, or financial return subindices. Similar results are seen in the Barclay currency subindex. This could in part be due to the small currency and energy weighting in the MLM index and the fact that financial markets, especially, the S&P 500 generally show little evidence of long-term trend following.

Stock and Bond Fund Correlations with Commodity, Stock, Bond and Currency Indices

In Table 4, the correlation between each of the stock and bond fund performance indices and the nominal and absolute values of the set of explanatory variables is given. Again, of principal interest, is the differences, if any, in the correlation patterns of the CTA and hedge fund performance indices given in Tables 2 and 3 with those given in Table 4. The buy-and-hold strategy employed by stock and bond mutual fund managers results in correlation patterns that are very different from broad hedge fund and CTA indices. First, the correlations among the equity-based indices are all above .80. Similar correlations are seen among the government and corporate bond mutual funds. As discussed in previous analysis [Fung and Hsieh (1996) and Schneeweis (1996)], the high intercorrelation among stock and bond mutual funds lessens the potential diversification benefits within those groups.

The MLM index is negatively correlated with stock funds and is uncorrelated with bond funds. This is in contrast to the pattern for CTA indices. Lastly, in contrast, to both hedge funds and CTAs, there is little evidence of the importance of the absolute values of the factors on stock or bond mutual fund performance.[6]

Insert Table 4 about here

Different correlation patterns are evident in the three classes of assets studied. CTAs capture a trendfollowing component through their correlation with the MLM index, while hedge funds and mutual funds are negatively correlated with this index. CTAs also correlate more strongly with the absolute values of asset benchmarks than with nominal values, reflecting the ability to sell short and to engage in option strategies. Pairwise correlation patterns suggest CTA investment would provide diversification benefits to a portfolio of stocks, bonds, and hedge funds. Hedge funds, on the other hand, share some explanatory factors with stocks and bonds. A close

[6] The reported results, i.e., low correlation between commodity benchmarks and an equity index, may differ for subindices of the equity index that would be expected to be highly correlated with underlying commodity markets (e.g., mining, energy firms).

examination of the strategy employed by the fund is necessary before determining the diversification benefits of a hedge fund relative to a stock and bond portfolio.

C. Factors Determining CTA, Hedge, and Mutual Fund Returns: Regression Analysis

Correlation results suggest the factors determining CTA and hedge fund performance differ considerably from the factors that drive stock and bond fund returns, although hedge funds share some factors with CTAs and some factors with traditional stock and bond fund managers. In this section, regression analysis is used to fit an explicit multifactor model. Tables 5 and 6 give a correlation matrix for the full set of explanatory variables. These results show few pairwise correlations above .5. While low pairwise regressions do not prevent high levels of multi-collinearity among the explanatory variables, the relatively low correlations allow the assumption of stable coefficients.

Insert Tables 5 and 6 about here

Regression Analysis of CTA, Hedge, and Mutual Fund Returns

Tables 7-9 report the regression results. Table 7 shows the coefficients using the MAR CTA indexes. Table 8 gives the EACM hedge fund regression results, and Table 9 reports the Morningstar stock and bond mutual fund regressions. In each instance, the independent variables are the nominal and absolute values of the SP500, GSCI, SBBI, and USDX, the intramonth standard deviation of the SP500, GSCI, bond, and USDX, and the nominal value of the MLM index. For each regression, the *r*-square, *f*-statistic, intercept, and thirteen slope coefficients are reported. Significance of coefficients is reported at the 5% and 1% significance levels.

In Table 7A, the regression results for the CTA dollar-weighted index are given. For the overall sample, the most significant variables are the MLM trendfollowing index, and the absolute value of the USDX. The sign for the MLM factor is positive, as is the sign for the absolute value of the USDX. The sign is negative for the intra-month standard deviation of the USDX. This is as expected. The MLM variable captures various long-term trendfollowing models used by many CTAs. The absolute value of the USDX may also capture returns to CTAs who were long or

short foreign currencies during the period of analysis for which currency trends existed. The MAR Diversified index, also on table 7A, has the same two significant coefficients and also the intramonth standard deviation of the USDX. The negative coefficient for the intra-month standard deviation of the USDX confirms the expectation that, to the degree that many CTAs are trendfollowers, high intra-month standard deviation may result in traders being 'whipsawed' in a volatile market. While these variables are generally significant across all of the various sub-indices, the relative significance is a function of the CTA trading style or market. For instance, the highest significance for the absolute value of the USDX is reported for CTA currency managers. The significance of the USDX variable is lowest for Discretionary CTA managers, whose investment opportunities and trading style are not fixed on a single market or trendfollowing system.

---------- Insert Table 7A about here ----------

In Tables 7B and 7C, regression results for the top five, median, and bottom five CTAs are presented. Table 7B covers all CTAs who reported results for the full 1990-1995 period, and Table 7C gives results for CTAs listed as Diversified by MAR. If relative investor skill is important (and not just differential leverage or risk factors), the top five should be sensitive to the same variables as the other groups, but have a positive alpha. The median CTAs should have an insignificant alpha while the bottom five CTA should have a negative alpha. Results in Table 7B are consistent with this hypothesis. The best 5 CTAs have a monthly alpha of 8.80%, the median CTA of .5% and the bottom 5 an alpha of -8.1%.

Similar results are reported for Diversified CTAs in Table 7C. Moreover, the return model is consistent across alternative performing CTAs. For most regressions the MLM index and the absolute value and intra-month variance of the USDX are significant, and the coefficients have the same sign and similar magnitudes.

---------- Insert Tables 7B-7C about here ----------

In Table 8A, the regression results for the EACM hedge fund indexes are given. For the EACM 100 index (a broad index which tracks primarily hedge funds and has some exposure to managed futures strategies through the Global Asset Allocators sub-index), the most significant variable is the absolute value of the USDX. The MLM is

almost significant at the 5% level (*p*-value is .062). The sign of both the USDX and the MLM are positive. This is expected because the index includes some CTAs and also some hedge funds that follow similar directional strategies. However, most hedge fund advisors have investment styles and trade in asset markets that differ from CTAs. The MLM index is not significant in any of the hedge fund index regressions[7]. As important, the signs are generally in line with expectations. For instance, the equity-based indexes (Event-driven, Equity Hedge, Domestic Long, Global/International, and Short Selling) are significantly correlated with the S&P 500 and have the expected signs. Similarly, for other hedge fund indices such as the Bond Hedge, there is little evidence of significant explanatory variables. This too is as expected, given that a pure hedge play should not be correlated directly with the long return of any of the underlying markets. Bond Hedge reports a statistically significant alpha of 1% per month. This suggests the source of the returns is not captured by the explanatory variables tested, and other variables are needed to fully explain this return. Many other hedge fund indexes report significantly positive alphas as well.

---------- Insert Table 8A about here ----------

In Tables 8B and 8C, regression results for the top five, the median, and bottom five hedge funds are presented. Table 8B covers all hedge funds that have reported data to MAR from 1990-1995, and Table 8C analyzes the performance of those funds listed as US Opportunity funds. In Table 8B, the best 5 hedge funds are shown to have a significant monthly alpha of 2.2%, the median hedge fund a significant monthly alpha of 1.5% and the bottom 5 a monthly alpha of -4.31% (this coefficient is significant at the 10% level, but not the 5% level). Results also indicate that the MLM index explains a portion of the lowest performers but not the median or best performers. This suggests that the worst performing funds in a given month were following directional strategies that, consistent with results in Table 1, offered lower risk-adjusted returns during the sample period.

Table 8C shows similar results for the US Opportunity hedge fund subsample. The return model is both consistent across varying performing hedge funds. For each group the S&P 500 index is significant, while for the median and bottom hedge funds the absolute value of the S&P 500 had a negative coefficient.

[7] Hedge funds that follow directional derivative strategies (EACM Global Asset Allocators) were grouped in the CTA category

---------- Insert Tables 8B and 8C about here ----------

Tables 9A and 9B repeat this analysis for Morningstar stock and bond mutual fund indices and the best, median and bottom Growth & Income equity mutual funds. The results are consistent with results reported previously by Sharpe [1992], Blake et al., [1993], and Elton et al., [1995]. The major factor determining the return of a fund is the factor that reflects the primary market the fund is trading. For instance, all the mutual fund indexes have significantly positive SP500 coefficients. Fixed income and asset allocation mutual funds also report significant coefficients with the Salmon Bond index (except Convertible bonds, which has no sensitivity to this index). For equity mutual funds, the intra-month standard deviation of the S&P 500 has a negative sign (significantly so for Growth & Income). Similarly, most bond funds have negative sensitivity to volatility in the bond index. This suggests that mutual fund returns are diminished by volatility in the underlying markets.

---------- Insert Table 9A about here ----------

The average, best, median, and bottom Growth & Income funds all show significance at the 95% level to the SP500 (Table 4B). The top Growth & Income managers have a significant positive sign with the absolute value of the SP500 while reporting a lower overall fit (*r*-square of .88) with the model than the median manager (*r*-square of .98). The worst managers have a significantly negative coefficient with the absolute value of the SP500. Interestingly, the best managers have a large, significant coefficient with the bond index, suggesting the managers who placed relatively more emphasis on income as opposed to growth performed best during the sample period.

---------- Insert Table 9B about here ----------

D. Trading Style and CTA, Hedge Fund, and Mutual Fund Returns

Correlation Relationships

Results in section C conclude that CTA returns are positively related to factors such as market trends and currency movement, while hedge fund and mutual fund returns are best explained by the return to a buy-and-hold

strategy in the markets the fund invests in. In this section, we further explore these sources of return by correlating the returns of the top five, median, and bottom five performers with other measures of intramonth price movement. Results are reported in Table 10. Three measures of intramonth price movement are calculated: the standard deviation, the maximum drawdown, and the maximum drawup. For CTAs, results are consistent with results in section C that show a high positive correlation with the MLM index. There is a significant negative correlation with the maximum drawup of the SP500 and almost no correlation with the maximum drawup of the SP500. This is especially true for the top performers, and is consistent with the inclusion of CTAs to provide downside risk protection for equity portfolios [Schneeweis, Spurgin, and Potter, 1996].

Insert Table 10 about here

Hedge fund performance is positively correlated with SP500 drawups and drawdowns. Among top performers the coefficients are of the same magnitude, but for median and bottom performers the drawup coefficient is much lower than the drawdown. Hedge funds show significant correlation with the maximum drawup of USDX but not with the maximum drawdown, suggesting they are better able to time the currency market than the stock market. Growth and Income mutual fund performance is positively correlated with both SP500 and JPM Bond index drawups and drawdowns. This is as expected, as mutual funds generally do not attempt to time entry and exit. Results for G&I funds also show a negative relationship with the standard deviation of the stock market. For the top performers, however, this relationship is less negative.

Implications of Results

Previous research on investment performance concentrates on single-factor models such as beta, standard deviation, and drawdown as an indicator of future risk/returns performance. In this paper, a number of factors are proposed to explain a broad range of managed assets. Results indicate that these factors may help explain the differences in investment return, as well as some of the differences within each investment grouping. Adding managed

futures and hedge fund products to traditional stock and bond portfolios only makes sense if these products derive return from sources unique from those that drive stock and bond return, and if, furthermore, the returns from those sources are positive. If this is the case, and results reported here support this, then alternative investments provide beneficial diversification to traditional stock and bond funds.

Future research is required to develop passive investment approaches that capture these unique factors more precisely. Unlike equity or bond mutual funds, the lack of a single factor that describes the return process means that alternative investments must be classified according to their style rather than a general return process. Alternatively, the fact that each position in a fund may draw from a unique return source means that a detailed breakdown of the individual positions in a fund may be required to understand the expected return. Results presented in this paper suggest both of these areas of research contain important information about the returns to actively managed assets in general, and managed futures and hedge funds, in particular.

Bibliography

Ackermann, Carl, "The Impact of Regulatory Restrictions of Fund Performance: A Comparative Study of Hedge Funds and Mutual Funds" Working Paper, University of North Carolina at Chapel Hill, 1998

Blake, C., E. Elton, and M. Gruber. "The Performance of Bond Mutual Funds," *Journal of Business.* Vol. 66. No. 3 (1993), pp. 371-403.

Chan, L., N. Jegadeesh, and J. Lakonishok. "Momentum Strategies," *Journal of Finance*, December, 1996, pp.1681-1713.

Edwards, F. and Andy C. Ma. "Commodity Fund Performance: Is the Information Contained in Fund Prospectuses Useful?" *Journal of Futures Markets* Vol. 8. No. 5 (1988), 589-616.

Elton, E. .J., M. .J. Gruber, and C. Blake. "Fundamental Economic Variables, Expected Returns, and Bond Fund Performance." *Journal of Finance*, Vol. 50, No. 4 (September, 1995), 1229-1256.

Fung, William and D. Hsieh. "Empirical Characteristics of Dynamic Trading Strategies", The Review of Financial Studies, 1977, pp. 275-302.

Irwin, S. "Further Evidence on the Usefulness of CTA Performance Information in Public Commodity Fund Prospectuses and a Proposal for Reform," *Advances in Futures and Options Research*, Vol. 7 (1994), 251-265.

Lintner, J. "The Potential Role of Managed Commodity-Financial Futures Accounts in Portfolios of Stocks and Bonds." Annual Conference of the Financial Analysts Federation, Toronto, Canada, 1983

McCarthy D., Schneeweis, T., R. Spurgin and. "Informational Content in Historical CTA Performance." *Journal of Futures Markets*, May, 1997, pp. 317-340

Schneeweis, T. *The Benefits of Managed Futures*. European Managed Futures Association, 1996.

Schneeweis, T., R. Spurgin, and M. Potter. "Managed Futures and Hedge Fund Investment for Downside Equity Risk Management", *Derivatives Quarterly*, Fall, 1996.

Schneeweis, T. "Multi-Factor Models in CTA, Hedge Fund, and Mutual Fund Return Estimation: A Technical Report" MFA (1997).

Silber, W. "Technical Trading - When it Works and When it Doesn't", *The Journal of Derivatives*, Spring, 1994, pp. 39-44

Schneeweis, T. "Equity Alternatives: A Managed Futures, Hedge Fund, and Mutual Fund Comparison CISDM Working Paper, 1997.

Sharpe, W. "Asset Allocation: Management Style and Performance Measurement." *Journal of Portfolio Management* Vol 18. No. 2 (1992), 7-19.

Spurgin, R. "Managed Futures, Hedge Fund, and Mutual Fund Performance: An Equity Class Analysis", *The Journal of Alternative Investments*, Summer, 1998, pp. 41-55.

Table 1. Descriptive Statistics of Hedge Fund, CTA, Mutual Fund, and Asset Benchmarks, 1991-1995

Benchmarks	*Avg*	*StDev*	*Max*	*Min*	*Av/SD*	*Shrpe*
MLM Index	7.8	5.2	4.7	-4.0	1.50	.58
GSCI	6.9	16.3	22.9	-9.4	0.43	.13
S&P 500	13.0	11.8	11.5	-9.2	1.10	.70
Treasury Bond	9.0	4.4	4.1	-2.3	2.04	.96
MSCI World	7.7	14.1	10.5	-11	0.55	.21
World Govt Bond	10.8	6.3	5.9	-3.6	1.72	.97
US Dollar Index	-1.6	9.1	8.5	-5.4	-0.17	-.70
PPI	1.9	1.4	1.9	-0.8		
US Treasury Bill	4.8	0.5	0.7	0.2		

Hedge Funds	*Avg*	*StDev*	*Max*	*Min*	*Av/SD*	*Shrpe*
Hedge Fund Research Indexes						
Convertible Arb.	13.2	4.4	4.3	-2.4	3.00	1.91
Distressed Sec.	20.4	7.4	7.3	-5.5	2.74	2.10
Emerging	31.1	18.4	22.3	-8.8	1.69	1.43
Fixed Income	19.1	7.0	12.0	-1.3	2.72	2.04
Foreign Exch.	18.5	15.9	14.6	-8.2	1.17	.87
Fund of Funds	13.7	4.6	5.1	-1.9	2.98	1.95
Growth	19.9	8.9	8.2	-5.3	2.25	1.71
Macro	27.9	9.6	10.2	-6.0	2.90	2.40
Market Neutral	13.7	3.1	3.5	-0.7	4.43	2.89
Market Timing	16.1	6.6	8.9	-2.5	2.45	1.73
Merger Arb.	12.0	5.1	4.2	-5.4	2.37	1.43
Sector	20.9	8.2	7.6	-4.6	2.53	1.95
Multi-Strategy	11.0	3.6	2.9	-1.8	3.10	1.76
Opportunistic	22.3	7.0	8.2	-2.3	3.18	2.50
Short Selling	7.8	15.7	12.1	-11	0.50	.19
Value	20.0	6.7	6.3	-4.5	3.00	2.29
Evaluation Associates Indexes						
EACM 100	15.9	3.4	4.8	-0.9	4.67	3.27
Relative Value	11.6	2.3	2.5	-1.1	5.12	3.02
Lng/Sht Equity	11.7	3.1	3.5	-1.0	3.78	2.24
Convert Hedge	9.7	5.0	5.0	-5.0	1.94	.99
Bond Hedge	10.2	1.5	2.0	-0.2	6.85	3.64
Rotational	14.9	5.1	4.3	-2.0	2.95	2.01
Event-Driven	13.8	5.3	5.1	-4.8	2.58	1.69
Arbitrage	8.9	7.4	5.9	-11	1.21	.57
Bankruptcy	18.4	7.3	10.1	-6.4	2.53	1.88
Multi-Strategy	13.9	4.6	3.7	-2.7	3.05	2.01
Equity Hedge	18.7	6.5	5.4	-3.4	2.90	2.16
DomLong	18.3	8.3	6.7	-4.6	2.19	1.62
DomOpp	16.7	7.1	6.7	-3.0	2.37	1.69
Global/Int'l	21.1	10.4	8.4	-8.5	2.03	1.57
Short	-1.1	19.8	12.7	-13	-0.05	-.29

CTA Indexes	*Avg*	*StDev*	*Max*	*Min*	*Av/SD*	*Shrpe*
Managed Account Reports Indexes						
Dollar-Weight	14.2	11.8	14.5	-6.0	1.20	.80
Equal Weight	10.0	10.3	11.3	-5.4	.97	.51
Currency	14.6	17.2	16.4	-8.2	.85	.57
Discretionary	15.2	8.4	8.7	-4.6	1.82	1.25
Diversified	11.2	13.1	12.7	-7.5	.85	.49
Energy	7.9	10.9	10.0	-6.1	.73	.29
Financial	14.4	14.4	20.2	-8.6	1.00	.67
Trend-Follow	13.9	18.7	22.0	-10	.74	.49
Barclay Indexes						
CTA	7.4	9.9	10.0	-5.5	.75	.27
Currency	12.4	15.8	15.0	-7.7	.79	.49
Agriculture	8.1	6.9	5.8	-4.8	1.17	.49
Fin/Metal	8.0	8.5	7.0	-10	.94	.38
Energy	9.6	12.8	26.9	-4.4	.75	.38
Diversified	11.5	12.9	12.0	-6.6	.89	.52
Systematic	11.7	13.7	14.5	-7.6	.86	.51
Discretionary	6.5	5.3	8.5	-3.0	1.22	.32
Evaluation Associates Indexes						
Gl. Asset Alloc.	24.0	12.1	16.6	-5.4	1.98	1.58
Discretionary	20.5	8.4	7.5	-5.2	2.43	1.87
Systematic	27.5	21.2	30.3	-10	1.30	1.07

Mutual Funds	*Avg*	*StDev*	*Max*	*Min*	*Av/SD*	*Shrpe*
Morningstar Indexes						
Growth & Income	11.5	10.7	10.1	-8.0	1.07	.63
Growth	12.6	12.4	11.4	-9.0	1.02	.63
Equity Income	11.1	9.0	7.5	-6.7	1.24	.70
Aggressive Grwth	16.2	16.6	12.7	-12	.98	.69
Small Company	15.3	15.1	10.6	-12	1.01	.70
Govt.Bond	7.4	3.6	3.0	-1.9	2.03	.73
Corporate Bond	8.1	3.6	3.3	-2.0	2.23	.93
Multi-Sector Bnd	9.4	4.7	4.0	-3.0	2.01	.99
Asset Allocation	10.2	6.5	7.2	-4.1	1.57	.84
Balanced	10.4	7.7	7.4	-5.6	1.35	.73
Convertible Bond	10.8	8.1	6.4	-5.9	1.33	.74
Hybrid: HiYld	11.1	6.7	7.0	-5.0	1.66	.95
Hybrid: Global	8.3	6.1	4.5	-3.8	1.37	.58

Absolute Values	*Avg*	*StDev*	*Max*	*Min*	*Av/SD*	*Shrpe*
GSCI	35.5	12.7	22.9	0.1	2.80	2.42
S&P 500	33.8	7.6	11.5	0.2	4.45	3.82
Treasury Bond	14.5	2.9	4.1	0.0	4.99	3.35
MSCI World	38.9	8.6	10.5	0.0	4.51	3.96
World Govt Bnd	19.3	4.3	5.9	0.0	4.54	3.42
US Dollar Index	23.2	6.1	8.5	0.0	3.80	3.02

Table 2A. MAR CTA Correlations

MAR CTA	*Dollar*	*Equal*	*Curr.*	*Discret.*	*Divers.*	*Energy*	*Fin.*	*Trend*
Dollar-Weight								
Equal-Weight	.94**							
Currency	.77**	.79**						
Discretionary	.62**	.54**	.47**					
Diversified	.93**	.92**	.65**	.55**				
Energy	.11	.11	.01	.32**	.08			
Financial/Metal	.92**	.87**	.71**	.47**	.84**	-.06		
Trendfollowing	.97**	.96**	.79**	.51**	.93**	.02	.94**	

Nominal Factors	*Dollar*	*Equal*	*Curr.*	*Discret.*	*Divers.*	*Energy*	*Fin.*	*Trend*
MLM	.28*	.30*	.09	.26*	.37**	.12	.17	.27*
GSCI	.08	.13	.00	.19	.06	.41**	-.03	.07
SP500	-.13	-.19	-.03	-.21	-.15	-.28*	-.01	-.10
Salomon Bond	.14	.08	.17	.16	.13	-.23	.25*	.15
MSCI	-.15	-.15	.01	-.10	-.09	-.15	-.01	-.12
World Bond	.22	.16	.22	.08	.24*	-.19	.34**	.24*
US Dollar	-.21	-.21	-.16	.09	-.25*	.29*	-.35**	-.26*
PPI	.07	.09	-.01	.00	.10	-.03	.01	.02
Tbill	.01	.05	.07	-.09	.00	-.12	.00	.02

Absolute Values	*Dollar*	*Equal*	*Curr.*	*Discret.*	*Divers.*	*Energy*	*Fin.*	*Trend*
GSCI	.12	.14	.02	.15	.13	.28*	.05	.08
SP500	.14	.12	.04	-.04	.16	-.15	.21	.19
Salomon Bond	.18	.11	.06	.17	.13	.05	.28*	.17
MSCI	.06	.12	.15	.05	.05	.04	.11	.09
World Bond	.42**	.38**	.56**	.23	.35**	-.12	.47**	.42**
US Dollar	.41**	.41**	.60**	.25*	.30*	.24*	.34**	.41**

Table 2B. EACM CTA Correlations

EACM CTA	*GAA*	*Discret.*	*System*
Global Asset All.			
Discretionary	.51**		
Systematic	.94**	.19	

Nominal Factors	*GAA*	*Discret.*	*System*
MLM	.28*	.30*	.09
GSCI	.08	.13	.00
SP500	-.13	-.19	-.03
Salomon Bond	.14	.08	.17
MSCI	-.15	-.15	.01
World Bond	.22	.16	.22
US Dollar	-.21	-.21	-.16
PPI	.07	.09	-.01
Tbill	.01	.05	.07

Absolute Values	*GAA*	*Discret.*	*System*
GSCI	.12	.14	.02
SP500	.14	.12	.04
Salomon Bond	.18	.11	.06
MSCI	.06	.12	.15
World Bond	.42**	.38**	.56**
US Dollar	.41**	.41**	.60**

Table 2C. Barclay CTA Correlations

Barclay CTA	*CTA*	*Curr*	*Agric.*	*Fin.*	*Energy*	*Divers.*	*System.*	*Discret.*
CTA								
Currency	.75**							
Agriculture	.06	-.17						
Financial/Metal	.77**	.66**	-.08					
Energy	.28*	.25*	-.16	.22				
Diversified	.98**	.74**	.06	.76**	.30*			
Systematic	.96**	.83**	.01	.80**	.26*	.96**		
Discretionary	.63**	.45**	.10	.44**	.68**	.65**	.54**	

Nominal Factors	*CTA*	*Curr*	*Agric.*	*Fin.*	*Energy*	*Divers.*	*System.*	*Discret.*
MLM	.37**	.08	.23	.27*	.26*	.40**	.32**	.38**
GSCI	.15	.07	.00	.12	.50**	.14	.13	.34**
SP500	-.23	-.16	.12	-.18	-.25*	-.22	-.17	-.38**
Salomon Bond	.02	.06	.09	.20	-.12	.02	.09	-.17
MSCI	-.20	-.07	.04	-.18	-.23	-.19	-.17	-.32**
World Bond	.16	.17	-.08	.28*	-.02	.13	.18	-.15
US Dollar	-.22	-.25*	.06	-.23	-.08	-.20	-.26*	.08
PPI	.11	.10	.01	.11	.22	.13	.08	.30*
Tbill	.05	.18	.06	.11	.29*	.09	.10	.19

Absolute Values	*CTA*	*Curr*	*Agric.*	*Fin.*	*Energy*	*Divers.*	*System.*	*Discret.*
GSCI	.16	.11	-.08	.14	.62**	.15	.12	.46**
SP500	.13	.09	-.23	.17	.34**	.11	.15	.10
Salomon Bond	.06	.04	.04	.27*	.07	.04	.09	-.02
MSCI	.10	.21	-.33**	.12	.35**	.10	.09	.24*
World Bond	.32**	.55**	-.20	.51**	-.02	.29*	.39**	.03
US Dollar	.36**	.51**	-.25*	.41**	-.09	.33**	.39**	.14

Table 3A. EACM Hedge Fund Index Correlations

EACM Index	*100*	*RelVal*	*L/S Eq*	*Conv*	*Bond*	*Rotat.*	*Event*	*Arb.*	*Bnkrpt.*	*Multi*	*Equity*	*DomLng*	*DomOpp*	*Gl/Int*	*Short*
EACM 100															
Relative Value	.50**														
Lng/Sht Equity	.26*	.25*													
Convert Hedge	.32**	.78**	-.06												
Bond Hedge	.01	.19	-.16	.00											
Rotational	.42**	.81**	-.06	.45**	.15										
Event-Driven	.34**	.23	-.24*	.34**	.15	.18									
Arbitrage	.18	-.03	-.32**	.09	.08	.03	.84**								
Bankruptcy	.31*	.42**	-.11	.47**	.16	.30*	.81**	.40**							
Multi-Strategy	.38**	.19	-.15	.29*	.15	.11	.86**	.68**	.58**						
Equity Hedge	.50**	.25*	-.08	.30*	.08	.18	.59**	.52**	.45**	.50**					
DomLong	.27*	.15	-.18	.25*	.12	.11	.57**	.49**	.47**	.45**	.85**				
DomOpp	.40**	.27*	.26*	.20	-.07	.15	.07	.01	.04	.17	.50**	.19			
Global/Int'l	.44**	.16	-.19	.22	.10	.15	.59**	.56**	.44**	.44**	.85**	.64**	.09		
Short	-.03	-.09	.30*	-.26*	-.07	-.06	-.57**	-.53**	-.42**	-.46**	-.70**	-.82**	-.13	-.56**	

Nominal Factors	*100*	*RelVal*	*L/S Eq*	*Conv*	*Bond*	*Rotat.*	*Event*	*Arb.*	*Bnkrpt.*	*Multi*	*Equity*	*DomLng*	*DomOpp*	*Gl/Int*	*Short*
MLM	.06	-.01	.09	-.12	-.01	.05	-.29*	-.32**	-.23	-.15	-.33**	-.36**	.07	-.37**	.43**
GSCI	.00	.13	.37**	.03	-.16	.03	-.17	-.33**	.09	-.18	-.14	-.22	.38**	-.34**	.29*
SP500	.22	-.02	-.23	.05	.10	.02	.46**	.53**	.24*	.36**	.69**	.79**	.04	.63**	-.77**
Salomon Bond	.35**	.19	.18	.17	.08	.04	.23	.27*	.09	.22	.38**	.37**	.16	.30*	-.26*
MSCI	.16	.00	-.12	.04	.12	.00	.27*	.33**	.16	.18	.57**	.59**	.08	.54**	-.53**
World Bond	.20	.10	.20	.05	.03	.00	-.02	.05	-.09	-.01	.11	.10	.05	.09	-.08
US Dollar	-.02	.03	-.19	.15	.03	.01	.23	.13	.24*	.20	.17	.17	.09	.12	-.17
PPI	-.22	-.05	.25*	-.12	-.18	-.07	-.65**	-.68**	-.42**	-.52**	-.44**	-.40**	-.09	-.43**	.44**
Tbill	.07	.02	.28*	-.20	-.08	.09	-.19	-.11	-.20	-.18	.02	.05	.16	-.12	.07

Absolute Values	*100*	*RelVal*	*L/S Eq*	*Conv*	*Bond*	*Rotat.*	*Event*	*Arb.*	*Bnkrpt.*	*Multi*	*Equity*	*DomLng*	*DomOpp*	*Gl/Int*	*Short*
GSCI	.05	.03	.33**	-.12	-.17	.03	-.34**	-.39**	-.20	-.24*	-.14	-.22	.21	-.23	.24*
SP500	.07	.02	-.08	-.04	-.09	.14	-.25*	-.26*	-.12	-.26*	.06	.14	-.02	.03	-.11
Salomon Bond	.12	.15	.15	.12	-.05	.07	-.11	-.06	-.11	-.12	.01	.02	-.04	.04	-.02
MSCI	.10	.09	.15	-.11	-.07	.20	-.27*	-.23	-.20	-.23	.02	-.10	.17	.01	.11
World Bond	.48**	.31*	.28*	.26*	-.13	.16	-.06	-.03	-.05	-.08	.21	.17	.19	.12	-.05
US Dollar	.44**	.31*	.17	.33**	-.04	.14	.05	-.02	.12	.03	.13	.04	.12	.13	.00

Table 3B. HFR Hedge Fund Index Correlations

HFR Index	*Cnvrt.*	*Distrs*	*Emrge.*	*FixInc*	*Forex*	*FoF*	*Growth*	*Macro*	*Neutral*	*Timing*	*Merger*	*Sector*	*Multi*	*Opprt.*	*Short*	*Value*
Convertible Arb.																
Distressed Sec.	.58**															
Emerging	.47**	.44**														
Fixed Income	.20	.28*	.11													
Foreign Exch.	.05	-.10	.06	-.06												
Fund of Funds	.27*	.15	.43**	.07	.38**											
Growth	.65**	.48**	.47**	.24*	-.07	.37**										
Macro	.44**	.17	.43**	.08	.12	.66**	.55**									
Market Neutral	.03	.16	-.03	.12	.09	.11	.26*	.05								
Market Timing	.45**	.34**	.54**	.09	.12	.37**	.62**	.54**	-.05							
Merger Arb.	.46**	.68**	.40**	.17	-.13	.10	.47**	.18	.07	.33**						
Sector	.49**	.52**	.57**	.28*	-.12	.32**	.71**	.44**	.28*	.59**	.48**					
Multi-Strategy	.29*	.26*	.16	.08	.13	.47**	.16	.28*	.13	.21	.15	.30*				
Opportunistic	.58**	.62**	.40**	.24*	.13	.45**	.70**	.52**	.22	.48**	.34**	.58**	.32**			
Short Selling	-.37**	-.24*	-.20	-.11	.07	.00	-.54**	-.24*	.13	-.53**	-.33**	-.43**	-.07	-.31*		
Value	.49**	.46**	.46**	.43**	-.14	.25*	.69**	.40**	.19	.42**	.34**	.68**	.21	.62**	-.40**	

Nominal Factors	*Cnvrt.*	*Distrs*	*Emrge.*	*FixInc*	*Forex*	*FoF*	*Growth*	*Macro*	*Neutral*	*Timing*	*Merger*	*Sector*	*Multi*	*Opprt.*	*Short*	*Value*
MLM	-.23	-.35**	-.15	-.17	.12	.08	-.42**	-.08	-.28*	-.13	-.40**	-.41**	.11	-.23	.20	-.35**
GSCI	-.18	-.28*	-.39**	-.28*	.10	.17	-.22	-.11	.01	-.23	-.34**	-.36**	.33**	-.08	.15	-.22
SP500	.51**	.31*	.43**	.18	-.04	.08	.74**	.40**	.05	.61**	.48**	.51**	.02	.41**	-.60**	.56**
Salomon Bond	.44**	.13	.24*	-.02	.17	.23	.30*	.39**	.21	.24*	.18	.14	.15	.27*	-.14	.26*
MSCI	.37**	.23	.45**	-.04	-.04	.06	.56**	.36**	.07	.58**	.33**	.54**	.17	.31*	-.41**	.54**
World Bond	.24*	-.06	.14	-.06	.23	.04	.10	.07	.10	.18	-.03	.05	.08	-.04	.03	.12
US Dollar	.06	.23	.08	.06	-.23	.15	.19	.23	.02	.01	.23	.20	.06	.24*	-.16	.10
PPI	-.34**	-.47**	-.27*	-.05	.00	.01	-.41**	-.16	.00	-.26*	-.63**	-.23	.00	-.33**	.24*	-.28*
Tbill	-.03	-.09	-.07	.22	.09	.00	-.01	-.02	.21	-.02	-.17	.01	.28*	-.06	-.04	-.08

Absolute Values	*Cnvrt.*	*Distrs*	*Emrge.*	*FixInc*	*Forex*	*FoF*	*Growth*	*Macro*	*Neutral*	*Timing*	*Merger*	*Sector*	*Multi*	*Opprt.*	*Short*	*Value*
GSCI	-.21	-.35**	-.16	.06	.09	.28*	-.13	-.06	.02	-.07	-.38**	-.20	.14	-.15	.08	-.11
SP500	.12	-.14	.17	.18	.17	.03	.13	.01	-.23	.23	-.22	-.13	-.06	.01	-.31*	.11
Salomon Bond	.21	-.07	.19	.04	.13	.07	-.01	.07	-.06	.03	-.09	-.04	-.08	.01	-.02	.16
MSCI	-.10	-.22	.12	-.04	.14	.19	-.04	.08	-.02	.12	-.20	-.06	.28*	-.15	-.07	-.16
World Bond	.28*	-.03	.19	.03	.54**	.31*	.24*	.32**	.21	.14	-.05	.20	.15	.15	.04	.15
US Dollar	.15	.08	.06	-.07	.49**	.36**	.21	.31*	.14	.04	.02	.07	.02	.26*	.13	.08

Table 4. Morningstar Mutual Fund Index Correlations

Index	*G&I*	*Growth*	*Equity Income*	*Aggress. Growth*	*Small Co*	*Govt Bond*	*Corp. Bond*	*Multi Bond*	*Asset Alloc*	*Bal-anced*	*Conv Bond*	*High Yield*
Growth & Income												
Growth	.98**											
Equity Income	.98**	.93**										
Aggressive Grwth	.90**	.97**	.85**									
Small Company	.89**	.95**	.84**	.99**								
Govt.Bond	.58**	.51**	.63**	.40**	.37**							
Corporate Bond	.58**	.51**	.64**	.40**	.38**	.98**						
Multi-Sector Bnd	.67**	.62**	.73**	.55**	.56**	.77**	.82**					
Asset Allocation	.98**	.95**	.97**	.88**	.86**	.69**	.70**	.73**				
Balanced	.98**	.96**	.98**	.88**	.87**	.70**	.71**	.75**	.99**			
Convertible Bond	.93**	.95**	.92**	.93**	.94**	.54**	.56**	.73**	.93**	.93**		
High Yield	.51**	.49**	.55**	.49**	.53**	.36**	.45**	.82**	.52**	.53**	.64**	
Global	.82**	.79**	.85**	.73**	.72**	.60**	.63**	.80**	.84**	.84**	.84**	.60**

Nominal Factors	*G&I*	*Growth*	*Equity Income*	*Aggress. Growth*	*Small Co*	*Govt Bond*	*Corp. Bond*	*Multi Bond*	*Asset Alloc*	*Bal-anced*	*Conv Bond*	*High Yield*
MLM	-.36**	-.40**	-.34**	-.44**	-.45**	.01	.00	-.15	-.29*	-.32**	-.39**	-.27*
GSCI	-.29*	-.33**	-.24*	-.36**	-.36**	-.08	-.07	-.18	-.24*	-.26*	-.31*	-.14
SP500	.99**	.95**	.97**	.86**	.84**	.60**	.60**	.66**	.96**	.97**	.89**	.47**
Salomon Bond	.52**	.45**	.58**	.33**	.30*	.98**	.99**	.74**	.65**	.65**	.48**	.33**
MSCI	.68**	.64**	.70**	.58**	.56**	.44**	.44**	.59**	.67**	.68**	.65**	.40**
World Bond	.29*	.23	.32**	.13	.09	.63**	.60**	.48**	.36**	.37**	.25*	.08
US Dollar	.02	.05	.00	.12	.16	-.23	-.19	-.10	-.02	-.02	.07	.18
PPI	-.43**	-.45**	-.42**	-.47**	-.50**	-.10	-.16	-.42**	-.39**	-.40**	-.47**	-.55**
Tbill	.04	.05	.00	.03	.01	.20	.16	.07	.06	.07	-.05	-.13

Absolute Values	*G&I*	*Growth*	*Equity Income*	*Aggress. Growth*	*Small Co*	*Govt Bond*	*Corp. Bond*	*Multi Bond*	*Asset Alloc*	*Bal-anced*	*Conv Bond*	*High Yield*
GSCI	-.19	-.19	-.20	-.23	-.25*	.01	-.05	-.23	-.14	-.16	-.27*	-.36**
SP500	.27*	.26*	.22	.20	.16	.12	.10	.02	.27*	.24*	.18	-.08
Salomon Bond	.18	.14	.19	.07	.05	.53**	.52**	.26*	.27*	.26*	.17	.02
MSCI	-.04	-.03	-.06	-.06	-.11	-.06	-.10	-.14	-.05	-.05	-.12	-.24*
World Bond	.22	.20	.22	.16	.13	.47**	.44**	.30*	.28*	.28*	.21	.06
US Dollar	-.04	-.01	-.04	.05	.06	-.01	.00	.04	-.02	-.02	.03	.14

Table 5. Traditional Asset Correlations

Index	*MLM*	*GSCI*	*SP500*	*Tbond*	*MSCI*	*Wbond*	*USDX*	*PPI*	*Tbill*
MLM									
GSCI Total Return	.19								
S&P 500	-.33**	-.28*							
Solomon Treasury Bond	.03	-.05	.54**						
M.S.C.I. WORLD	-.23	-.24*	.69**	.41**					
Solomon World Govt Bond	.11	-.07	.33**	.63**	.53**				
US Dollar Index	-.21	-.04	-.02	-.21	-.28*	-.78**			
PPI	.33**	.23	-.41**	-.10	-.27*	.03	-.15		
US Treasury Bill	.15	.17	.07	.15	-.11	.09	-.12	.23	

	Nominal Index Values									*Absolute Index Values*				
Index	*MLM*	*GSCI*	*SP500*	*Tbond*	*MSCI*	*Wbond*	*USDX*	*PPI*	*Tbill*	*GSCI*	*SP500*	*Tbond*	*MSCI*	*Wbond*
GSCI	.29*	.56**	-.17	.00	-.23	.03	-.10	.47**	.30*					
SP500	.10	.03	.28*	.08	.11	.17	-.18	.17	.31*	.32**				
Salomon Bond	.04	-.06	.19	.56**	.11	.44**	-.18	.06	.04	.04	.27*			
MSCI	.06	.24*	-.01	-.09	.12	.11	-.11	.24*	.26*	.46**	.55**	-.05		
World Bond	-.20	-.10	.23	.45**	.27*	.56**	-.31*	.03	.15	.00	.13	.39**	.17	
US Dollar	-.21	-.10	-.05	-.01	-.02	-.07	.24*	-.20	-.22	-.04	-.09	.05	.02	.54**

Table 6. Correlation of Intramonth Standard Deviation Measures

	Nominal Index Values					*Absolute Values*				*Intramonth StDev*			
Intramonth StDev	*MLM*	*GSCI*	*SP500*	*USSB*	*USDX*	*GSCI*	*SP500*	*USSB*	*USDX*	*SP500*	*JPBD*	*GSCI*	*USDX*
SP500	.16	.14	-.21	-.12	-.08	.47**	.36**	.04	-.06				
Salomon Bond	-.01	-.05	.09	-.22	.12	-.12	-.07	-.14	-.11	.05			
GSCI	.11	.01	-.08	-.05	-.10	.55**	.32**	.06	-.12	.68**	.06		
USDX	-.24*	-.06	.04	.19	.19	-.13	-.10	.18	.24*	.10	-.05	-.03	

Table 7A. Regression using MAR CTA Performance Indexes

Performance Index	Adj. R^2	F-stat	Intercept	MLM	*Nominal Index Coefficients* GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
Dollar Weight	0.32	3.57	-.015	.555*	.027	-.122	.474	-.265	-.034	.183	.149	1.035**	3.074	-.677	-1.079	-2.815
Diversified	0.30	3.39	-.006	.745*	-.016	-.216	.736	-.280	-.029	.307	-.200	1.001**	1.670	1.484	-.799	-4.754*
Equal-Weight	0.42	5.04	-.001	.427	.048	-.161	.501	-.211	-.050	.168	-.030	.974**	2.946	-.103	-.987	-5.431**
Energy	0.32	3.57	-.015	.555*	.027	-.122	.474	-.265	-.034	.183	.149	1.035**	3.074	-.677	-1.079	-2.815
Currency	0.53	7.22	-.042	.358	.077	-.092	1.312*	-.439**	-.231	.102	-.930	2.128**	7.401**	4.967	-1.203	-6.442**
Financial/Metal	0.35	3.97	-.003	.231	-.055	-.182	.792	-.491**	-.051	.340	.422	1.099**	3.321	-3.366	-1.323	-5.270*
Discretionary	0.14	1.88	-.014	.379	.050	-.173	.557	.124	.022	.001	.156	.339*	1.371	1.358	-.490	.882
Trend-Following	0.41	4.83	-.018	.756	.039	-.275	1.032	-.486*	-.116	.537	-.037	1.726**	4.322	.844	-2.040	-7.338*

* Significant with 95% confidence, ** Significant with 99% confidence

Table 7B. Regression using Best Performing, Worst Performing, and Median CTAs

Performance Index	Adj. R^2	F-stat	Intercept	MLM	*Nominal Index Coefficients* GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
All CTAs	.38	4.34	.002	.976**	.035	-.124	.405	-.404*	-.091	.191	-.149	1.366**	3.489	-1.986	-1.077	-6.219*
Best Five	.42	5.02	.085	1.582*	.300	-.257	.109	-.980**	-.132	.584	.287	3.256**	8.966	.642	-.933	-11.102*
Median	.38	4.36	.005	.919**	.029	-.043	.225	-.443**	-.069	.173	-.025	1.125**	2.844	-3.320	-1.273	-5.139*
Worst Five	.25	2.83	-.081*	1.410**	-.126	-.136	.790	-.288	-.133	-.346	-.319	.814*	1.880	-2.337	-1.389	-8.502*

* Significant with 95% confidence, ** Significant with 99% confidence

Table 7C. Regression using Best Performing, Worst Performing, and Median Diversified CTAs

Performance Index	Adj. R^2	F-stat	Intercept	MLM	*Nominal Index Coefficients* GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
All CTAs	.31	3.48	.004	1.256**	-.010	-.110	.182	-.367	.000	.206	-.130	1.247**	3.111	-2.667	-1.553	-5.472
Best Five	.30	3.33	.083	1.759*	.038	.034	-.337	-.768*	.267	.430	.776	2.449**	4.856	2.445	-2.454	-8.553
Median	.29	3.24	.007	1.163**	-.010	-.093	.125	-.415*	-.064	.253	-.183	1.080**	2.348	-3.037	-1.201	-5.020
Worst Five	.31	3.44	-.065*	1.560**	-.105	-.127	.599	.017	-.028	-.272	-.610	.684*	4.191	-11.356	-2.355*	-5.189

* Significant with 95% confidence, ** Significant with 99% confidence

Table 8A. Regression using EACM Hedge Fund Performance Indexes

Performance Index	Adj. R^2	F-stat	Intercept	*Nominal Index Coefficients* MLM	GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
EACM 100	0.27	3.03	.010	.150	.031	.075	.207	-.010	-.036	-.003	-.142	.299**	.394	-2.336	.114	-.219
Long/Short	0.29	3.25	.007	-.081	.044	-.061	.239	-.054	.032	-.084	.053	.110*	1.295*	-.996	-.165	-.795
Relative Value	0.07	1.40	.011*	.027	.035	-.005	.075	.005	-.033	.019	.003	.113*	-.114	-2.719	.100	.360
Convertible Hedge	0.20	2.33	.010	.032	.034	-.021	.098	.040	-.017	.106	-.039	.182	-1.670	-4.131	-.119	2.621**
Bond Hedge	-0.10	0.51	.010**	.037	.000	.015	.008	.004	-.029	-.013	-.055	-.012	-.209	-.790	.167	.319
Event Driven	0.33	3.72	.028**	-.033	.012	.211**	.093	.095	-.031	-.157	-.274	-.009	-.748	-1.962	-.205	.135
Rotational	-0.09	0.55	.019	.122	.062	.047	-.045	.029	-.119	.065	.053	.172	.127	-4.961	.516	-.706
Arbitrage	0.42	4.88	.029*	-.142	-.077	.286**	.204	.073	-.004	-.292*	-.229	-.075	-.506	.486	-.335	-1.324
Bankruptcy	0.15	1.97	.029*	.004	.134	.225	-.111	.124	-.099	-.047	-.300	.058	-.520	-5.836	-.319	2.021
Equity Hedge	0.50	6.50	.015	.008	.052	.390**	.082	.080	-.028	-.026	-.360	.122	-1.265	-2.174	.425	1.727
Multi-index	0.21	2.46	.027**	.040	-.021	.123	.185	.088	.010	-.133	-.292	-.009	-1.220	-.536	.039	-.293
Domestic Long	0.67	11.9	.005	.047	.070	.585**	-.044	.106	-.120	.017	-.408	.059	-1.234	-.987	.751	2.771**
Dom. Opportunity	0.11	1.67	.003	.137	.198**	.036	.386	.057	-.019	.038	-.457	.192	-1.653	2.550	.515	1.412
Short Selling	0.64	10.6	.022	.307	.063	-1.355**	.852	-.173	-.087	.040	.185	.156	3.350	-5.406	-.054	-5.728*
Global/Internat'l	0.39	4.50	.036*	-.161	-.111	.548**	-.095	.078	.055	-.132	-.216	.114	-.908	-8.084	.010	.998

* Significant with 95% confidence, ** Significant with 99% confidence

Table 8B. Regression using Best Performing, Worst Performing, and Median Hedge Funds

Performance Index	Adj. R^2	F-stat	Intercept	MLM	*Nominal Index Coefficients* GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
All Funds	.58	8.49	.012	.139	.039	.399**	-.335*	.097*	-.108*	-.130	-.045	.128	-.425	-3.051	.450	1.424*
Best Five	.53	7.20	.022**	.060	.050	.375**	-.318	.123*	-.062	.020	-.041	.170*	-.365	-2.511	.668*	1.403
Median	.56	7.99	.015**	.065	.056	.303**	-.169	.075	-.113*	-.122*	-.099	.057	-.382	-3.232	.408	1.131
Worst Five	.22	2.53	-.043	1.165**	-.087	.572**	-1.158	.170	-.315	-.628*	-.007	.215	.336	-10.950	.217	4.125

* Significant with 95% confidence, ** Significant with 99% confidence

Table 8C. Regression using Best Performing, Worst Performing, and Median Opportunity Hedge Funds

Performance Index	Adj. R^2	F-stat	Intercept	MLM	*Nominal Index Coefficients* GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
All Funds	.67	11.8	.009	.101	.043	.449**	-.342*	.073	-.118*	-.224**	-.154	.111	-.964	-3.262	.485	1.280
Best Five	.50	6.57	.024**	.054	.056	.352**	-.219	.130*	-.070	.039	-.130	.165*	-.072	-2.499	.552	1.261
Median	.72	15.2	.008	.020	.019	.435**	-.281	.020	-.063	-.312**	-.050	.061	-1.216	-2.181	.271	.934
Worst Five	.58	8.51	-.006	.204	.048	.549**	-.528*	.062	-.190*	-.407**	-.269	.096	-1.733	-4.626	.611	1.604

* Significant with 95% confidence, ** Significant with 99% confidence

Table 9A. Regression using Morningstar Mutual Fund Performance Indexes

Performance Index	Adj. R^2	F-stat	Intercept	*Nominal Index Coefficients* MLM	GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
Growth & Income	0.98	259.7	.000	-.017	.012	.895**	-.062	.029	-.025	.009	.021	.005	-.719*	-.134	.295*	.568
Equity Income	0.95	101.6	.005	.008	.052*	.721**	.149	.027	-.065	-.024	-.067	-.003	-.436	-1.458	.238	.468
Growth	0.91	59.34	-.003	-.101	-.034	1.003**	-.241	.031	.008	.038	-.055	.030	-1.079	.111	.390	1.461
Aggress. Growth	0.77	19.72	.005	-.234	-.075	1.249**	-.617	.097	-.006	.032	-.189	.101	-2.382	-2.429	.825	2.892
Small Company	0.76	18.26	.009	-.147	-.045	1.155**	-.712*	.143	-.052	-.031	-.075	.108	-2.520	-3.348	.937	2.863
Corporate Bond	0.98	234.5	.002	.013	.011	.029**	.784**	.007	-.025**	.010	-.034	.006	.101	-.746*	.009	.051
Gov't Bond	0.97	190.9	.001	.002	-.001	.034**	.767**	-.009	-.001	-.005	-.010	.006	.208	-.612	.012	-.110
Multi-Sect. Bond	0.67	11.95	.015**	.050	.032	.190**	.547**	-.005	-.101*	-.069	-.181	.050	.401	-4.888**	.133	-.042
Asset Allocation	0.94	91.77	-.002	.034	.016	.482**	.225**	.018	-.012	.022	.016	.018	-.452	-.130	.162	.748*
Convertible Bond	0.82	26.18	.002	.006	.030	.611**	-.088	.033	-.098	.007	-.024	.037	-1.356	-2.532	.560*	2.447**
Balanced	0.97	152.5	-.001	-.019	.009	.562**	.311**	.019	-.016	.002	-.025	.015	-.309	-.496	.172	.598
High Yield	0.34	3.76	.027*	.040	.086	.273**	.198	.120	-.206*	-.060	-.265	.113	.331	-7.998*	-.016	.439
Global	0.65	11.31	.012	.167	.047	.437**	.075	-.088	-.044	-.047	-.173	.038	-.867	-4.038	.192	1.033

* Significant with 95% confidence, ** Significant with 99% confidence

Table 9B. Regression using Best Performing, Worst Performing, and Growth & Income Mutual Funds

Performance Index	Adj. R^2	F-stat	Intercept	*Nominal Index Coefficients* MLM	GSCI	SP500	SBBI	USDX	*Absolute Index Coefficients* GSCI	SP500	SBBI	USDX	*Intramonth StDev Coefficients* GSCI	SP500	SBBI	USDX
All Funds	.98	224.2	.000	-.021	.015	.882**	-.046	.035	-.033	.002	.010	.001	-.731*	-.256	.340**	.646
Best Five	.88	42.36	.016	-.185	.019	.843**	-.120	.163**	.029	.174*	.242	.040	-.351	-1.593	.815**	1.562
Median	.98	296.2	.000	-.008	.017	.903**	-.052	.014	-.025	.001	.015	.003	-.592*	-.234	.234*	.560
Worst Five	.90	48.50	-.023**	-.097	.005	.818**	.154	.075	-.107	-.158*	-.249	-.006	-2.044**	.976	.334	1.365

* Significant with 95% confidence, ** Significant with 99% confidence

Table 10. Traditional Asset Correlations

	CTA Performance Indexes					*Hedge Fund Performance Indexes*				*Mutual Fund Performance Indexes*			
	Average	*Top 5*	*Median*	*Bottom 5*	*MLM*	*Average*	*Top 5*	*Median*	*Bottom 5*	*Average*	*Top 5*	*Median*	*Bottom 5*
Top 5	.88**					.88**				.93**			
Median	.98**	.81**				.88**	.85**			1.00**	.93**		
Bottom 5	.76**	.52**	.74**			.54**	.19	.25*		.94**	.83**	.93**	
MLM	.37**	.31*	.38**	.40**		-.35**	-.34**	-.37**	.04	-.36**	-.39**	-.35**	-.42**
SP500	*Average*	*Top 5*	*Median*	*Bottom 5*	*MLM*	*Average*	*Top 5*	*Median*	*Bottom 5*	*Average*	*Top 5*	*Median*	*Bottom 5*
Return	-.19	-.24*	-.15	-.14	-.34**	.66**	.63**	.65**	.11	.99**	.90**	.99**	.91**
Standard Dev.	.10	.25*	.05	-.13	.14	-.24*	-.03	-.27*	-.20	-.21	-.03	-.21	-.38**
Max Drawdown	-.30*	-.42**	-.27*	-.01	-.35**	.52**	.32**	.54**	.26*	.56**	.37**	.55**	.69**
Max Drawup	-.02	-.05	-.01	-.08	.01	-.06	-.02	-.08	-.05	.15	.18	.16	.10
JPM Bond	*Average*	*Top 5*	*Median*	*Bottom 5*	*MLM*	*Average*	*Top 5*	*Median*	*Bottom 5*	*Average*	*Top 5*	*Median*	*Bottom 5*
Return	.04	-.04	.07	.10	.03	.29*	.29*	.26*	.21	.53**	.46**	.54**	.50**
Standard Dev.	-.14	-.11	-.16	-.09	-.01	.23	.22	.24*	.16	.10	.06	.09	.11
Max Drawdown	.08	-.09	.13	.18	-.08	.06	.06	.12	.04	.37**	.26*	.38**	.37**
Max Drawup	.09	.02	.10	.10	.01	.28*	.27*	.25*	.21	.15	.11	.17	.17
USDX	*Average*	*Top 5*	*Median*	*Bottom 5*	*MLM*	*Average*	*Top 5*	*Median*	*Bottom 5*	*Average*	*Top 5*	*Median*	*Bottom 5*
Return	-.26*	-.25*	-.32**	-.20	-.21	.29*	.29*	.26*	.21	.02	.11	.00	.10
Standard Dev.	-.23	-.17	-.23	-.28*	-.25*	.23	.22	.24*	.16	.08	.15	.07	.14
Max Drawdown	-.15	-.21	-.18	.06	.08	.06	.06	.12	.04	-.07	-.08	-.08	-.03
Max Drawup	-.21	-.16	-.25*	-.23	-.20	.28*	.27*	.25*	.21	.07	.14	.06	.15
GSCI	*Average*	*Top 5*	*Median*	*Bottom 5*	*MLM*	*Average*	*Top 5*	*Median*	*Bottom 5*	*Average*	*Top 5*	*Median*	*Bottom 5*
Return	.08	.18	.07	-.06	.17	-.27*	-.18	-.20	-.30*	-.29*	-.23	-.28*	-.33**
Standard Dev.	-.04	.11	-.09	-.19	.12	-.14	.08	-.18	-.22	-.07	.11	-.08	-.22
Max Drawdown	-.02	-.12	.02	.13	-.25*	.18	-.03	.25*	.16	.11	-.06	.12	.26*
Max Drawup	.00	.16	-.05	-.20	.22	-.30*	-.12	-.27*	-.32**	-.19	-.05	-.19	-.33**

Figure 1. Risk and Return for Selected Indexes, 1990-1995