Managed Futures, Hedge Fund and Mutual Fund Return Estimation: A Multi-Factor Approach

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Abstract

The past five years have witnessed a dramatic increase in managed futures products whose managers (commodity trading advisors) trade primarily in futures and options markets and which are available to the retail public as well as in hedge funds whose managers invest in both cash and futures markets simultaneously and which are structured primarily for pool investment and not for public sale. Despite this growth, funds invested in managed futures and hedge fund products are estimated to be less than 1% of the over 3 trillion dollar mutual fund industry. One reason for the relatively small percentage invested in managed futures or hedge fund vehicles is that little published research exists on the determinants of managed futures and hedge fund expected performance. However, while extensive literature exists on theoretical and empirical models of return expectation for stock and bonds, little academic research has directly tested for the underlying factors which explain managed futures and hedge fund return. In this paper, various factors, chosen to capture managed futures and hedge fund trading styles and investment markets, are used to explain managed futures and hedge fund performance. Similar tests are run on portfolios of traditional stock and bond funds in order to evaluate the relative explanatory power of the multiple factor models.

Results indicate that for the managed futures, hedge fund, and mutual fund portfolios, a set of factors exist which help to explain managed futures, hedge fund, and mutual fund returns. These factors are based on the characteristics of the trading style (e.g., discretionary, systematic . . .) and the unique asset markets traded (e.g., currency, financial) of managed futures, hedge funds, and mutual funds. Results indicate that technical trading rule and market momentum variables are shown to explain managed futures return. In contrast, technical trading rules are shown to be less helpful in explaining return movements in traditional stock and bond funds whose returns are consistent with long positions in underlying cash markets, and hedge funds whose trading style is often based on capturing undervalued stock or bond investments. Results provide evidence that to the degree that underlying stock and bond markets provide explanatory power for traditional stock and bond managers returns but fail to describe the return patterns of managed futures and hedge fund products, while certain trend following and volatility factors help describe managed futures but not hedge fund return patterns, managed futures and hedge funds provide reasonable diversification patterns to traditional stock and bond funds as well as to each other.

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I. Introduction

The past five years have witnessed a dramatic increase in managed futures products, which are available to the retail public, and hedge funds, which are structured primarily for pool investment and generally not for public sale.[1] Despite this growth, total funds invested in managed futures and hedge fund products are estimated to be less than 1% of more than three trillion dollars invested in mutual funds. One reason for the relatively low level of investment in managed futures and hedge funds is that investors often require both a theoretical basis for investment as well as supporting empirical results before investing in a new investment vehicle. For traditional assets such as stocks and bonds, there are broadly accepted single factor and multi-factor theoretical models (e.g., CAPM, APT) as well as empirical tests that support the alternative theories. For instance, Sharpe [1992] used over fifteen global stock and bond indices to explain the return structure of U.S. equity funds. Elton, Gruber, and Blake [1995] also used fundamental economic variables to describe the cross sectional returns of U.S. bond funds.

Theoretical models as well as empirical tests of stock and bond return formation, however, may neither fully explain the theoretical basis nor the empirical factors describing returns to managed

[1] The past five years has also witnessed a dramatic increase in academic research conducted on the potential benefits of non-traditional asset forms. This is due not only to the recent growth in these vehicles but to the recent availability of researchable data bases which provide historical information on market performance. Within the past few years, research on return persistence in managed futures returns [Elton et al., 1989; Irwin et al., 1994; Schneeweis et al., 1997], survivor bias [Elton et al., 1992; Schneeweis et al., 1996], the potential benefits of managed futures in portfolio creation [Chance, 1994; McCarthy et al., 1996, Schneeweis et al., 1996; Schneeweis 1996] as well as comparisons of the risk and return properties of commonly used passive commodity and active and passive managed futures and hedge fund benchmarks [Schneeweis and Spurgin, 1996, 1997] has been published.

futures or hedge funds. Schneeweis [1996] and Fung and Hsieh [1996] point out that hedge fund traders and managed futures traders (commodity trading advisors (CTAs)) have different investment styles and opportunities than traditional stock and bond fund managers. These include the ability to trade in multiple markets, take long and short positions, and use varying degrees of leverage. As important, while futures and options markets are a zero sum game, that is, daily gains must equal daily losses for market participants, academic research [Schneeweis, 1996; Chan et al., 1996] has shown that the existence of arbitrage returns, convenience yields, and returns to providing liquidity as well as the existence of trending markets due to institutional and market trading characteristics may provide a source of positive return for CTA and hedge fund managers.[2] Little research, however, exists on the actual market or trading factors that explain the performance of managed futures investments or hedge funds.[3] Previous research has concentrated on either a simple benchmark consisting of the average return of all public funds [Irwin et al., 1994] or a more complex Bayesian risk-adjusted beta based CTA benchmark [Schneeweis et al., 1997]. However, little research exists on the sources, or factors, that underlie these CTA based benchmark returns or the individual public commodity funds/CTAs themselves. Mitev [1995] used traditional factor analysis to explain the differential factors explaining commodity trading advisor returns, however, no attempt was made to strictly identify explanatory variables consistent with those factors. Similarly, Fung and Hsieh [1996] also used factor analysis to explain the relative returns to mutual funds, hedge funds, and CTAs and to extract the trading styles and market factors common to all. Fung and Hsieh conclude that the number of possible CTA or hedge

[2] The review of number of articles describing various arbitrage activities, the existence of convenience yield, and trending markets is beyond the scope of this article. The cited articles are only several among hundreds which explore their existence.

[3] For general books on the structure of managed futures or hedge funds, see Lederman and Klein, 1995 and Chandler, 1994.

fund strategies make extension of the single factor CTA benchmarks [Irwin et al., 1994; Schneeweis et al., 1997] or the multi-factor mutual fund models [Sharpe, 1992] unsuitable for describing CTA or hedge fund returns. However, while individual CTA or hedge fund strategies may vary, the fact that they can be grouped into general explanatory factors by factor analysis and/or into common benchmarks by selection criteria used by firms such as Managed Account Reports, EACM, or Barclay, indicates that variables may exist which capture common CTA trading strategies or market-based CTA returns.

In contrast to earlier single-index regression or factor analytic approaches, this research uses a multi-factor approach to explain the sources of return to a wide variety of actively managed investment vehicles, including managed futures, hedge funds, and stock and bond mutual funds. Analysis of measurable factors reflecting the return to CTA and hedge fund trading is important, since in previous research the actual factors proposed to explain CTA or hedge fund return are unspecified.[4] Thus empirical factors (variables) must be specified which reflect the trading styles or markets described by the factor regression or the underlying strategies of the traders themselves. Tests are conducted on both commonly used benchmark indices for stock and bond funds (e.g., Morningstar), managed futures vehicles (e.g., Managed Accounts Reports, EACM, Barclay, TASS) and hedge funds (e.g., Hedge Fund Research, EACM) as well as portfolios of individual stock and bond funds, hedge funds, and CTAs grouped by trading style or market sectors. The study is designed to extend Sharpe's style/market regressions by measuring the influence of CTA and hedge fund investment style or market selection on their return. As such, factors such as trading opportunities (e.g., arbitrage, value) and trading approach

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[4] Single-factor models use the average performance of CTAs as a benchmark, but a benchmark itself is not a factor determining return. Similarly, factor analysis identifies the number of common factors in return performance, but cannot identify what those factors are.

(technical trendfollowing or fundamental) as well as markets traded (e.g., stock, bond, currency, and commodity) are used to explain CTA, hedge fund, and mutual fund return performance. The factors underlying the return patterns of managed futures and hedge funds are shown to differ from those that explain stock and bond mutual funds as well as from each other.

Section II of this paper reviews previous academic results on explanatory return models for managed futures and hedge funds. In Section III, the data and methodology are presented. Since managed futures and hedge funds are capable of profiting from increases and decreases in the price of underlying asset markets, we use both the nominal and absolute value of cash (e.g., S&P 500, Salomon Brothers Bond index, USDX exchange rate index) and futures-based commodity indices (e.g., GSCI) as determinants of managed futures returns. Similarly, since higher volatility may offer managed futures and hedge funds more trading opportunities, intramonth volatility measures (standard deviation and intramonth drawdowns and intramonth drawups) are also tested. In addition, since CTAs and hedge fund managers often base timing decisions on technical trading rules, another proposed explanatory variable, the Mount Lucas Management (MLM) passive futures markets trading index, a moving average index of commodity and financial futures contracts, is used.[5] Results are discussed in Section IV. These results provide evidence that several factors contribute to the return of CTAs and that those factors are different from the factors that explain hedge fund and mutual fund stock and bond returns. Investment implications, conclusions and areas of future research are discussed in the final section. For instance, the results provide evidence that stock and bond markets provide explanatory power for traditional stock and bond managers returns but fail to describe the return patterns of

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[5] The MLM index is used primarily due to its industry acceptance and that it exists as a tradeable index. Other time series models may exist which provide a better fit to actual return structures of various technical trading CTAs.

managed futures and hedge fund products, while certain trend following and volatility factors help describe managed futures but not hedge fund return patterns. Thus, managed futures and hedge funds provide reasonable diversification patterns to traditional stock and bond funds as well as to each other. Future research should focus on higher frequency data and unique trading strategies, as the results presented here point to intramonth volatility and market pressure as important sources of managed futures and hedge fund returns.[6]

II. Managed Futures, Hedge Funds, and Mutual Funds Return Determinants

Theoretical models, such as the single index capital asset pricing model and the multi-factor arbitrage pricing theory, have been used to describe the basis for returns to traditional stock and bond funds. For stocks and bonds, both single factor and multi-factor empirical tests of return formation have also been conducted. For instance, Sharpe [1992] used over fifteen global stock and bond indices to explain the return structure of U.S. equity funds. Elton, Gruber, and Blake [1995] also used fundamental economic variables to describe the cross sectional returns of U.S. bond funds. Theoretical models as well as empirical tests of stock and bond return formation, however, may neither fully explain the theoretical basis nor the empirical factors explaining returns to managed futures or hedge funds. First, the fact that the underlying futures and options markets operate in a zero sum game; that is, daily gains must equal losses for market participants, has led to questions as to the potential benefits of many non-traditional investment vehicles. However, recent academic research [Clardia and Taylor, 1993; Kapadia, 1995; Chan, Jegadeesh, Lakonishok, 1996] on the existence of convenience yields, market momentum, and institutional features which result in the existence of short-term arbitrage or

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[6] Since research [Schneeweis, 1996] has shown that CTA return is due to a relatively small number of actual trades, research is required as to the source of these unique return opportunities (e.g., squeezes).

positive potential risk/returns tradeoffs to those providing liquidity, has indicated that positive returns may accrue to non-traditional investment managers whose investment styles may capture returns due to arbitrage, convenience yield, or market momentum factors. Various academic studies [Chance, 1994; Schneeweis, 1996] point out that CTAs and hedge fund traders have different investment styles and market opportunities than traditional stock and bond fund managers. These alternative investment styles and market opportunities include the ability to trade in multiple markets, take long and short positions, and use varying degrees of leverage in varying market conditions which may thus permit them to capture returns consistent with arbitrage or market momentum.

For instance, for stock and bond funds, in which investment managers are strictly regulated to hold primarily long positions in the underlying assets, theoretical and empirical models of return estimation may focus on the expected return of the underlying assets themselves. In contrast, for investment vehicles such as a hedge fund which focus on market-neutral arbitrage positions, the comparison benchmark may be the risk-free rate. However, if the hedge fund focuses on domestic or international equity/bond investments, then U.S. or international equity/fixed income benchmarks similar to those used for traditional mutual funds may be regarded as the standard.

In managed futures investments, where traders in futures and options markets are operating in a zero sum game, the existence of a zero sum game does not restrict futures and options investors from holding positions which offer positive return/risk tradeoffs. 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. Moreover, given the lower transaction costs of trading in futures and options markets, managed futures returns may, in fact, offer superior returns to the underlying cash markets for

comparable long (short) positions. Furthermore, institutional characteristics and differential carry costs among investors may permit managed futures traders to take advantage of short-term pricing differences between theoretically identical futures, options and cash market positions as well as differential risk transfer needs. This differential hedging demand may create investment situations where hedgers are required to offer speculators a return for holding unhedged long or short positions. This return to speculative traders for offering liquidity to hedgers, who desiring to limit losses, may exist not only in futures markets but may exist in a wide range of derivative products such as options. For instance, option traders may be able to create positions which offer a risk premium in exchange for accepting exposure to certain portions of the return distribution of the underlying security. This return (e.g., convenience yield) can be earned simply by buying and holding a derivative portfolio and is, arguably, the basis for the positive long-term return seen in various futures-based commodity index products, such as the JPMorgan or the Goldman Sachs commodity index.

The return to managed futures can also stem from the ability of managers to exploit imperfections in the markets for futures and options as well as the market for the underlying cash instrument. Research on traditional investment vehicles (e.g., stocks, bonds, and currencies) indicates that investors may underreact to information and, consequently, security prices may trend. Trading techniques based on capturing these trends may be profitable.[7] In addition, research on traditional security markets has shown that market prices react to unexpected changes in micro or macro information [Ederington and Lee, 1995; Johnson and Schneeweis, 1993]. Unlike stock and bond

[7] It is not the purpose of this paper to review the mound of research dedicated to the existence or non-existence of liquidity premia, market momentum, or the profitability of technical trading rules or call writing. For the purposes of this paper, the existence of extensive and costly proprietary trading operations at some of the largest financial houses is at least somewhat indicative of the potential for short-term trading profits from a wide variety of alternative trading techniques. For recent academic evidence, see Chan, Jagdeesh, and Lakonishok, [1996].

funds, managed futures accounts often have few restrictions on short sales, either institutional (such as the uptick rule) or structural (poor liquidity when short selling small capitalization stocks). Because of the ability of futures traders to take unrestricted short positions, it is not necessary for markets to trend upward or gap upward to make money. In fact, some of the most impressive periods of return for trading advisors have been during periods of poor performance in the equity markets (e.g., October, 1987). While the existence of positive security returns from technical trading rules have been questioned, most studies rely on the high transactions costs of cash markets to rule out profit. Low transaction costs combined with the ability to sell short and utilize leverage may permit technical trading rules to obtain positive returns in markets which, for short time periods, may be mispriced.[8] Access to options markets permits managed futures and hedge fund traders to create positions which offer potential returns due to changes in market volatility. While it is not possible at present to trade volatility directly on public exchanges, it is possible to construct positions (e.g., straddle positions) that derive some of their return from volatility or changes in expected volatility.

Since managed futures can replicate many strategies available to a cash market investor at a lower cost, and allow strategies that are unavailable to cash investors, return models must be based not only on factors that explain traditional asset returns but also on factors unique to managed futures and hedge fund market trading opportunities.[9] Managed futures and hedge funds may, thus, offer a positive risk-adjusted return that differs from underlying cash markets. Thus, to the degree that different factors

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[8] These factors could explain the explain some portion of the historical return to the MLM index, which incorporates a trend-following timing rule.

[9] For a discussion of the basis of managed futures returns as a natural result of market forces or based primarily on trader skills, see T. Schneeweis and R. Spurgin, 'Managed Futures: Nature vs. Nurture' Barclays Newsletter [Fall, 1996].

explain managed futures, hedge fund, and stock and bond fund returns, managed futures as well as hedge funds may provide investors exposure to unique sources of return, and, thus, provide an important source diversified return in combination with traditional investment assets.[10]

However, the factors underlying CTA or hedge fund returns have not been fully identified in previous research. Irwin et al. [1994] focused on a simple managed futures benchmark as the best forecast of an individual CTA's return while Schneeweis et al. [1997] proposed a single index Baysian risk-adjusted (e.g., beta) benchmark forecast which may capture differential leverage to the underlying benchmark. This research sheds light on how CTAs perform relative to one another, but does not address the underlying source of CTA return. For CTAs, Mitev [1995] and for CTAs and hedge funds, Fung and Hsieh [1996] used factor analytic approaches to determine the common factors that help explain CTA or hedge fund return patterns. Fung and Hsieh cite five general investment areas (Distressed, Global/Macro, Systems, Systems/opportunistic, and Value) which explain most CTA and hedge funds return variation. Of these five groups, Global/Macro, Systems, and Systems/Opportunistic were determined to be driven by factors not easily explained by the factors common to stock mutual funds, bond funds, Distressed CTA/Hedge or Value CTA/Hedge fund managers. Fung and Hsieh do not determine if the difference in the return groups is due primarily to systems based trading managers,

[10]As discussed in footnote one, considerable research exists on the risk reduction benefits of managed futures. In short, academic [Schneeweis et al, 1996] and practitioner [Schneeweis, 1996] literature has shown that the returns of hedge funds and public commodity funds have a low correlation with traditional investment vehicles, such as stocks and bonds. The low correlation is especially true for managed futures since while stock and bond funds invest primarily in cash markets and hedge funds invest in both cash and futures markets simultaneously, managed futures funds are restricted to futures and options markets. Moreover, while the correlation between managed futures products and certain hedge funds and stock and bond portfolios is approximately zero, recent research has shown that when returns are segmented according to whether the stock/bond market rose or fell, managed futures are shown to have a negative correlation when these cash markets portfolios posted significant negative returns and are positively correlated when these cash portfolios reported significant positive returns. Thus, managed futures may also offer unique asset allocation properties in differing market environments.

but conclude that the differences occurred in time periods when rallies or severe declines were experienced. Similarly, for CTAs, Mitev suggests a five factor solution that emphasizes the differential CTA trading strategies. Mitev concludes that the CTAs in his sample group primarily on 1) technical or trend following strategies, 2) surprise or stop-loss control models, 3) agricultural markets, 4) spread-strategies (primarily interest rate) and 5) fundamental economic factos or global markets. Like Fung and Hsieh, Mitev does not conduct multi-factor regression models aimed at using factors which capture the trading or market conditions consistent with the groupings suggested by the factor models.[11]

This study is designed to extend Sharpe's style/market regressions by measuring the influence of traditional stock fund, bond fund, CTA and hedge fund investment style or trading markets on stock fund, bond fund, CTA and hedge fund return. Factors such as trading opportunities (e.g., arbitrage, value), the trading approach (technical or fundamental) as well as markets traded (e.g., stock, bond, currency, and commodity) are used to explain the return performance of CTAs, hedge funds, and mutual funds. The factors underlying the return patterns of managed futures and hedge funds are shown to differ from those that explain stock and bond mutual funds as well as from each other.

III. Data and Methodology

This study reports the results of an empirical model designed to explain the monthly return performance of actively managed stock funds, bond funds, CTAs and hedge funds. Individual CTA and hedge fund data were obtained from the LaPorte data system. Individual stock and bond fund data was obtained from Morningstar. Benchmark CTA and hedge fund data were obtained from a number of fund data providers (Managed Accounts Reports, Barclay, EACM, Hedge Fund Research). For

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

individual CTA and hedge funds, style and market groupings were obtained from LaPorte. For CTA and hedge fund index data, the groupings were determined by the individual data provider (See Appendix I for a summary of the alternative CTA and hedge fund benchmark descriptions). For stock and bond funds, the portfolio benchmarks were determined from those stock and bond funds with full data over the time period of study and were grouped according to Morningstar definitions (See Appendix II for a summary of the alternative Morningstar fund descriptions). Lastly, for a set of 'diversified' CTAs, 'U.S. Opportunity' hedge funds, and 'Growth and Income' equity mutual funds, fund returns are ranked each month and three portfolio groupings are determined (top five, median, and bottom five). Empirical tests are run on each of the three groups (average of the top five, average of the bottom five and the median) to measure the existence of abnormal returns for high, median, and low performing fund portfolios. In addition, a few individual CTAs and hedge funds were examined.[12] Results, however, are consistent with those described at the portfolio or index level in this paper.[13] Return are derived as follows:

$$R_{i,T} = (NAV_{i,T} / NAV_{i,T-1}) \quad (1)$$

where,

$R_{i,T}$ = Monthly rate of return for CTA, Hedge Fund, Mutual Fund or Index i in period T

$NAV_{i,T}$ = Total asset value for CTA, Hedge Fund, Mutual Fund or Index i in period T

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[12]Results are not presented here due to the extensive detail required to separately analyze individual CTA or hedge fund performance (results for selected CTAs, hedge funds, and mutual funds are presented in Appendix III).

[13] Tests were conducted at the individual CTA/hedge fund level. Results are similar to those conducted on individual equities, that is, the explanatory power of the return model shows greater variance at the individual CTA/hedge fund level than for portfolio or benchmark return determination.

Returns for all data series are expressed as monthly holding period returns. The test period, January, 1990 - December, 1995, permits complete analysis of several managed futures and hedge fund indices (e.g., Hedge Fund Research (HFR) and Evaluation Associates Capital Management (EACM)) that provide data from January, 1990.[14] Statistical tests include presentation of descriptive risk and return characteristics, return correlations between each of the primary and sub-indices using both nominal and absolute value of independent variable returns as well as multiple regression analysis between CTA, hedge fund, and stock and bond fund indices and the measured explanatory factors.[15] Basic independent variables include 1) the SP500 total return index and MSCI World index as domestic and world equity indices, 2) Salomon Brothers U.S. and World Government bond indices as domestic and world bond performance indices, 3) the U.S. Dollar Index (USDX) (as calculated by Datastream) for currency returns, 4) the Goldman Sachs total return commodity index (GSCI) as a benchmarks for traditional commodity asset class performance as well as positive roll yield and collateral (T-bill) return, 5) the MLM index as a benchmark for market trends, [16] and 6) the nominal value of a Treasury bill index for the return on the margin account held by CTA investors.[17] Lastly, the ability of CTAs and hedge funds to take both long and short positions within a given month is

[14] Alternative CTA (e.g., CMA) and hedge fund indices (e.g., Van Hedge) exist. However, data for these benchmarks are provided either only quarterly for the time period of analysis or use a smaller universe. Correlations of these alternative indices with tested indices over common time periods show high levels of similarity.

[15] The basis for using both nominal and absolute returns is that managed futures products often use both long and short positions. Thus, managed futures and hedge funds may be correlated with absolute return of the underlying contracts.

[16] A full description of the various CTA, hedge fund, commodity indices, stock and bond indices, and stock and bond fund indices is given in Appendices I-II.

[17] The methodology is patterned after Chen and Jordan [1993] and Sharpe [1992] who explain stock, bond, and hedge fund returns as a function of the underlying markets.

modeled both as an absolute value of the stock, bond, commodity and currency market indices and as a function of their intramonth volatility. Measures of intramonth volatility include the calculation of intramonth standard deviation as well as intramonth drawdowns (drawups) using daily returns for the S&P 500 equity index, the JPMorgan Government Bond Index, the USDX trade-weighted currency index, and the Goldman Sachs commodity index.

IV. Results

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

As for the stock and bond mutual fund industry, performance indices have been created by various private firms to mimic the performance of underlying CTA and hedge fund groups and sub-groups. In Table 1a, the average monthly arithmetic returns and standard deviations for the CTA, hedge, stock and bond fund indices as well as variables used to explain CTA, hedge fund, and stock and bond fund returns are presented.[18] For the period analyzed, the mean monthly returns of three of the broad-based CTA indices differ (MAR Dollar-Weighted, 1.2%; Barclay Index, 0.6%). Similarly, the monthly returns of the two hedge fund indices (HFR and EACM) also report varying levels of return performance for similar trading style classifications. For instance, the HFR convertible arbitrage strategy reports a monthly return of 1.1% while the EACM convertible hedging strategy reports a .8% monthly return.. There are several plausible explanations for the varying levels of return among seemingly similar performance indices. These include differing CTA and hedge fund selection criteria for CTA or hedge

[18] Similar descriptive statistics results were obtained for the 6/94-12/95 subperiod for which MAR provides returns for MAR hedge fund indices. Results are available from the authors.

fund inclusion in the various indices as well as differing return determination.[19] However, the differing levels of return are not necessarily indicative of different explanatory variables, only the sensitivity of the relative CTA or hedge fund index to the variables. This may be due to differences in leverage as well as differing degrees of risk tolerance among the managers in each index. In fact, previous research on the comparisons of alternative CTA and hedge fund indices indicate that the alternative CTA and hedge fund indices track each other closely, especially those CTA and hedge fund benchmarks with similar style objectives [Schneeweis and Spurgin, 1996; 1997].[20]

Insert Tables 1a and 1b about here

Results in Table 1a are also consistent with a different return and risk structure for cash, hedge funds, and managed futures indices, whether actively or passively managed. For instance, results in Table 1b, in which the CTA, hedge fund, and mutual fund indices are ranked by their relative information ratio (average return/standard deviation), shows that the relative return/risk tradeoff of the CTA indices differs from hedge fund indices and traditional asset indices (e.g., S&P 500, GSCI) over the 1990-1995 period. Among the active strategies for the period of analysis, hedge fund strategies dominate the return and risk

[19] For discussion of the relative tracking error within major CTA and hedge fund indices see Schneeweis and Spurgin, 1996, 1997.

[20] However, results in Table 1 are for the entire period. Since, certain hedge fund managers have the ability to easily change investment areas and styles relative to the investment climate, it is important to measure the time period stationarity of the relative performance. The results in Table 1 also indicate that the various hedge fund indices each reflect their underlying structure.

tradeoff while hedge fund and CTA trading styles which concentrated primarily on equity short selling provided the lowest information ratios.

However, the existence of differential returns and/or return and risk tradeoffs do not provide evidence as to the actual determinants of return over the time period. In the following sections, univariate and multivariate relationships between CTAs, hedge fund, and stock and bonds funds and indices and the nominal and absolute returns for stock, bond, commodity and currency indices as well as measures of intramonth volatility (e.g., intramonth standard deviation) are analyzed.[21] The pairwise correlation patterns between the various explanatory variables are given in Tables 1c-1d.

Insert Tables 1c and 1d about here

With the exception of the world and domestic U.S. stock and bond indices and the world bond index and the U.S. dollar exchange rate index, pairwise correlations are generally below .5. Thus, the signs of the explanatory variables should be consistent with the proscribed investment style.

[21] In addition to nominal and absolute values, tests are conducted on the relationships between CTA, hedge fund, and mutual fund performance and intramonth standard deviation and intramonth drawdowns and drawups for the cited indices (S&P 500, JPMorgan bond index, GSCI, and USDX trade-weighted currency index). These results are discussed in later sections.

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

Managed Futures Correlations with Commodity, Stock, Bond and Currency Indices

In Tables 2a-2c, the correlations between the various CTA benchmark subindices in each CTA index grouping (MAR, Barclay, and EACM) as well as the correlations between the various CTA indices (MAR, Barclay, and EACM) and the tested nominal and absolute value of the explanatory factors (MLM, GSCI, S&P500, MSCI, Salomon Brothers US (USSB) and World bond (WDSB) indices, PPI, and USDX) are given. Of interest is the high (above .9) between the overall CTA index (CTA$ or Barclay CTA) and the other CTA subindices. The only low correlations (below .3) are for the correlation between the overall CTA index and the energy or agricultural CTA subindices. Similarly, for all three CTA benchmark samples, a correlation between the general CTA index and the systematic subindices (e.g., CTA trend, EACM systematic, and Barclay systematic) is high (above .9) while the correlation between the general CTA indices and the discretionary indices in each CTA benchmark group is approximately .5. These results indicate that the predominate number of CTA traders follow systematic or trendfollowing strategies. However, for CTAs who follow discretionary (e.g., mixed markets and strategies) or unique markets (e.g., energy, currency, and agriculture), separate explanatory return variables may be required.

The potential impact of the various explanatory variables is also shown in Tables 2a-c. For the variables tested and for each CTA index provider (e.g., MAR, EACM, and Barclay), the MLM index had positive correlations above 0.20 for five of the eight MAR CTA indices, two of the three EACM indices, and seven of the eight Barclay CTA indices.[22] Consistent with the intra CTA correlation patterns, however, the correlation between the MLM trendfollowing passive index was lowest for the energy,

[22]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.

currency, and diversified subindices. These results indicate that different factors may be necessary to capture the returns for the overall CTA indices and several of the CTA subindices.

Insert Tables 2a-2c about here

The simple correlation results also indicate that the overall CTA$ index and the CTA subindices are positively correlated with several nominal return factors (e.g., Salomon Brothers World Bond and USDX) as well as the measured factors which capture months with positive or negative directional return moves (e.g., absolute value). This is especially true for CTA subindices, such as the currency CTA index, which focus on a particular market (e.g., USDX).

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

In Tables 3a -3b, the correlation between each of the hedge fund indices (HFR and EACM) and between the nominal and absolute value of the explanatory factors and the hedge fund indices are given. 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 Table 2a, Table 2b, and Table 2c for the MAR, EACM, and Barclay CTAs indices. Three primary differences can be observed. First, in contrast to the results in Tables 2a-2c, for the various hedge fund subindices in Tables 3a and 3b, there is no case of a correlation of over .90. Thus, the various hedge fund traders may be more dissimilar in markets traded or trading styles than in the case of the reporting CTAs. Second, in contrast to CTA

indices, there exists a relatively low and even negative correlation between hedge fund indices and the variable capturing trend following markets, the MLM index. For instance, for the correlation between the MLM and EACM hedge fund indices, fourteen of the fifteen subindices had correlations below .10 and ten of the fifteen subindices had negative correlations. (Similar results are presented for the HFR hedge fund indices). Third, also in contrast to CTA indices, hedge fund indices are often positively correlated with long stock and bond positions. Whereas none of the reporting CTA indices had correlations above .20 with the S&P 500, the majority of the EACM and HFR hedge fund indices had correlations above .20 with the S&P 500. The principal similarity between CTAs and hedge fund performance indices is that currency subindices in both asset groups are positively correlated with the absolute value of the USDX rate. Thus, except for these two sets of investments, CTAs and hedge fund advisors seem to be capturing differing return patterns.

Insert Tables 3a-3b about here

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 between the stock and bond fund performance indices and the nominal and absolute value of the explanatory factors are 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 2a-2c and 3a and 3b with those given in Table 4 for the stock and bond mutual funds. The buy-and-hold strategy employed by stock and

bond fund managers results in correlation patterns which are very different from broad hedge fund and CTA indices. First, the correlation between the equity-based indices are all above .90. A similar high correlation is shown between 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/or bond mutual funds lessens the potential diversification benefits within those groupings. Secondly, the MLM index is negatively correlated with stock funds and has a zero correlation with bond funds. This is in contrast to the pattern for several hedge fund indices and is similar to the pattern for most CTA indices. Lastly, in contrast, to both hedge funds and CTAs, there is little evidence of the importance of the absolute values of the tested variables on stock or bond mutual fund performance.[23]

Insert Table 4 about here

Thus, based on simple correlation patterns, the moving average trendfollowing returns in the MLM index, and the factors capturing volatility patterns may explain CTA performance while these factors are either uncorrelated with stock funds, bond funds, and hedge funds or are correlated in the opposite direction. The 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, and a close examination of the specific strategy

[23] 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).

employed by the fund is necessary before determining if diversification benefits relative to stock and bond investment are available from a hedge fund.

Correlations of Best, Median, and Worst Performing Funds with Benchmark Indices

In Tables 2-4, the correlation patterns were given between the various CTA, hedge fund, and stock and bond portfolio indices and the explanatory factors. In Tables 5-6, results are given as to whether the results in Tables 2-4 are specific to various CTAs, hedge funds, or mutual fund subindices or can be extended to individual manager subsets. In Table 5, the descriptive statistics (mean return, standard deviation, and information ratio) are given for the CTA, the hedge fund, and the average Growth and Income mutual fund samples, as well as for an equally-weighted portfolio (determined monthly from sorted returns) of the top five performers, the median, and the bottom five in each of the overall samples as well as two subsamples ('Diversified' CTAs and 'US Opportunity" hedge funds). [24] In all cases, the return and risk difference between the top five and bottom five return are significant. The question remains, however, if this relative performance is due to different explanatory variables or simply 'manager skill based' performance given the same basic explanatory return variables.

Insert Table 5 about here

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[24] For discussion of possible survivor bias see Schneeweis et al. [1996]. Correlations between individual CTA, hedge fund, and mutual fund performance with survivor bias and corresponding indices with limited survivor bias were all above .95 indicating that for correlation or regression purposes survivor bias should have little impact on reported relationships.

Correlation of Return Ranked CTAs

In Table 6a, the correlation between each of the top performing, median, and lower performing CTAs and the nominal and absolute value of the stock, bond, commodity, and currency indices are given. The average CTA is positively correlated with the MLM index while the correlation with the S&P 500 and MSCI is approximately zero. The MLM correlation for the top five CTAs is consistently lower than for the median or the lower five CTAs, while the absolute values of various other factors correlates more highly with top five CTAs. These results indicate that better performing CTAs may be making unique asset weightings based on fundamental information in contrast to more widely used technical program based trading strategies.

Insert Table 6a about here

Correlation of Ranked Hedge Funds

In Table 6b, the correlations of the top five, median and bottom five hedge fund managers are given as well as their correlation with the explanatory factors. In contrast to CTAs (Table 6a), the average hedge fund as well as the average US Opportunity hedge fund is negatively correlated with the MLM while the correlation with the S&P 500 (approximately .67) and/or MSCI (approximately .53) is highly positive. The primary difference between average hedge funds and those that are expressly invested in equity issues (e.g., U.S. Opportunity), is that for the low performing group, the hedge funds invested in the equity area (US Opportunity) also are highly correlated with the S&P 500 while for all hedge funds, the lowest performing hedge funds were not correlated with the equity index. Thus, to the degree that this

period reflected a positive return to equity investment, the best performing hedge funds had strategies consistent with a positive return to equities.

Insert Table 6b about here

Correlation of Ranked Mutual Funds

Table 6c reports the correlation of the average, top five, median, and bottom five growth and income mutual fund managers with the explanatory factors. As with hedge funds (Table 6b), a negative correlation is reported for the MLM index. However, the correlations with the S&P 500 are consistently higher than with hedge funds or CTAs.[25] Results in Table 6c also indicate that the explanatory factors load similarly on the high, median and low performing Growth and Income mutual fund managers. Thus, the differential performance for these stock fund managers may be due more to security selection than the general factors tested.

Insert Tables 6c-6d about here

The differences in the impact of the explanatory factors on the CTAs, hedge funds, and growth and income stock and bond mutual fund managers is summarized in Table 6d for the major CTA

[25] The negative correlation of the hedge fund and mutual funds with the MLM may be partly attributable to the impact on long positions due to inflationary expectations. Note that for hedge fund, and mutual funds a negative correlation also exists for the GSCI and PPI, while for CTAs no such relationship exists.

(MAR$), hedge fund (EACM 100), and mutual fund indices(Growth and Income equity and bond). As indicated in Tables 6a-6c, stock fund managers load primarily on the S&P 500 (and negatively on the MLM index), bond fund managers load on the USSB bond index, while hedge fund managers are correlated with both the stock and bond cash markets and the absolute value of the bond or currency markets. In contrast, the CTAs have their primary correlation with the MLM index and with the absolute value of the bond and currency markets.

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. (The simple correlation relationships between the explanatory variables are given in Tables 1c-1d. As indicated previously, results show few examples of pairwise correlations above .5 with the exception of the S&P 500, the MSCI ,and the USSB and WDSB bond indices. Thus, while low pairwise regressions do not prevent high levels of multi-collinearity among the explanatory variables, the variable signs may be generally regarded as stable. In Tables 7a-7d the results of a multiple regression using the Morningstar Growth and Income (7a), Morningstar Govt. bond index (7b), the EACM 100 (7c), and MARCTA$ index (7d), as dependent variables and the nominal and absolute values of the S&P 500, GSCI, Salomon Brothers bond indices, MSCI, PPI, and USDX as independent variables are reported. The MLM index and T-bill index are also included to model autocorrelation patterns in underlying cash markets and the return to invested cash position held by the various funds.

Insert Tables 7a-7d about here

Tables 7a and 7b indicate that growth and income mutual funds and government bond mutual funds are primarily driven by the underlying cash index (S&P 500 and USSB, respectively). In neither case was the MLM index a significant explanatory variable. The EACM hedge fund index (Table 7c) has three significant factors: the MLM Index, PPI, and the absolute value of the world bond index. The CTA regression (Table 7d) has one highly significant coefficient, the MLM index, and one marginally significant one, the absolute value of USDX.[26]

In Tables 8a-8b, regression results for the top five, the median, and bottom five CTAs are also presented. Table 8a covers all CTAs (CTAs with full data from 1990-1995) and Table 8b 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, but have a positive alpha. In contrast, the median CTAs should have an insignificant alpha while the bottom five CTA should have a negative alpha. Results in Table 8a are consistent with this hypothesis. The best 5 CTAs have a monthly alpha of 5.0%, the median CTA of -1.1% and the bottom 5 an alpha of -12.2%. In Table 8b, results are similar for the diversified CTA subsample. Thus, the return model is both consistent across varying performing CTAs and reflects the excess ex post performance of the CTA sample.

[26]Results for a regression of the variables on sample individual CTAs, hedge funds, and mutual funds are reported in Appendix III.

Insert Tables 8a-8b about here

Tables 9a-9b present regressions for top five, median, and bottom five return hedge funds (from among funds with full data from 1990-1995) as well as a subset of hedge funds listed as 'US. Opportunity" by LaPorte. As with the CTA sample, if the explanatory model is consistent across all hedge funds, the top five should have positive alpha with loading on similar factors. In contrast, the median hedge funds should have an insignificant alpha while the bottom five hedge funds should have a negative alpha. Results in Table 9a are consistent with this hypothesis, as overall sensitivity to factors is similar across performance groups, but top hedge funds produced an alpha of 2.5%, the median fund produced an alpha of 1.1% and the bottom funds produced an alpha of -5.3%. In Table 9b, results are similar for the 'US Opportunity' hedge fund subsample. Thus, the return model is both consistent across varying performing hedge funds as well as a select subindex.

Insert Tables 9a-9b about here

Table 10 repeats this analysis for best, median and bottom Growth and Income equity mutual funds. As expected the average (Panel 1), best (panel 2), median (Panel 3) and bottom (Panel 4) funds show significance at the 95% level to the SP500. The top 5 portfolio is also sensitive to the SP500 as well as the MLM, the USDX, and the absolute values of the GSCI and SP500. This suggest that top

Growth and Income mutual fund managers are investing differently than other Growth and Income managers, and are positioned to take advantage of movements in currency, commodity markets as well as avoid losses in stock market downturns.

Insert Table 10 about here

D. Market Volatility Impacts and CTA, Hedge Fund, and Mutual Fund Returns

Recent research [Schneeweis et al., 1996] suggests that CTA returns are positively related to market volatility while equity and bond market returns are negatively related to market volatility. In the previous sections, market volatility was not directly tested due to the desire to keep the model as parsimonious as possible and the fact that absolute value and measures of market volatility may be correlated. In Tables 11, 12, and 13, regression results for the MAR$ CTA, EACM hedge fund, and Morningstar mutual fund benchmark indices are presented in which intramonth market volatility (standard deviation) measures are included as explanatory variables and the MSCI and WDSB are removed. The MSCI and the WDSB are excluded due to their high correlation with the respective US equity and bond indices.

Insert Tables 11, 12, and 13 about here

Results in Table 11 indicate two important additions to the explanatory return model given in Table 8 (Note that to further distinguish these Tables from Tables 8-10, SB Bond is used to reflect the Salomon Brothers government bond index instead of USSB). First, when the intramonth volatility variable is included, the significance of the MLM index in Table 8 decreases. Second, the absolute value of the USDX increases while the intramonth SD of the USDX has a negative sign. These results are consistent with CTA returns not being strictly related to volatile markets, but markets which are trending or offer large intramonth moves. These results are generally consistent across all panels in Table 11 and are especially significant for panel 5, Currency CTAs. Results in Table 11b-c also show that, as for Table 8, the strength of the explanatory factors is consistent across the high, median and low performing CTAs.

Results in Table 12, for hedge funds, indicate that when the intramonth volatility variables are included and the MSCI is removed, the overall explanatory power remains fairly constant. However, for hedge funds whose style or investment is equity market related, the significance of the S&P 500 as an explanatory variable is increased. This is consistent with the high pairwise correlation between the S&P 500 and the MSCI (Table 1c-1d). Similar to results in Table 11b-c, results in Table 12b-c also indicate that the strength of the explanatory factors is consistent across the high, median and low performing hedge funds.

Results in Table 13 for mutual funds indicate that when the intramonth volatility variables are included and the MSCI is removed, the overall explanatory power remains fairly constant. Similar to hedge funds, the significance of the S&P 500 and SB Bond as an explanatory variable is increased when the MSCI and WDSB indices are removed. This is also consistent with the high pairwise correlation between the S&P 500 and the MSCI as well as between the two bond indices as shown in

Table 1c-1d. Similar to results in Table 11b-c and 12b-c, results in Table 13b indicates that for Growth and Income mutual funds the strength of the explanatory factors is consistent across the high, median and low performing funds. Differences do exist, however. For instance, for equity based mutual funds, the intramonth volatility factor for the S&P 500 is negatively correlated with returns, in contrast to the more general positive relationship for CTAs or hedge funds. These results are consistent for the overall index and across the various levels of mutual fund returns (though not all have statistically significant coefficients). In contrast, the influence of intramonth volatility on hedge funds and CTA performance is dependent on the style and area of concentration. These results demonstrate that CTAs may offer some diversification advantages in markets with high levels of ex post market volatility. Moreover, as expected, measures of market risk should also be considered as additional factors in explanatory models of CTA, hedge fund, and mutual fund returns. This may be especially true for managers whose performance may be directly related to changes in market volatility such as options investors.

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

Correlation Relationships

Previous results suggest that CTA returns are positively related to market trends while hedge fund and mutual fund returns are more closely associated with the performance of the underlying markets and market volatility. In this section, we further explore these sources of return by correlating the returns of the average, top five, median, bottom five performers with various measures of intramonth price movement (e.g., the intramonth standard deviation, the intramonth maximum drawdown, the intramonth maximum drawup). For CTAs in Table 14a, results are consistent with past results which show, with the exception of currencies, a low correlation with intramonth standard

deviation and a negative correlation with certain traditional markets (S&P 500 and USDX) in months with large drawdowns. This is especially true for the top performers and is consistent with the inclusion of CTAs as downside risk protectors in cash market portfolios. In contrast to CTA results presented in Table 14a, hedge fund (Table 14b) and growth and income mutual fund (Table 14c) performance is generally positively correlated with index drawups while offering mixed response to drawdowns; that is, hedge funds and mutual funds have positive returns in months with high returns. Results for Growth and Income mutual funds also show a general negative relationship with market volatility. For the top five performers, however, this relationship is generally less negative.

Insert Tables 14a-14c about here

Regression Relationships

Table 15 reports the results of regressing the CTA$ index on the mean return, standard deviation, monthly drawups and drawdowns for the respective indices. The explanatory power is similar to that of previous models, indicating that CTA returns are highly correlated with large intramonth movements.[27] However, results are different than those presented in Table 11 in that the standard deviation is often less significant in the presence of intramonth drawdowns and draw ups. In addition, the return relationship with intramonth drawups and drawdowns indicates that for the time period analyzed a consistent positive relationship in both up and down markets for fixed income related products is observed.

[27] Similar tests were conducted on the average rate of return for hedge funds and mutual funds. These tests indicate little direct association with intramonth movements for traditional stock and bond funds and hedge funds.

In order to determine if the returns in Table 15 were related to short-term price movements or to longer term trends, in Table 16, the MLM index is included in the regression (intramonth standard deviation of cash indices is dropped) in Table 16. The overall explanatory power remains similar when the MLM index is added. Of greater importance is that both the MLM and the maximum drawdowns and drawups are statistically significant, suggesting thatboth long term trends (MLM) and short-term volatility/trends are sources of CTA return. This analysis suggests future research on the sources of CTA returns should use daily data, preferably for both benchmark factors and for CTA returns, as trend analysis based on monthly data alone appears to overlook an important source of return movement.

Insert Table 15 and 16 about here

V. Implications of Results

Previous research on CTA performance concentrates on single factor models as an indicator of future returns. Generally, the factor selected is the contemporaneous performance of other CTAs. In this paper, a number of factors are proposed to explain a broad range of managed assets, including CTA, hedge fund and mutual fund return performance. Results indicate that these factors may help explain the differences in investment return between CTAs, hedge funds, and traditional mutual funds, as well as some of the differences within each investment grouping. For instance, CTAs are found to have a set of explanatory factors based on the CTAs' trading style (e.g., discretionary or systematic) and the unique asset markets traded (e.g., currency, financial, agricultural). The MLM index, which was designed to track the underlying returns to systematic (technical trend following) trading rules,

provides explanatory power for CTA and hedge funds which follow such strategies as well as broad indexes of CTAs and hedge funds. Factors designed to capture market volatility may also provide return in certain CTA and hedge fund products. In contrast, technical trend following trading rules are shown to be less helpful in explaining return movements in traditional stock and bond funds as well as for hedge funds whose trading style is primarily based on capturing undervalued stock or bond investments.

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. In addition, results in this paper suggest that managed futures derive returns from different sources than hedge funds, and so managed futures provide diversification benefits to hedge fund investment (and vice versa). Lastly, 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 CTA and hedge funds 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, 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.

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Appendix I

Alternative Commodity, Managed Futures, and Hedge Fund Indices

Goldman Sachs Commodity Index (GSCI) is an arithmetic measure of the performance of actively traded, dollar-denominated nearby commodity futures contracts. As of January 9, 1995, there were 22 commodities in the index. The weights assigned to individual commodities are based on a five-year moving average of world production. Weights are determined each July and are made effective the following January. All contracts are rolled on the fifth business day of the month prior to the expiration month of the contract. Subindices are calculated for agricultural, energy, industrial, livestock, and precious metals contracts. Two versions of the indices are available: a total return version, which assumes that capital sufficient to purchase the basket of commodities is invested at the risk-free rate, and a spot version, which only tracks movements in the futures prices. This study uses the total return measure.

JPMorgan Commodity Index (JPMCI) is comprised of 11 highly liquid industrial commodity futures contracts. It excludes "softs," relying exclusively on energy, precious metals, and industrial metals. The two nearby contracts for each commodity are used, and rolls are conducted over a five-day period from the fifth to the ninth business day of the month. Component weights are rebalanced monthly according to a scoring system that seeks to maximize risk-return performance, track unexpected changes in inflation, provide a hedge against stock and bond investments, and correlate with economic growth measures. Sub-indices for energy, precious metals, and industrial metals are also available. The JPMCI is published in both spot and total return formats. This study uses the total return measure. The JPMCI was officially launched on September 21, 1994.

Bankers Trust Commodity Index (BTCI) is based on spot rather than futures prices. It assumes ownership of a basket of five physical commodities: crude oil, gold, aluminum, heating oil, and silver. 55% of the weight is given to energy components, and the remaining 45% to the three metals. The basket is priced daily using spot quotes such as the London gold fix. Front-month futures quotes, which are equivalent to cash market quotes, are used for energy prices. BTCI thus reproduces the price changes of a basket of physical assets without the storage and holding costs. The BTCI was launched on July 18, 1994.

Mount Lucas (MLM) Index differs from other indices in two important ways. First, it allows both long and short positions in the underlying futures contracts. Second, it incorporates financial and currency futures (but not stock index futures) into the index, along with the commodities tracked by other indices. The index is an equally weighted average of the monthly returns from 25 separate futures contracts. Within each market (e.g., corn futures), the index will be long or short depending on whether the contract is above or below its trailing 12-month moving average. MLM is a total-return index. It was launched in May, 1989.

Managed Account Reports (MAR) tracks the performance of individual CTAs as well as CTA Funds and Pools that invest in individual CTAs. MAR produces several performance indices, the dominant being the CTA equal-weighted and dollar-weighted indices. MAR classifies CTAs into a number of different groups, and publishes each group's performance index. These groups are currency, energy, financial, diversified, discretionary, and trend-following. MAR also reports the following subindices for fund and pool performance: guaranteed, multi-advisor, single-advisor, private pools, and public pools.

Barclay Trading Group, publisher of the Barclay Managed Futures Report, also creates CTA performance indices. Indices are based on monthly returns of CTAs with established track records. Barclay publishes an equal weighted index of all CTAs as well as the following subindices: agricultural, currency, diversified, energy, financial/metal, discretionary, and systematic.

TASS offers historical managed futures performance similar to MAR or Barclays. It publishes a dollar weighted CTA index and one subindex of currency CTAs. Additional indices and subindices will be available in the future.

Hedge Fund Research, EACM, Van Hedge and MAR offers historical managed futures/hedge fund performance on an array of indices and subindices designed to capture the return to unique managed futures/hedge fund strategies. These indices include relative value, event-driven, equity hedge funds, global asset allocators and short selling. Subindices include long/short equity, convertible hedge, bond hedge, rotational, deal arbitrage, bankruptcy, and multi-event. For managed futures, the principal subindices include discretionary and systematic groups.

Appendix II: Morningstar Mutual Fund Classifications

Aggressive Growth seeks rapid growth of capital, often through investment in smaller companies and with investment techniques involving greater than average risk, such as shortselling, leveraging and frequent trading.

Asset Allocation seeks total return by placing top priority on the decision as to which types of securities will be held, often based on an analysis of business cycle trends. Frequently, separate managers will handle each class of security (for example, stocks, bonds, real estate, gold, cash), and an allocator will oversee the process of determining the percentage of assets each sector gets

Balanced Fund seek**s** total return by investing in a relatively fixed combination of both stocks **and** bonds. In general, these funds will hold a minimum of 25%, in stocks and 25% in bonds at any time.

Convertible Bond invests primarily in bonds and preferred stocks that can be converted into common stocks,

Corporate Bond General fund seeks income by investing in fixed income securities, Primarily corporate bonds of various quality ratings.

Corporate Bond High Yield fund seeks income by generally investing 65% or more of its assets in bonds rated below investment grade.

Corporate Bond High Quality fund seeks income by investing in fixed income securities, 65% of which are rated A or higher (although in actual practice this figures is as high as 80% or even 90%).

Equity income fund seeks current income by investing **at** least 50% of its assets in equity securities with above average yields,

Europe Stock fund generally invests at least 65% of assets in equity securities of European issuers,

Foreign Stock fund invests in equity securities of issuers located outside the United States, except under adverse market conditions.

Growth Fund seeks capital appreciation by investing primarily in equity securities of companies with earnings that are expected to grow at an above average rate, Current income, if considered at all, is a secondary objective.

Growth and Income fund seeks growth of capital and current income as near equal objectives by investing in equity securities with above average yields and some potential for appreciation.

Government Bond Adjustable Rate Mortgage fund invests at least 65% of its assets in mortgage or mortgage related securities with adjustable coupons. These securities are usually backed by the U.S. government.

Government Bond General fund seeks income by investing in a blend of mortgage backed securities, Treasuries, and agency securities.

Government Bond Mortgage Backed fund seeks income by generally investing at least 65% of its assets in securities backed by mortgages, such as securities backed by the Government National Mortgage Association (GNMA), the Federal National Mortgage Association (FNMA), or the Federal Home Loan Mortgage Corporation (FHLMC).

Government Bond Treasury fund seeks income by generally investing at least 80% of its assets in U.S. Treasury Securities.

Hybrid Fund invests in a combination of stocks and bonds, and is therefore more risky than the average bond fund. An investment in this type of security would add diversity to a fixed income portfolio; the equities in the portfolio adding a defense against a downturn in the bond market. The hybrid category contains the following objectives: asset allocation, balanced, international bond, and income.

Income fund invests in both equity and fixed income securities primarily for the purpose of realizing Current income. An income fund generally will not invest more than 50% of its assets in equities.

Municipal Bond fund like an investment bond, this fund has average to below average risk. However, the risk of a municipal bond fund lays within the average credit rating of the bonds in its portfolio. This category will only contain funds from the municipal bond national objective.

Municipal Bond National fund seeks income by investing primarily in tax-free bonds issued by any state or municipality

Pacific Stock fund invests primarily in issuers located in the Pacific Basin, such as Japan, Hong Kong, Malaysia, Singapore, and Australia.

Short-term World Income fund seeks income and a stable net asset value (NAV) by investing primarily in a portfolio of various non U.S. currency denominated bonds, usually with an average maturity of three years or less. Seeks higher yield than a money market fund and less fluctuation of NAV than a long-term international bond fund, May engage in substantial hedging strategies to reduce fluctuation of NAV.

Small Company fund seeks capital appreciation by investing primarily in stocks of small companies, as determined by either market capitalization or assets.
Specialty Financial fund seeks capital appreciation by investing primarily in equity securities of financial services companies, including banks, brokerage firms, and insurance companies.

Specialty Health fund seeks capital appreciation by investing primarily in equity securities of health care companies, including drug manufacturers, hospitals, and biotechnology firms.

Specialty Natural Resources fund seeks capital appreciation by investing primarily in equity securities of companies involved in the exploration, distribution, or processing of natural resources.

Specialty Precious Metals fund seeks capital appreciation by investing primarily in equity securities of companies engaged in the mining, distribution, or processing of precious metals.

Specialty Technology fund seeks capital appreciation **by** investing primarily in equity securities of companies engaged in the development, distribution, or servicing of technology related equipment or processes.

Specialty Utilities fund seeks capital appreciation by investing primarily in equity securities of public utilities.

World Stock fund invests primarily in equity securities Of issuers located throughout the world, maintaining a percentage of assets (normally 25% to 53%) in the United States.

World Bond fund seeks current income with capital appreciation as a secondary objective by investing primarily in bonds not denominated in U.S. currency. These bonds are frequently offerings of foreign governments.