

Brian Hurst
Principal

WINTER 2010

Yao Hua Ooi
Vice President

Lasse H. Pedersen, Ph.D.
Principal

Understanding Managed Futures

“Managed futures” is an alternative investment that has historically achieved strong performance in both up and down markets, exhibiting low correlation to traditional investments. It was one of the few investing styles that performed well in 2008 as most traditional and alternative investments suffered.¹ As a consequence, this little understood strategy has attracted much attention. This paper attempts to de-mystify managed futures. We review the economic intuition, describe how to construct a simple version of this strategy, illustrate how this simple version performs in various market environments, and show how managed futures can be used to enhance the risk-return profiles of traditional portfolios.

¹See Credit Suisse/Tremont Hedge Fund Indices, S&P 500 Index.

PART 1: INTRODUCTION

Managed futures strategies have been pursued by hedge funds and commodity trading advisors (CTAs) since at least the 1970s, shortly after futures exchanges expanded the set of traded contracts.³ While these strategies have existed for decades, many investors have shied away from them, perhaps due to a lack of understanding of how and why they work. The goal of this paper is to explain the intuition behind these strategies, show how to construct them, and examine the long-term performance of these strategies in different market conditions.

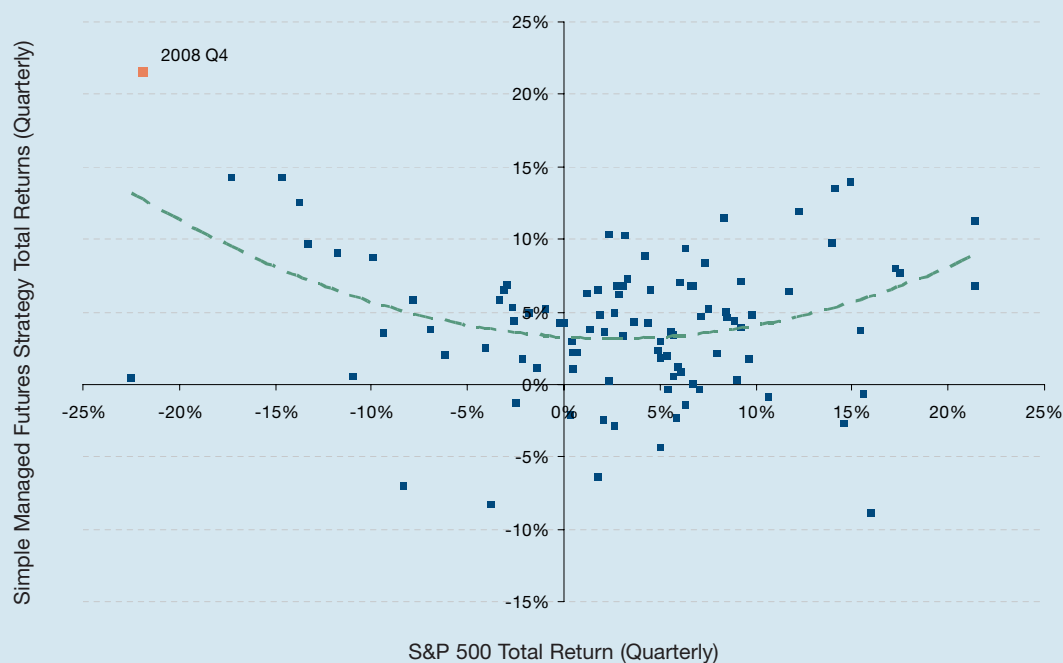
The primary driver of most managed futures strategies is trend-following or momentum investing; that is, buying assets that are rising and selling assets that are declining.⁴ These strategies are typically applied to liquid exchange-traded futures contracts on various commodities, equity indices, currencies and/or government bonds.

Trend-following strategies only work if price trends continue more often than not. But why should trends

continue? One explanation comes from Kahneman and Tversky's Nobel-Prize winning work on behavioral economics in the 1970's and a subsequent large body of economic research which links behavioral biases to under-reaction in market prices.⁵ If prices initially under-react to either good or bad news, trends tend to continue as prices slowly move to fully reflect changes in fundamental value. These trends have the potential to continue even further to the extent investors herd (or chase these trends). Herding can cause prices to over-react and move beyond fundamental value after the initial under-reaction. Naturally, all trends must eventually come to an end as deviation from fair value cannot continue infinitely.

These ideas can be tested with a simple trend-following strategy example (which we refer to as the "Simple Managed Futures Strategy" or Strategy)⁶ applied across a set of 60 futures and forward contracts on different commodities, equity indices, currencies and government bonds. This Strategy generated positive hypothetical returns in each of the 60 contracts over a period of more than two decades. Moreover, since these 60 trend-following

Exhibit 1: Managed futures "smile." This graph plots quarterly non-overlapping hypothetical returns of the Simple Managed Futures Strategy (gross of transaction costs)² versus the S&P 500 from 1985 to 2009.



² Please refer to the information contained in Part 3 of this paper for details on this hypothetical strategy. This hypothetical performance is for illustrative purposes only and not the performance of an actual account. In addition, please refer to the disclosures at the end of the paper relating to hypothetical performance.

³ Elton, Gruber, and Rentzler (1987).

⁴ Academic research on momentum returns includes: Asness (1994, 1995), Asness, Moskowitz, and Pedersen (2009), Jegadeesh, and Titman (1993), Ooi and Pedersen (2009).

⁵ See Tversky and Kahneman (1974), Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), and Hong and Stein (1999). These biases may not be eliminated immediately by arbitrage due to market frictions and slow moving capital (Mitchell, Pedersen, and Pulvino (2007) and references therein).

⁶ Note that this example is a much simpler strategy than what is employed by most CTAs and hedge funds, including AQR, and is for illustrative purposes only. Active trading strategies usually utilize a combination of different types of trading signals.

strategies have exhibited low correlation to each other, the Strategy produced strong risk adjusted returns by diversifying across all of them.

One of the most powerful attributes of this Simple Managed Futures Strategy is depicted in EXHIBIT 1 (on Page 2). When the hypothetical returns to the Strategy are plotted against the returns to the stock market, the Strategy exhibits a "smile." In other words, the Strategy produced its best performance in extreme up and extreme down stock markets.

Certainly any investment that produced positive returns in bear markets would have been beneficial to most investors' portfolios, but why has a simple trend-following strategy exhibited this kind of return characteristic? One reason is that most extreme bear or bull markets have not happened overnight, but instead have occurred as the result of continued deterioration or improvement in economic conditions. In bear markets, managed futures strategies position themselves short as markets begin to decline and can profit if markets continue to fall. Similarly, in bull markets, managed futures strategies position themselves long as markets begin to rise and can profit if the rise continues.

The most recent downturn represents a classic example. Going into the fourth quarter of 2008, equity and energy prices had been declining, government bond prices had

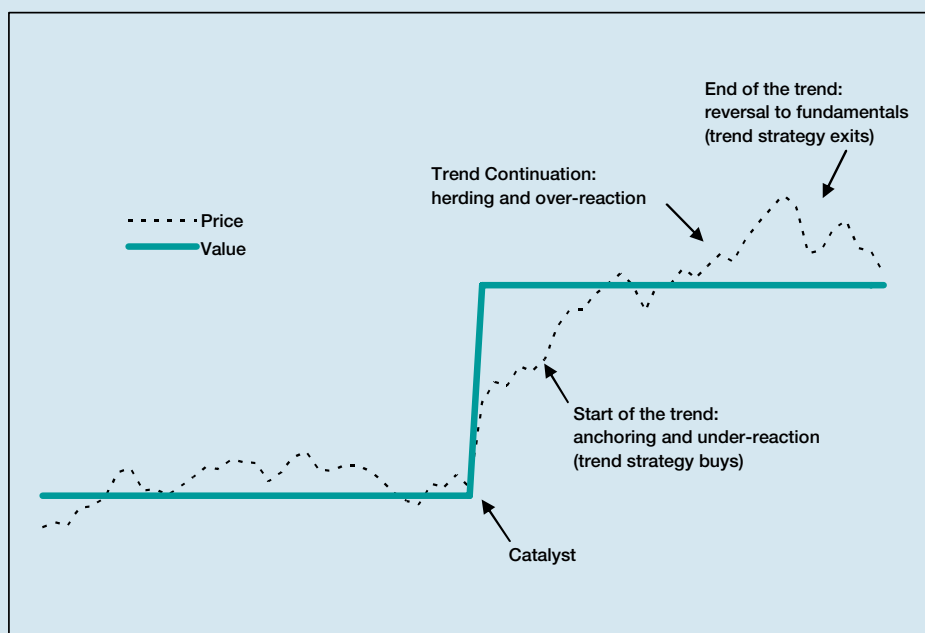
been rising, and currencies with high interest rates had been depreciating. This led to managed futures funds being positioned short equities, short energies, long government bonds and gold, and short "carry" currencies. These hypothetical positions profited as the same trends continued throughout the quarter, while markets and other strategies suffered. (The fourth quarter of 2008 is labeled in EXHIBIT 1, the top left data point.)

The next section of this paper further explores the economic rationale for why we think trends should continue. The following section describes the methodology for constructing a simple trend-following strategy and presents the long-term evidence on the efficacy of this strategy. The conclusion quantifies the effect of adding managed futures to a traditional portfolio.

PART 2: THE ECONOMIC RATIONALE UNDERLYING MANAGED FUTURES: THE LIFECYCLE OF A TREND

To aid in describing why trends exist, EXHIBIT 2 below illustrates the stylized lifecycle of a trend: an initial under-reaction to a shift in fundamental value can potentially allow a managed futures strategy to invest before the information is fully reflected in prices. The trend then over extends due to herding effects, and this finally results in a reversal. (Each of these stages is illustrated in EXHIBIT 2.)

Exhibit 2: Stylized plot of the lifecycle of a trend.



Source: AQR. For illustrative purposes only.

Start of the Trend: Under-reaction to Information

In the EXHIBIT 2 example, a catalyst – e.g., a positive earnings release, a supply shock, or a demand shift – causes the value of an equity, commodity, currency, or bond to change. (The change in value is immediate, as shown by the solid blue line.) The market price (shown by the dotted black line) moves up as a result of the catalyst, but it initially under-reacts and therefore continues to go up for a while.

Research has linked this under-reaction to a number of behavioral tendencies and market frictions that lead to actions that slow down the process of price discovery:

1) Anchor-and-insufficient-adjustment

Edwards (1968), Tversky and Kahneman (1974) find that people anchor their views to historical data and adjust their views insufficiently to new information. This behavior can cause prices to under-react to news.

2) The disposition effect

Shefrin and Statman (1985), Frazzini (2006) observe that people tend to sell winners too early and ride losers too long. They sell winners too early because they like to realize their gains. This selling creates downward price pressure, which slows down the upward price adjustment to the new fundamental level. On the other hand, people hang on to losers for too long since realizing losses is painful. Instead, they try to “make back” what has been lost. In this case, the absence of willing sellers keeps prices from adjusting downward as fast as they should.

3) Non-profit-seeking market participants who fight trends

Silber (1994) argues that central banks operate in the currency and fixed-income markets to reduce exchange-rate volatility and manage inflation expectations, thus potentially slowing down the price-adjustment to news. As another example, hedging activity in commodity markets can also slow down price discovery.

These effects make the price initially move too little in response to news, which creates a continued price drift as the market realizes the full importance of the news over time. A managed futures strategy will tend to position itself in relation to the initial news and therefore profit if the trend continues.

Trend Continuation: Over-reaction

Once a trend has started, a number of other phenomena exist which have the potential to extend the trend:

1) Herding and feedback trading

De Long et al. (1990) and Bikhchandani et al. (1992) argue that when prices have moved up or down for a while, some traders may jump on the bandwagon, and this herding effect can feed on itself. Herding has been documented among equity analysts in their recommendations and earnings forecasts, in institutional investors' investment decisions, and in mutual fund investors who tend to move from funds with recent poor performance and herd into funds that have recently done well.

2) Confirmation bias and representativeness

Wason (1960) and Tversky and Kahneman (1974) show that people tend to look for information that confirms what they already believe and look at recent price moves as representative of the future. This can lead investors to move capital into investments that have recently made money, and conversely out of investments that have declined, causing trends to continue.

3) Risk management

Garleanu and Pedersen (2007) argue that some risk-management schemes imply selling in down markets and buying in up markets, in line with the trend. For instance, stop-losses get triggered causing buying/selling in the same direction of the movement. Another example is that a drop in price is often associated with higher volatility (or Value at Risk), leading traders to reduce positions.

End of the Trend

Obviously, trends cannot go on forever. At some point, prices extend beyond underlying fundamental value. As people start to realize that prices have gone too far, they revert towards fundamental value and the trend dies out. The market may become range bound until new events cause price moves and set off new trends. One of the main challenges for managed futures strategies is to minimize losses associated with the ending of trends and to preserve capital in range bound markets that do not exhibit trends.

PART 3: CONSTRUCTING AND TESTING A SIMPLE MANAGED FUTURES STRATEGY

Having established the economic rationale behind trends, we now attempt to demystify the implementation of managed futures strategies by demonstrating the performance of a simple trend-following strategy. This hypothetical strategy trades 60 highly liquid futures and currency forwards during the period from January 1985 to December 2009.

Identifying Trends and Sizing of Positions

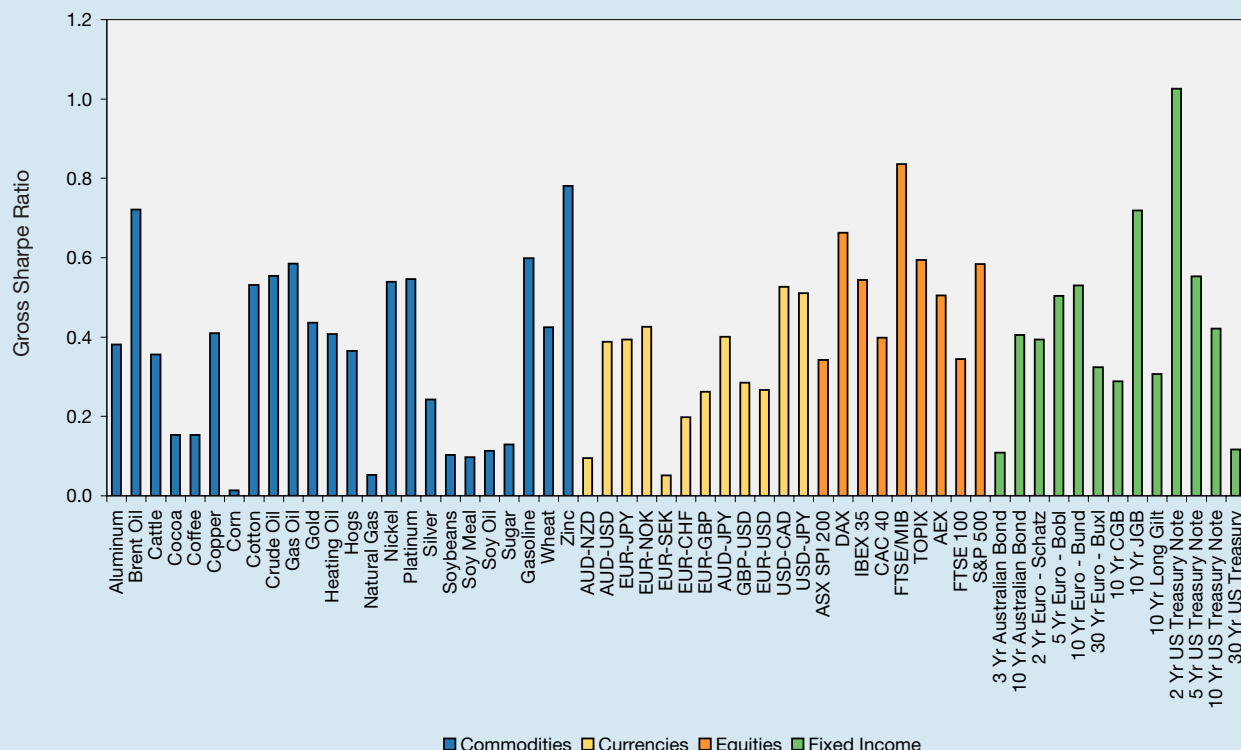
To determine the direction of the trend in each asset, the strategy considers the excess return over cash of each asset for the prior 12 months. The portfolio takes a long position if the return was positive and a short position if the return was negative. The strategy always holds positions in each of 24 commodity futures, 9 equity index futures, 15 bond futures and 12 currency forwards.

The size of each position is determined by volatility,⁷ with a target of 0.60% annualized volatility for each asset. This yields a portfolio that is *equal risk weighted* across the instruments to provide diversification and to limit the portfolio risk from any one asset.⁸ The portfolio is rebalanced at the end of each month.

Performance of the Strategy by Individual Asset

EXHIBIT 3 shows the performance of the Strategy for each of the assets over the full period studied (1985-2009, gross of transaction costs). The strategy yields positive risk-adjusted hypothetical returns for each of the 60 assets, a remarkably consistent result. The hypothetical Sharpe Ratios (excess returns divided by the realized volatility) range from 0 to 1, with an average of 0.4.⁹

Exhibit 3: Performance of the hypothetical Simple Managed Futures Strategy for each individual asset.

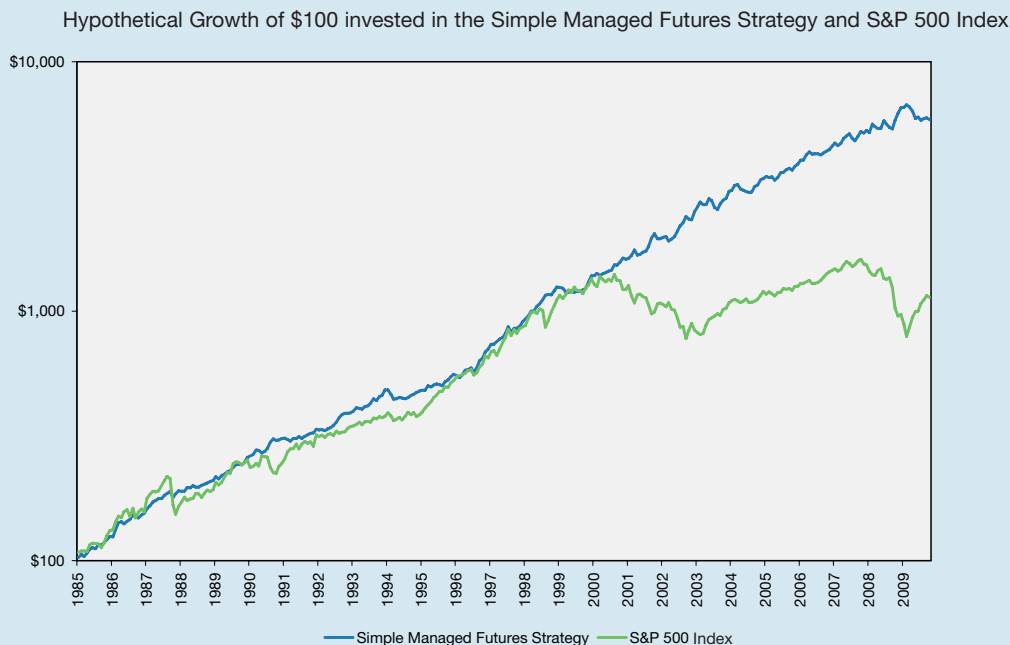


Source: AQR. For illustrative purposes only and not the performance of an actual account. Please read important disclosures relating to hypothetical performance at the end of this paper.

⁷ This target volatility was selected to yield an average portfolio volatility of around 9-10%. The model estimates future volatility for each asset based on the most recent 60 days.

⁸ See Ooi and Pedersen (2009) for further details on the strategy.

⁹ The results shown do not account for transactions costs. However, since the futures and forwards being traded are among the most liquid instruments in the world, the vast majority of the individual strategies shown above cover the transactions costs incurred.

Exhibit 4: The Performance of the Simple Managed Futures Strategy over time (gross of transaction costs).

Please read important disclosures relating to hypothetical performance at the end of this paper.

The Overall Strategy Combined Across Assets: The Power of Diversification

While the trend-following hypothetical Strategy performs consistently across securities, the average Sharpe ratio of any one asset is modest. Yet, the Sharpe ratio of the *portfolio* is 1.4, higher than any of the individual-asset Sharpe ratios. The consistent return is seen in the chart above that illustrates the hypothetical growth of \$100 invested in 1985, rebalanced monthly following the Simple Managed Futures Strategy described above.

This steady hypothetical performance is due to the diversification arising from applying the trend strategies in 60 different markets using risk-based position sizing. To understand this, note first that the average pair-wise correlation of these single-asset strategies is only 0.08, meaning that the strategies behave rather independently in these markets so one may profit when another loses. Even when the strategies are grouped by asset class, the four groupings have very low correlations (as seen in EXHIBIT 5). Second, an equal-risk approach means that, the higher the volatility of an asset, the smaller a position it has in the portfolio. This is an essential step in constructing a well-diversified portfolio because of the wide range of volatilities exhibited by various assets. For example, a 5-year US government bond future typically exhibits a volatility of

Exhibit 5: Hypothetical Correlations of the Simple Managed Futures Strategy across asset classes. (Jan 1985 – Dec 2009)

	Commodities	Equities	Fixed Income	Currencies
Commodities	1.00			
Equities	0.18	1.00		
Fixed Income	0.07	0.19	1.00	
Currencies	0.16	0.20	0.09	1.00

around 5% a year, while a natural gas future typically exhibits a volatility of around 50% a year. If a portfolio holds the same notional exposure to each asset in the portfolio (as some indices and managers do), the risk and returns of the portfolio will be dominated by the most volatile assets, significantly reducing the diversification benefits.

PART 4: MANAGED FUTURES IN A PORTFOLIO CONTEXT

The hypothetical returns of the Simple Managed Futures Strategy have exhibited very low correlations to traditional asset classes as seen in the table in EXHIBIT 6. In addition,

Exhibit 6: Hypothetical Correlations of the Simple Managed Futures Strategy to various asset classes. (Jan 1985 – Dec 2009)

S&P 500 Index	-0.03
Barclays US Aggregate Bond Index	0.23
S&P GSCI Commodities Index	0.05

EXHIBIT 1 shows that the Simple Managed Futures Strategy performed especially well during periods of financial crisis, which can provide substantial diversification benefits when investors may need the protection most.

To analyze the potential portfolio benefits of managed futures more directly, EXHIBIT 7 shows the performance of the 60/40 portfolio, the Simple Managed Futures Strategy, and a portfolio of the two with 80% in the 60/40 portfolio and 20% in managed futures, rebalanced monthly. The combined hypothetical portfolio has lower volatility

than the 60/40 portfolio and at the same time higher average hypothetical returns. Further, the Simple Managed Futures Strategy tends to do well during the worst 12 months periods for the 60/40 portfolio. Hence, we think a portfolio with even a modest allocation to managed futures may provide significant diversification benefits, reduce losses during market downturns, and increase the overall Sharpe ratio.¹⁰

PART 5: RISKS OF INVESTING IN MANAGED FUTURES STRATEGIES

Obviously, managed futures strategies have risk and do not always work. Managed futures strategies generally perform poorly when markets stay range-bound without trending. They also tend to suffer when trends abruptly reverse. Further, managed futures strategies require high turnover, incur substantial trading costs, and the high fees typically charged by managed futures funds can substantially lower the net returns investors receive from investing in the strategy.

Exhibit 7: Performance statistics gross of transaction costs. (Jan 1985 – Dec 2009)

These statistics for S&P 500 and the simple managed futures strategy do not include trading costs or fees.

	60/40 Portfolio*	Simple Managed Futures Strategy (Hypothetical)	80% 60/40 Portfolio*, 20% Managed Futures (Hypothetical)
Annualized Return	9.9%	17.8%	11.6%
Annualized Standard Deviation	9.9%	9.3%	8.1%
Sharpe Ratio	0.53	1.42	0.85
Worst Month	-11.5%	-6.4%	-10.3%
Worst Drawdown	-32.5%	-13.3%	-22.8%
Worst 12-month Periods for the S&P 500			
March 2008 - February 2009	-27.7%	19.3%	-19.5%
October 2000 - September 2001	-12.3%	28.8%	-4.9%
April 2002 - March 2003	-11.3%	39.8%	-2.4%
Sept 1987 - August 1988	-7.1%	7.8%	-4.1%

Please read important disclosures relating to hypothetical performance at the end of this paper.

* 60/40 Portfolio Returns are calculated based on a hypothetical portfolio that has 60% invested in the S&P 500 Index and 40% invested in the Barclays US Aggregate Index, rebalanced monthly.

¹⁰ The general performance characteristics and diversification properties of the strategy are not materially affected by the selection of assets, the volatility forecasting methodology and the time period of the study.

PART 6: CONCLUSION: BEYOND SIMPLE MANAGED FUTURES STRATEGIES

This paper demonstrates the potential strong performance and diversification benefits of a simple managed futures strategy. The simple portfolio shows explicitly how a managed futures strategy can be implemented in an attempt to de-mystify the asset class. The hypothetical Simple Managed Futures Strategy has produced strong returns in both bear and bull markets, and has performed consistently across markets.

The simple strategy can be enhanced in a number of ways. Indeed, managers such as CTAs and hedge funds (full disclosure: we belong to the latter group) use more advanced managed futures strategies in practice. They try to enhance the strategies by relying on more sources of information and more sophisticated tools to identify trends.

To improve the accuracy and scope for identifying trends, managers apply rigorous quantitative methods such as statistical filtering techniques. They look at trends at various time horizons, trying to identify both short-term, medium-term, and long-term trends. (Our example used only

12-month price changes, a fairly long-term trend indicator.)

Further, managers use rigorous risk management systems to limit drawdowns. They seek to identify over-extended trends to limit the losses from sharp trend-reversals, and try to identify short-term countertrends to improve performance in range-bound markets. To reduce the impact of trading costs, they use portfolio optimization techniques and electronic trading algorithms to implement the strategies (Garleanu and Pedersen (2009)).

Investors seek out alternative investments in order to increase the expected return of their portfolios while improving diversification and reducing their downside risk if global markets suffer. We believe managed futures strategies can meet all of these criteria, which means they have the potential to benefit a wide range of portfolios.

Although managed futures strategies have a long history, many investors have little or no exposure to them. We expect that to change over time, as more investors recognize the potential benefits of managed futures.

ACKNOWLEDGEMENTS: We thank Cliff Asness, Adam Berger, Ronen Israel, Bryan Johnson and John Liew for helpful comments, and Ari Levine and Haibo Lu for research assistance.

REFERENCES*

- Asness, C.** (1994), "Variables that Explain Stock Returns." Ph.D. Dissertation, University of Chicago.
- Asness, C.** (1995), "The Power of Past Stock Returns to Explain Future Stock Returns," Goldman Sachs Asset Management.
- Asness, C., T.J. Moskowitz, and L.H. Pedersen,** (2009) "Value and Momentum Everywhere," National Bureau of Economic Research.
- Barberis, N., A. Shleifer, and R. Vishny (1998), "A Model of Investor Sentiment," *Journal of Financial Economics* 49, 307-343.
- Bikhchandani, S., D. Hirshleifer, and I. Welch (1992), "A theory of fads, fashion, custom, and cultural change as informational cascades," *Journal of Political Economy*, 100, 5, 992-1026.
- Daniel, K., D. Hirshleifer, and A. Subrahmanyam (1998), "A theory of overconfidence, self-attribution, and security market under- and over-reactions," *Journal of Finance* 53, 1839-1885.
- De Long, J.B., A. Shleifer, L. H. Summers, and Waldmann, R.J. (1990), "Positive feedback investment strategies and destabilizing rational speculation," *The Journal of Finance*, 45, 2, 379-395.
- Edwards, W., (1968), "Conservatism in human information processing," In: Kleinmütz, B. (Ed.), *Formal Representation of Human Judgment*. John Wiley and Sons, New York, pp. 17-52.
- Elton, E. J., M. J. Gruber, and J. C. Rentzler (1987), "Professionally Managed, Publicly Traded Commodity Funds," *The Journal of Business*, vol. 60, no. 2, 175-199.
- Frazzini, A.** (2006), "The Disposition Effect and Underreaction to News." *Journal of Finance*, 61.
- Garleanu, N. and **L.H. Pedersen** (2007), "Liquidity and Risk Management," *The American Economic Review*, 97, 193-197.
- Garleanu, N. and **L.H. Pedersen** (2009), "Dynamic Trading with Predictable Returns and Transaction Costs," National Bureau of Economic Research.
- Hong, H. and J. Stein (1999), "A Unified Theory of Underreaction, Momentum Trading and Overreaction in Asset Markets," *Journal of Finance*, LIV, no. 6.
- Jegadeesh, N. and S. Titman (1993), "Returns to buying winners and selling losers: Implications for stock market efficiency," *Journal of Finance* 48, 65-91.
- Mitchell, M., L.H. Pedersen, and T. Pulvino** (2007), "Slow Moving Capital," *The American Economic Review*, 97, 215-220.
- Ooi, Y. H. and L.H. Pedersen** (2009), "Trends and Time-Series Momentum," work in progress.
- Shefrin, H., and M. Statman (1985), "The disposition to sell winners too early and ride losers too long: Theory and evidence," *Journal of Finance* 40, 777-791.
- Silber, W.L. (1994), "Technical trading: when it works and when it doesn't," *Journal of Derivatives*, vol 1, no. 3, 39-44.
- Tversky, A. and D. Kahneman (1974), "Judgment under uncertainty: heuristics and biases," *Science* 185, 1124-1131.
- Wason, P.C. (1960), "On the failure to eliminate hypotheses in a conceptual task," *The Quarterly Journal of Experimental Psychology*, 12, 129-140.

* The **highlighted authors** are our colleagues at AQR Capital Management.

DISCLAIMER:

The information set forth herein has been obtained or derived from sources believed by AQR Capital Management, LLC ("AQR") to be reliable. However, AQR does not make any representation or warranty, express or implied, as to the information's accuracy or completeness, nor does AQR recommend that the attached information serve as the basis of any investment decision or trading program. This document has been provided to you solely for information purposes and does not constitute an offer or solicitation of an offer, or any advice or recommendation, to purchase any securities or other financial instruments, and may not be construed as such. This document is intended exclusively for the use of the person to whom it has been delivered by AQR Capital Management, LLC, and it is not to be reproduced or redistributed to any other person. This document is subject to further review and revision.

The performance results contained herein do not reflect the deduction of transaction costs and other fees that may be associated with investing such as broker or advisory fees, which would reduce an investor's actual return. **Past performance is not an indication of future results.**

Hypothetical performance results (e.g., quantitative backtests) have many inherent limitations, some of which, but not all, are described herein. No representation is being made that any fund or account will or is likely to achieve profits or losses similar to those shown herein. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently realized by any particular trading program. One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or adhere to a particular trading program in spite of trading losses are material points which can adversely affect actual trading results. The hypothetical performance results contained herein represent the application of the quantitative models as currently in effect on the date first written above and there can be no assurance that the models will remain the same in the future or that an application of the current models in the future will produce similar results because the relevant market and economic conditions that prevailed during the hypothetical performance period will not necessarily recur. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results, all of which can adversely affect actual trading results. Hypothetical performance results are presented for illustrative purposes only.

There is a risk of substantial loss associated with trading commodities, futures, options and leverage. Before investing carefully consider your financial position and risk tolerance to determine if the proposed trading style is appropriate. Investors should realize that when engaging in leverage, trading futures, commodities and/or granting/writing options one could lose the full balance of their account. It is also possible to lose more than the initial deposit when engaging in leverage, trading futures and/or granting/writing options. All funds committed should be purely risk capital.