GLOBAL VOLATILITY SUMMIT

August 2017 Newsletter

Dear Investor,

The Global Volatility Summit ("GVS") brings together volatility and tail hedge managers, institutional investors, thought-provoking speakers, and other industry experts to discuss the volatility markets and the roles volatility strategies can play in institutional investment portfolios. The GVS aims to keep investors updated on the volatility markets throughout the year, and educated on innovations within the space.

R.G. Niederhoffer Capital has provided the latest piece in the GVS newsletter series.

Cheers,
Global Volatility Summit

Event

The ninth annual Global Volatility Summit ("GVS") is scheduled for Wednesday, March 14th, 2018 at Pier 60 in New York City. Alongside our featured volatility managers, we are excited to announce the addition of a Quantitative and CTA manager panel, featuring prominent portfolio managers in the space to share their views on the volatility markets and resulting impact on these strategies.

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2017 Event Recap

The 8th Annual Global Volatility Summit was held on March 15, 2017 at Chelsea Piers in New York City. Presenting to and networking with a well-attended crowd was an exciting lineup of 15 hedge fund managers, plus industry experts, hedge fund consultants, and institutional investors addressing the use of volatility, hedging, CTA and quantitative strategies within institutional investment portfolios.

R. G. Niederhoffer
Capital Management, Inc.

CTAs and Rising Interest Rates:

Is the Party Over?

Authors:

Roy Niederhoffer

Coen Weddepohl

April 2014

WHITE PAPER

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Executive Summary

The absolute level of interest rates, their direction, as well as the slope of the yield curve all have a significant impact on the performance of CTAs and global macro managers pursuing trend following strategies. The 32-year period of declining interest rates provided a fertile environment for CTAs and macro hedge funds to earn handsome profits. But, now, a long period of rising rates is once again a possibility, beginning with the Federal Reserve's "taper" of its quantitative easing strategy. In this white paper we examine how an environment of rising interest rates may impact CTA performance.

We designed a CTA proxy and simulated its performance for the period 1980-2013. We found that historically CTAs have generated a significant part of their profits from long positions in fixed income. This is likely due to the fact that fixed income markets offered a combination of high liquidity, a long uptrend from the secular decline in rates and, importantly, a general state of backwardation which earned investors in fixed income futures an average roll yield of about +3% per year.

We also show that if rates were to increase in a path inverse to their multi-decade decline, CTAs will struggle to make money due to a lack of clear price trends in fixed income futures and the negative carry from being short fixed income futures. This problem will become worse if the yield curve steepens.

More specifically, a buy-and-hold strategy in US 10-year note futures would have generated a cumulative profit of +109% in an environment of falling rates. *However, a sell-and-hold strategy would have actually lost 37% in a hypothetical environment of rising rates, assuming rates follow an inverse path of their decline for the last 24 years.*

Our model of CTA trading also performed poorly in a rising rate environment, generating a gross average monthly return of +0.2% with a Sharpe Ratio of 0.2. In contrast, in a declining rate environment it generated an average monthly return of +1.7% with a Sharpe Ratio of 1.4.

At the same time that CTAs struggle to make money in fixed income during a rising rate environment, commodity markets may not offer a useful alternative, despite the potential for rising prices as interest rates rise. This sector is not liquid enough and too volatile for large CTAs to allocate significant capital, thereby limiting the sector's potential contribution. Also, when commodity markets made large gains, CTA performance actually tends to be rather muted. Our model furthermore suggests that the Sharpe Ratio generated by CTAs in commodity markets is significantly lower than in any of the other asset classes.

Historically, CTAs have provided investors with protection during periods of equity market declines, mainly due to the fact that the long bull market in fixed income offered an attractive refuge for trend followers, and because shorting equity futures, on average, earned the investor +1.5% in positive carry. For the last 5 years, however an investor looking to short S&P 500 Index futures would have instead paid a negative carry of 2.1% per year as dividend yields were higher than short rates. Also, if interest rates rise, CTAs are less likely to profit from "flight-to-quality" rallies in fixed income that occur during equity market declines as they did often during the long decline in rates. Since CTAs are likely to spend less time long fixed income during a rising rate environment, the correlation of CTAs to equities will likely rise, challenging the potential for CTAs to serve as a "put on the stock market."

In conclusion, CTA performance appears to be highly interest rate regime-dependent. An environment of rising rates will be more challenging for CTAs (and macro hedge funds that follow similar strategies) than the environment of falling rates that has prevailed since 1982. We expect CTA correlation with equities to rise as fixed income will no longer provide an effective hedge against equities.

1. Introduction: a changing landscape

The last period of great inflation that many of us still remember began in 1969 and ended in 1981. Paul Volcker, Fed Chairman at the time, responded to price increases of over 13% per year in 1981 by raising the Fed funds rate to 20%. The US 10-year Treasury yield increased to 15.3%. The peak in the 10-year yield in September 1981 marked the end of a 27-year period of rising interest rates which had begun in April 1954. What followed was a long and steady period of declining interest rates lasting 31 years, taking 10-year yields to a low of 1.5% in July 2012.

The question of what happens next will be of great significance to investors in CTAs, as it is our view that trend following strategies are likely to face serious challenges in a rising interest rate environment. The objective of this white paper is to discuss how such an environment of rising interest rates will impact the performance of CTAs, as well as that of the entire hedge fund industry. We also discuss the potential protective value of CTAs in a portfolio and how that might change if rates rise.

For the purpose of the paper, we define the interest rate environment by looking at the US 10-year Treasury yield (the "long rate"), rather than the federal funds rate (the "short rate") which is the interest rate at which depository institutions lend balances to each other overnight. Most of the industry papers written on this topic define the interest rate environment by using the federal funds rate. In this paper, we focus primarily, though not exclusively, on the long end of the yield curve. This sector has been highly profitable for CTAs, and, as we will show, offers dramatically different opportunities if rates rise.

Sections 2-5 take a closer look at the dynamics of trend following strategies in fixed income markets, and illustrate that the ***cost of carr***y, and not the actual direction in interest rates, accounts for the largest portion of price moves in fixed income futures. In sections 6-10 we create a proxy for trend following strategies, and we demonstrate that CTAs are likely to struggle generating profits during periods of rising interest rates. Sections 11-13 look at the impact of rising interest rates on commodity and equity markets, where we observe that these markets are also unlikely to provide CTAs with attractive opportunities when interest rates go up.

We will begin our analysis by looking at the important role that roll yield plays in the price formation of fixed income futures, which is the topic of the next section.

2. Most of the return of long fixed income positions came from positive carry, not from interest rate declines

As we will show in Section 8, the majority of profits generated CTAs has historically come from long positions in fixed income. But before we get into this, it is important to understand the particular dynamics of fixed income futures.

There are two components of the large fixed income profits generated by CTAs: price appreciation caused by the long decline in interest rates, and positive carry of being long fixed income futures while the yield curve is positively sloping (and negative carry if it inverts). The second is actually more important – see text box on the next page for a brief description of roll yield.

Roll Yield Explained: Roll yield is the carry earned by an investor holding a long position in a treasury futures contract and rolling this position forward on a quarterly basis to stay in the most liquid contract. The holder of 10-year note futures contract does not receive any yield, unlike the holder of a 10-year note. An arbitrage opportunity would arise if an investor could short a 10-year note futures contract, use cash to buy the 10-year note, earn a positive spread (receiving the 10-year yield and paying the short-term rate), and deliver the asset against the short position on maturity. Therefore, in an arbitrage-free world, a 10-year note futures contract further out should trade at a discount to the nearby futures contract. This discount (carry) on a US 10-year note futures contract can be calculated as the yield on a US 10-year note minus the cost of financing, or the repo rate. As long as the yield curve is positively sloping, US 10-year note futures will be in backwardation. This results in a positive roll yield when rolling a long position in a nearby contract into a position in a contract further out.

In order to examine the impact of roll yield, we consider a simple buy-and-hold strategy in US 10-year note futures.

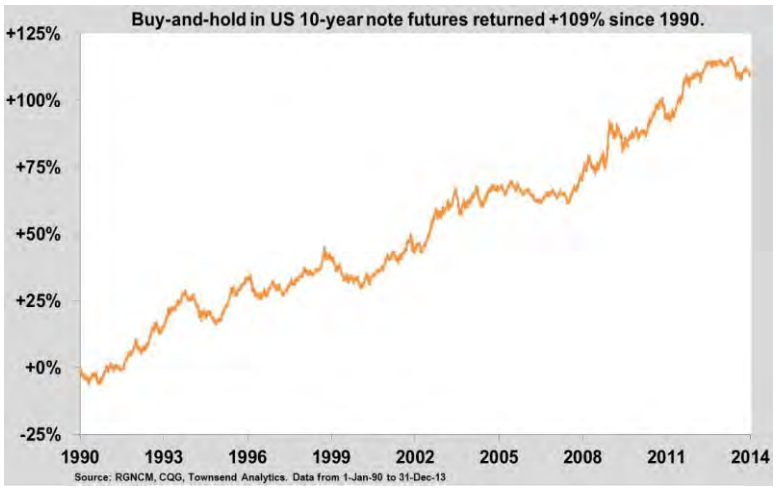


Figure 1: Buy-and-hold strategy in US 10-year note futures (1990 – 2013)

Figure 1 on the left shows that a buy-and-hold strategy in US 10-year note futures from January 1990 through December 2013 would have earned a cumulative return of +109% (excluding transaction costs).

A trend-following CTA would not have been long the entire time, of course, but would likely have captured a large percentage of the upward move. During this period, the 10-year Treasury yield fell from 7.93% to a low of 1.66% on May 1, 2013.

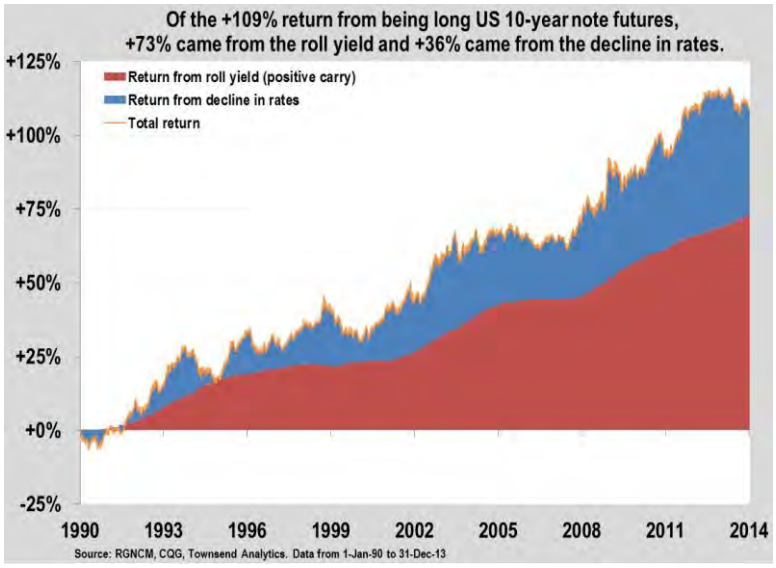


Figure 2: Breakdown of US 10-year note futures price into roll yield and change in the underlying interest rate (1990 – 2013)

Figure 2 breaks the total return of +109% into two components: +36% from price appreciation resulting from the overall decline in interest rates and +73% from the roll yield (positive carry) of the futures contract.

Clearly, the falling rates period presented CTAs with an enormous opportunity. But what will happen if rates experience a sustained rise?

3. Sell-and-hold does not equal buy-and-hold

As with falling interest rates, we can decompose the return from sell-and-hold in US 10-year note futures into two pieces: 10-year note price depreciation resulting from the rise in interest rates and the (negative) roll yield from being short futures.

Let's start with the price depreciation. To keep things comparable, we will make an assumption that interest rates will rise in exactly the opposite path as they went down over the last 24 years, as though time were running backwards. It is of course unknowable what path rates will take. Nevertheless, as long as rates start low and end high and the yield curve is positive sloping through most of the period, the results will be largely similar to what we show regardless of the exact path.

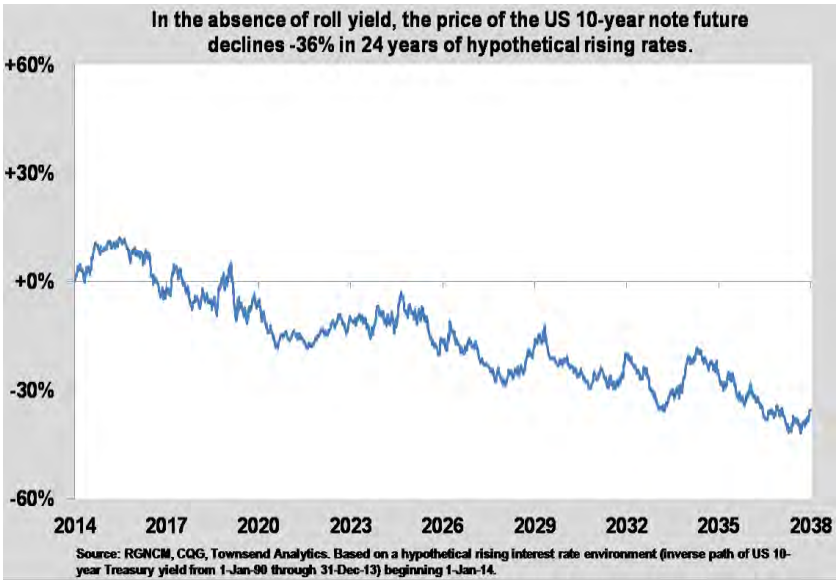


Figure 3: US 10-year note futures return inverted, excluding roll yield

Figure 3 shows the price change of US 10-year note futures resulting from the *rise in interest rates only* (excluding roll yield) if interest rates take the inverse path for the next 24 years of the way they fell for the last 24 years. Not surprisingly, the line slopes downwards and the total return is -36%. However, unlike buy-and-hold (which had a positive roll yield), sell-and-hold results in a negative roll yield. And the results look extremely different.

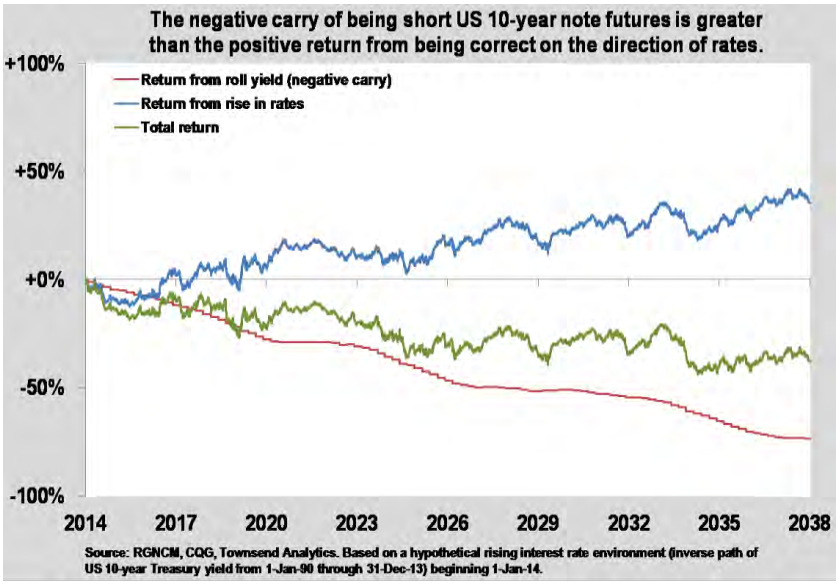


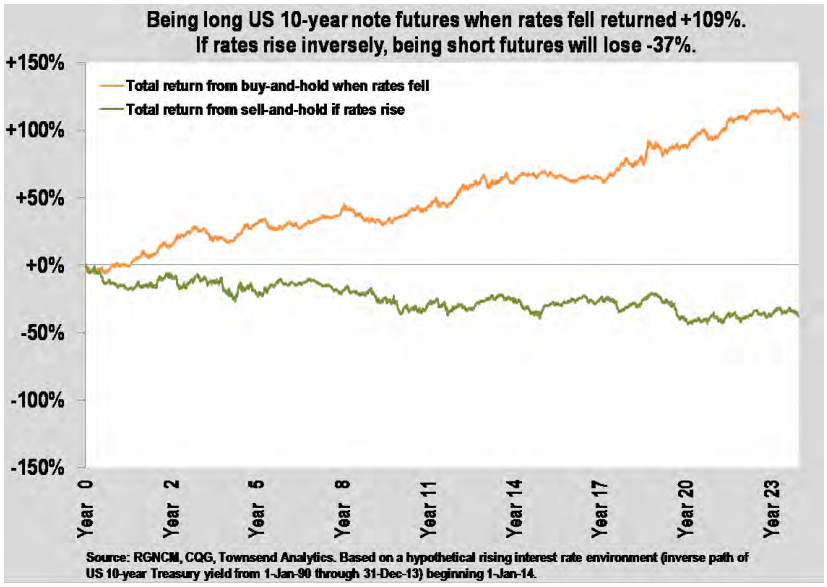
Figure 4: Returns on a sell-and-hold strategy, separated into roll yield and impact of the rise in the underlying 10-year rate

In *Figure 4,* the blue line shows the *return* on a hypothetical sell-and-hold position in the US 10-year note futures contract (the return is positive because the price, shown in *Figure* 3, has dropped). This short position yields a return of +36% from the rise in interest rates.

The return from the negative roll yield, shown in red, is -73%. Obviously this vastly exceeds the +36% profit from being correct on the direction of interest rates. The green line in *Figure 4* shows the *total return* of a sell-and-hold strategy. Obviously, the -36% total return is not particularly attractive.

Summarizing our argument so far, *Figure 5* below compares the return on a buy-and-hold strategy to that of a sell-and-hold strategy. Clearly, *being short US 10-year note futures if interest rates rise is not the inverse of being long when rates fall*.

Figure 5: Returns from buy-and-hold versus sell-and-hold



Specifically, buy-and-hold *gained* +4.5% per year since 1990 while sell-and-hold *lost* -1.5% per year. The difference of 6% per year comes from the fact that being long US 10-year note futures earns the investor a positive carry of +3% per year, whereas being short the same contract costs the investor -3% per year in negative carry.

An investor shorting fixed income futures in a rising rate environment will face a headwind of -6% per year compared with an investor being long the same futures markets in a declining rate period, all else being equal. Within the context of a historical annualized volatility (annualized standard deviation) of US 10-year note futures of ~6.2% per year, this headwind presents a significant disincentive for CTAs to go short fixed income unless price declines are extremely rapid.

4. Will trend following strategies be able to take short positions in fixed income futures if rates rise?

So far we have looked at the performance of passive long or short positions in fixed income futures as rates fall or rise. But how would a typical CTA perform in these situations?

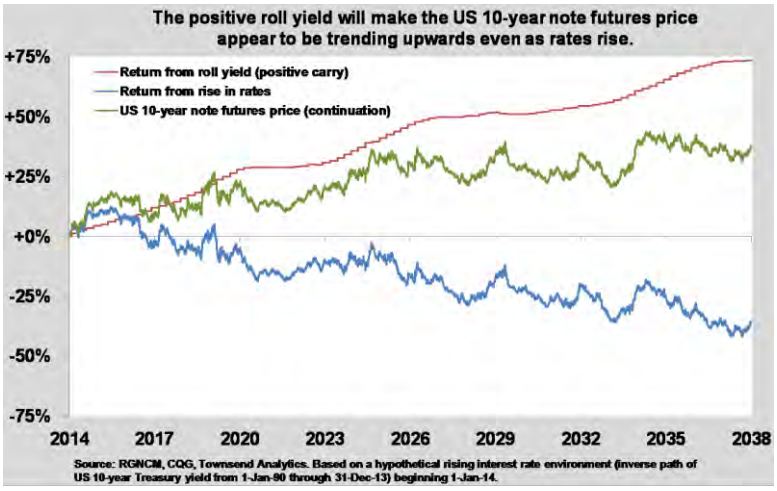


Figure 6: Hypothetical US 10-year note futures price in a rising rate environment (2014 – 2037)

Figure 6 provides a clue. The green line is the US 10-year note futures price during the hypothetical rising rate environment (the inverse of the 1990-2013 period). As you can see, *the futures price will actually trend sideways-to-upward even though interest rates are rising.*

This counterintuitive result occurs because the roll yield remains positive regardless of whether rates rise or fall (because the yield curve remains positively sloping). While the overall rise in rates would impact the futures price by -36% over the period, the positive roll yield causes an impact of +73%. Consequently, *the futures price rises over 37% even in a rising rate environment.*

It should also be clear from the upwardly sloping green line in *Figure 6* that for a trend-follower, the situation is very different from the strong uptrend that occurred in the falling rate period (see *Figure 1*). In fact, there is no downtrend to follow.

Thus, while CTAs enjoyed tremendous profits from strong uptrends in fixed income markets during the last 32 years (when both the roll yield and price direction from changing interest rates were positive), a rising interest rate environment is likely to provide a trendless environment (since the roll yield and price direction will be in opposite directions and offset each other). If anything, with rising rates we will see an uptrend, rather than a downtrend, in fixed income futures. ***For the most part, CTAs are unlikely to be short fixed income at all.***

However, there are two possible exceptions:

- A very rapid and sustained rise in interest rates in which the corresponding price decline of long duration fixed income securities swamps the upward price pressure from the positive roll yield.
- A flat or inverted yield curve, which lowers the carry or makes the carry negative. A flat yield curve eliminates the impact of the roll yield, and an inverted curve makes the roll yield negative, so that the price of futures tends to fall over time instead of rise and you get compensated for being short. Over the last 50 years the yield curve was inverted only 11% of the time, with an average duration of 27 days. And in the current environment, with the Fed trying to create, rather than fight, inflation, it is highly unlikely that an inverted yield curve would occur.

5. Fixed income markets other than US 10-year note futures show the same pattern

So far we have focused only on the US 10-year note futures. Will the same pattern be true on other markets? To examine the impact of a rising rate environment on other markets, we repeated our study on two additional markets that are big contributors to CTA performance, Eurodollar futures and Euro-Bund futures.

In 3-month Eurodollar futures, representing the short end of the US yield curve, our results were very similar to our findings for US 10-year note futures. The combined roll yield and uptrend in the falling rate period created a good opportunity for investors on the long side, but not for shorts in a rising rate environment.

Figure 7 on the next page shows that a buy-and-hold strategy in Eurodollar futures returned a total of +22.7% since 1990. The return from a sell-and-hold strategy in a rising rate environment would have been -10.3%. The negative carry (-16.4%) of being short is greater than the positive return (+6.1%) from being correct on the direction of rates. This chart is equivalent to *Figure 6* for US 10-year note futures.

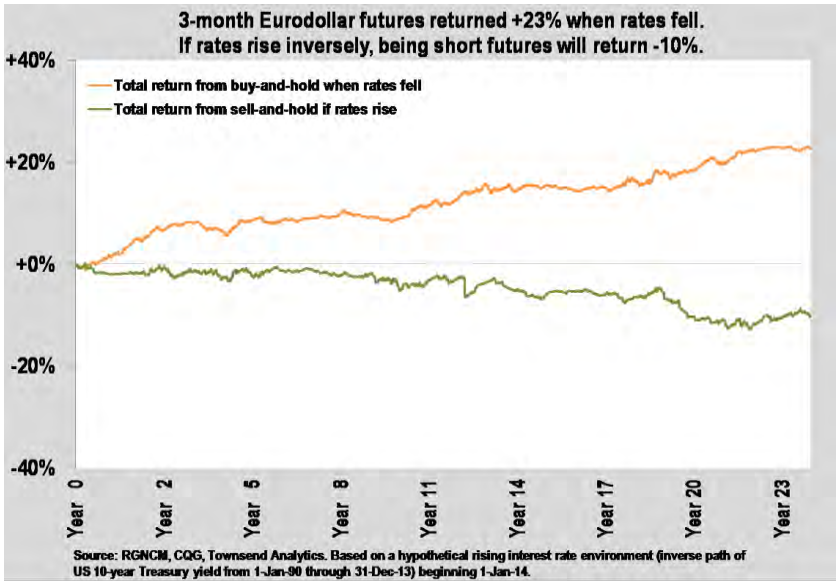


Figure 7: 3-month Eurodollar futures buy-and-hold versus sell-and-hold

Since the return from sell-and-hold in 3-month Eurodollar futures is negative, the price would be rising over the period (as in *Figure 6* for 10-year note futures) and CTAs would be unlikely to profit on the short side in this market, or even to establish short positions.

Figure 8 shows that just as in US 10-year note futures and 3-month Eurodollar futures, the return from a sell-and-hold strategy in

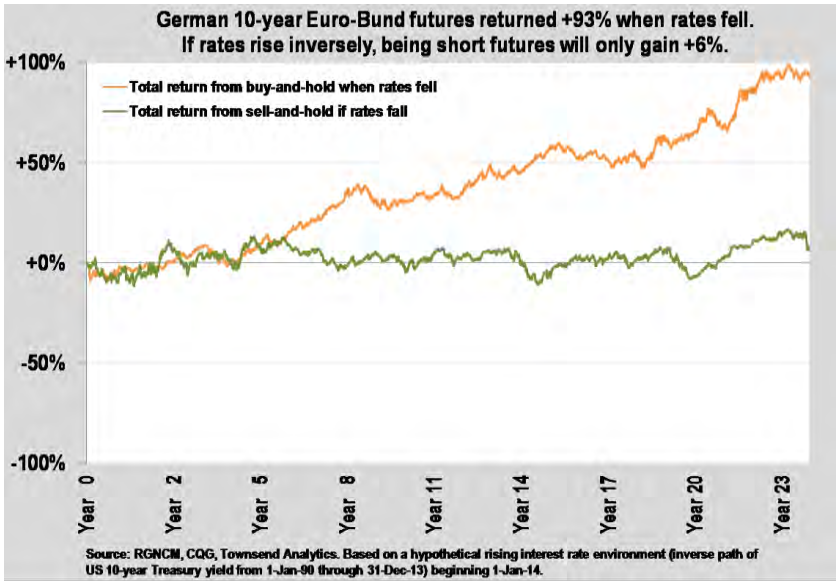


Figure 8: German 10-year Euro-Bund futures buy-and-hold versus sell-and-hold strategy

German 10-year Euro-Bund futures when rates rise will be much worse than buy-and-hold when rates fall. A buy-and-hold strategy would have returned +93.1% since 1990, whereas a sell-and-hold strategy would have gained only +6.2%.

Because the results from both the short end of the US yield curve and the long end of the European yield curve confirm our results, ***it seems safe to say that in most or all fixed income futures markets, profits will be far more challenging to obtain in a rising rate environment than they have been in the falling rate period that has persisted for more than three decades, assuming the yield curve remains positively sloping.***

6. Using a CTA proxy to simulate returns in fixed income markets in a rising interest rate environment

So far we have only compared the returns on a passive buy-and-hold and a sell-and-hold strategy in different rate environments. We have demonstrated that a sell-and-hold strategy in an environment where rates rise in the inverse path of how they fell would have strongly underperformed a buy-and-hold strategy during a falling rate environment.

In this section we design our own CTA proxy to simulate returns on both actual falling rate and hypothetical future rising rate data for US 10-year note futures, as well as for five other major fixed

income markets. We tested the period 1990-2013 (using daily data) because prior to 1990 the proxy has less explanatory power (correlation of ~0.5) due to the fact that during the 1980s CTAs traded fewer markets (mostly commodity futures), and the benchmark contained only a small number of funds.

We back-tested the proxy on 24 representative markets, six of each of the four main asset classes: equities, fixed income, currencies and commodities. Our CTA proxy is based on a portfolio of four indicators: three moving average cross-overs (20x120 day, 120x250 day, and 20x250 day), and one indicator that simply follows the direction of the previous month's return. The allocation to each of the four signals, as well as the 24 markets, is equally risk-weighted (using standard deviation) and rebalanced monthly. The model targets a portfolio volatility of 15% per year. We assume a conservative slippage of one tick per contract, and a fee structure of 2/20 (slippage makes a minimal impact on this model even if we use a higher level). Cash return is based on the T-bill rate, and we use an average margin-to-equity ratio of 15%. Some futures products were not launched until after 1990, in which case we used synthetic data to construct futures prices.

Our model explains CTA returns very well. From 2000 to 2013 the model has a daily correlation of +0.77 with the Barclay CTA Index.

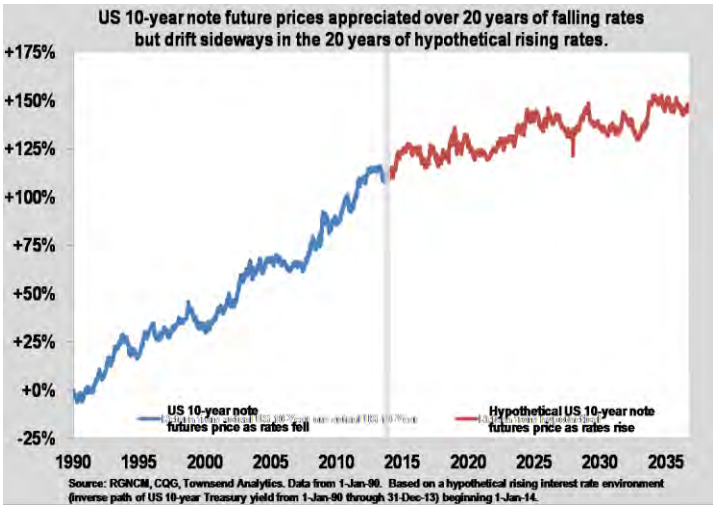


Figure 9:10-year note futures prices in falling (actual) and rising (hypothetical) rate periods

To begin, the blue line on the left in *Figure 9* shows the actual 10-year note futures price appreciation over the period 1990 to 2013. The red line on the right shows the hypothetical futures price based on rates rising following the inverse path (as in *Figure 6).* As before, the red line flattens out because the negative carry offsets the positive return from being correct on the direction of the interest rate. Clearly, the flat path of the futures price during a rising rate environment looks nothing like the sustained uptrend in prices when rates fell.

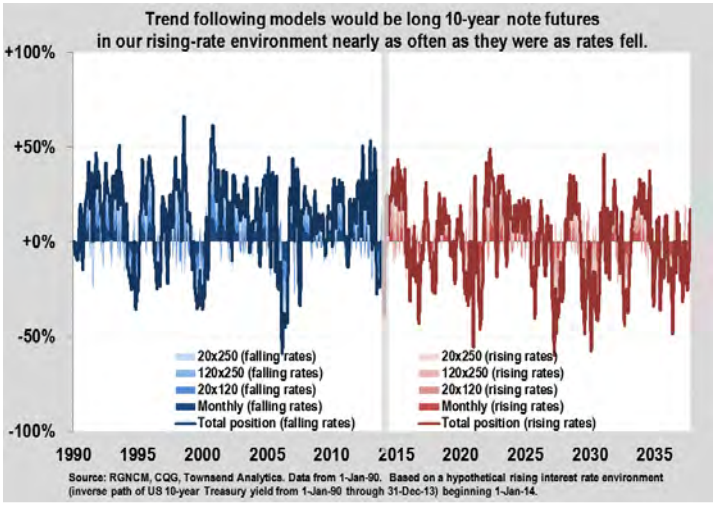


Figure 10: CTA proxy net exposure to US 10-year note futures

We then ran our trend-following proxy on the actual and the hypothetical US 10-year note futures data. The positions of the four strategies comprising our proxy model are summarized in *Figure 10*. The annualized volatility of each strategy is set at 6%. The Y-axis shows net exposure, with +100% representing a fully invested long position. *Figure 10* shows that the four long term models were mostly long US 10-year note futures in the falling rate period (the "actual" data). However, the models were also mainly long during the hypothetical rising rate period. The model spent 75% of the time long in the falling rate environment. When rates rose it was long 55% of the time.

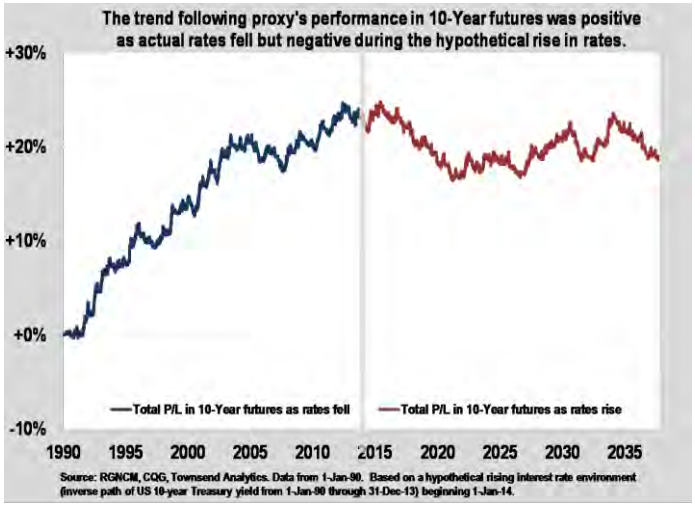


Figure 11: Total CTA proxy performance and US 10-year note futures prices in rising versus falling rate environments

Figure 11 shows that the trend following model was strongly profitable in 10-year note futures during the falling rate period (the left half of the chart) and essentially flat during the rising rate period. This finding supports our hypothesis that CTAs will have difficulty if interest rates rise.

To broaden our study and more accurately model what a trend following manager actually does, we ran each of the four model trend following strategies on six different futures markets: the US 10-year note, US 30-year bond, 3-month Eurodollar, German 10-year Euro-Bund, German 5-year Euro-Bobl, and Japanese 10-year Bond. Position sizes for each contract were volatility-equalized (please contact us if you would like to receive the full details on this).

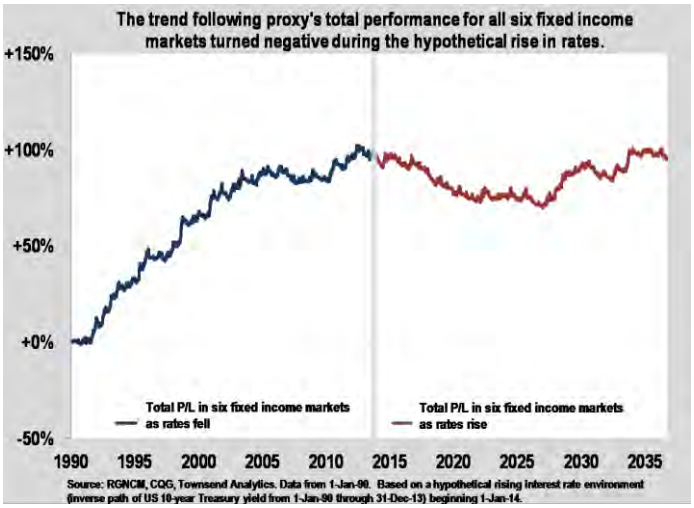


Figure 12: Total CTA proxy performance on six fixed income markets combined in rising versus falling rate environments

Figure 12 shows the combined performance of the CTA proxy in the six fixed income markets. Just as with static buy-and-hold and sell-and-hold, all four trend following models were profitable in the "real" falling rate period (total performance of +97%) but most were unprofitable during the hypothetical rising rate environment (total performance of -1%).

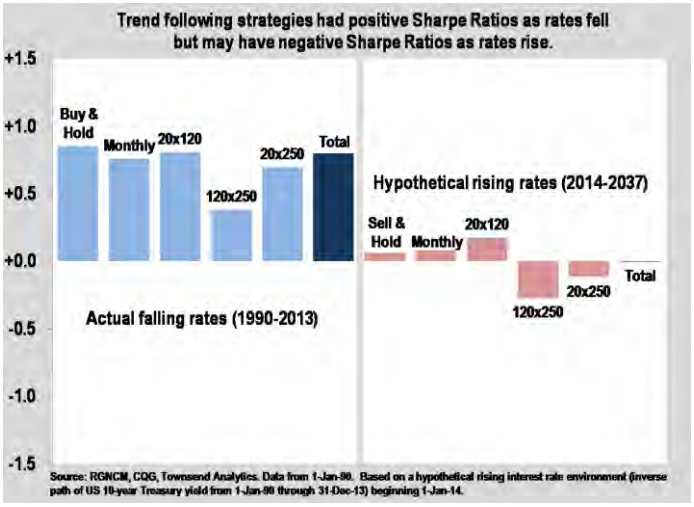


Figure 13: Sharpe Ratio of trend following strategies in rising versus falling rate periods for six fixed income markets combined

The Sharpe Ratios of the four individual trend following models, the combined model, and a passive hold strategy are shown in *Figure 13* for the six fixed income markets combined.

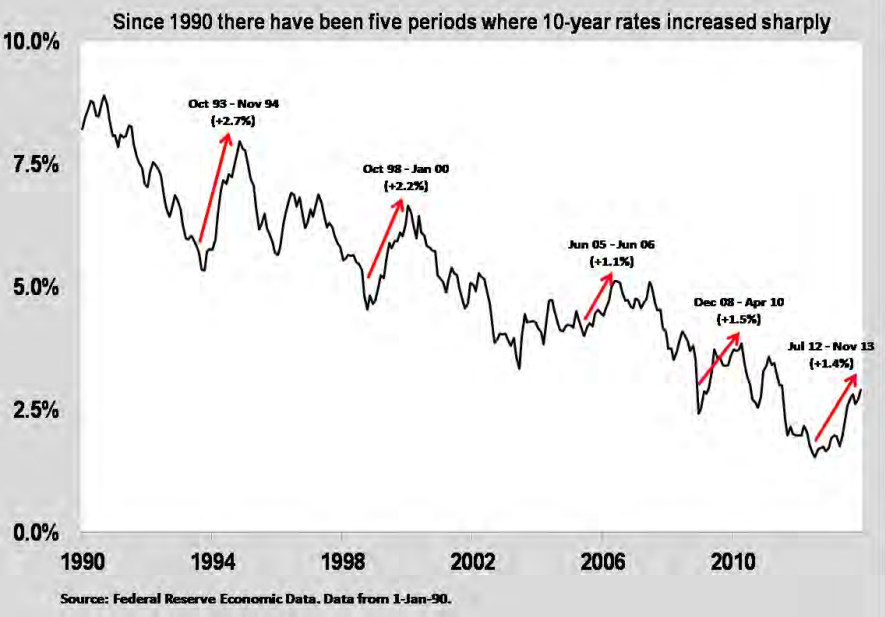
As rates fell for the last 24 years, the long positions held by the trend following models yielded positive Sharpe Ratios (shown in blue). The combined portfolio of four trend following models produced a Sharpe Ratio of +0.8. To put these in perspective, the entire Newedge CTA Index yielded an actual Sharpe Ratio of +0.4 during this period.

On the other hand, in the hypothetical rising rate environment, the trend following portfolio achieved a Sharpe Ratio of 0 (shown in red). All strategies did much worse in the rising rate period than in the falling rate period. This suggests that ***trend following will be very difficult in fixed income during a rising rate environment.*** In both the falling rate and rising rate environments, buy/sell-and-hold had better risk-adjusted returns than the trend following models.

7. Performance of the CTA proxy in actual rising interest rate environments across all asset classes

In the previous section we looked at the performance of the proxy in 6 fixed income markets. In this section we will widen our analysis to also include equities, commodities and currencies. Using the same data period 1990-2013, we divided the period 1990-2013 into rising and falling rates (see *Figure 14*).

Figure 14: US 10-year yields since 1990; periods of rising rates are marked in blue



Five periods of rising interest rates stand out, marked by a red arrow. The average rate increase over these 5 periods was 1.8%, with an average duration of 15.4 months.

We then measured the average monthly gross performance of the proxy for each asset class during falling as well as rising rate periods (see *Table 1 below*).

When rates fell, the proxy generated an average gross monthly return of +1.7% with a Sharpe Ratio of 1.4. But when rates rose, it returned just +0.1% per month with a Sharpe of +0.1. The results are particularly striking for fixed income. The model performed much better in falling rate periods (+1.2% per month) than rising rate periods environment (-0.6% per month).

Table 2 shows the percentage of time the proxy spent long for each of the four asset classes during the five most recent rising interest rate periods, which have an

Table 1: CTA performance attribution: Interest rate environment (1990-2013)

Asset Class	Average Monthly Gross P&L			Sharpe Ratio		
	Falling	Rising	Total	Falling	Rising	Total
Fixed income	+1.2%	-0.6%	**+0.6%**	+1.8	-1.2	**+0.7**
Equity indices	+0.3%	+0.2%	**+0.5%**	+0.5	+0.4	**+0.5**
Commodities	+0.1%	+0.3%	**+0.4%**	+0.1	+0.7	**+0.3**
Currencies	+0.2%	+0.1%	**+0.3%**	+0.4	+0.3	**+0.4**
Total	**+1.7%**	**+0.1%**	**+1.8%**	**+1.4**	**+0.1**	**+0.8**

Table 2: Percentage of time the proxy was net long during the most recent rising interest rate environments

Asset Class	Percentage of Time Long					
	Oct-93 to Nov-94	Oct-98 to Jan-00	Jun-05 to Jun-06	Dec-08 to Apr-10	Jul-12 to Nov-13	Average
Fixed income	38%	39%	57%	94%	66%	59%
Equity indices	65%	100%	89%	68%	100%	84%
Commodities	67%	42%	59%	43%	56%	54%
Currencies	82%	30%	67%	62%	53%	59%
Average	**63%**	**53%**	**68%**	**67%**	**69%**	**64%**

average duration of 15 months. As we can see, the proxy spent on average 64% of the time net long. The results for fixed income are worth highlighting; when rates were rising the model was still net long 59% of the time, on average. ***This supports our hypothesis that CTAs may struggle to make money on the short side in fixed income when rates rise.***

8. Historically, a significant portion of CTA profits has come from long positions in fixed income

While CTAs have the ability to diversify across many asset classes, in this section we will demonstrate that long positions in fixed income futures have accounted for a significant share of CTAs' historical profits. The rationale for this is that fixed income futures markets have shown clear trends as a result of a consistent decline in interest rates since 1982, combined with strong positive carry. In contrast, trends and positive carry in futures on other asset classes have been less persistent and more volatile. Furthermore, fixed income futures have been a highly liquid asset class and therefore offered large capacity for trend following strategies.

The results of our analysis are listed in *Table 3* below (P&L is represented as a cumulative percentage rather than a compounded return to avoid the distorting effect of compounding).

Our analysis shows that since 1990, long positions in fixed income generated a cumulative profit of +170%, *accounting for more than half of total CTA performance*, and short positions in fixed income actually *lost* money on average. *Table 3* also suggests that CTAs have generated all of their profits from long positions (+346%) in all sectors, and lost money on average from short positions.

Table 3: CTA performance attribution: Longs versus Shorts (1990-2013)

Asset Class	Total Gross P&L			Sharpe Ratio		
	Longs	Shorts	Total	Longs	Shorts	Total
Fixed income	+170%	-50%	**+121%**	+0.8	-0.5	**+0.7**
Equity indices	+91%	-12%	**+79%**	+0.6	-0.1	**+0.5**
Commodities	+45%	+3%	**+49%**	+0.3	+0.0	**+0.3**
Currencies	+39%	+6%	**+45%**	+0.3	+0.1	**+0.4**
Total	**+346%**	**-53%**	**+293%**	**+1.0**	**-0.2**	**+0.8**

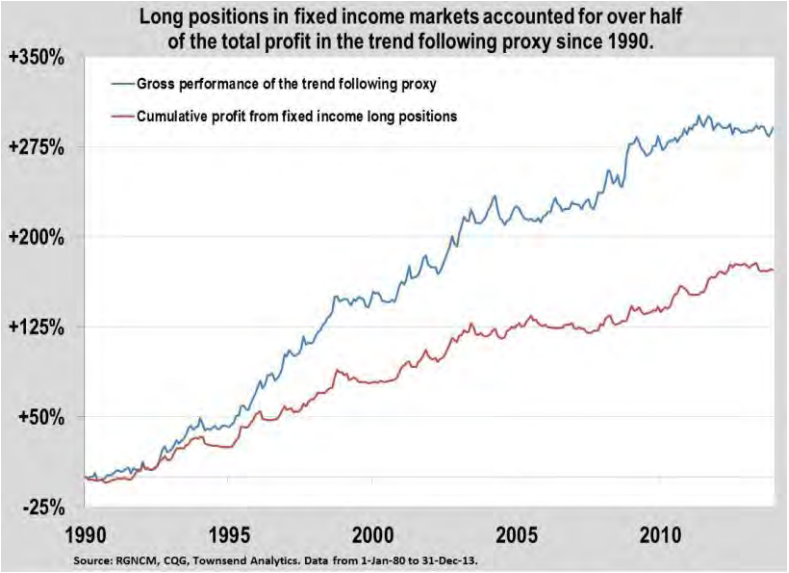


Figure 15: Contribution of long fixed income positions to total performance (1980 – 2013)

Figure 15 shows that long positions in fixed income (red line) accounted for 58.0% (170% out of 293%) of the model's total profits (blue line). ***This supports our hypothesis that CTAs have generated a large portion of their profits by being long fixed income.***

9. CTAs and global macro hedge funds have struggled during actual rising rate periods since 2000

To examine the impact of rapid rises in interest rates that occur in an overall falling rate period, we can look at actual history rather than creating hypothetical price streams. After all, the trend was not straight down in rates and there were in fact quite a few large interest rate rises within the long overall downtrend.

Table 4: 10 Worst Drawdowns for the US 10-year note future (1-Jan-00 to 31-Dec-13)

Start Date	End Date	Drawdown Duration (in months)	US 10-year note future	Newedge CTA Index	Newedge Trend Index	Global Macro Index (HFRXMA)	RGN Diversified
16-Jan-09	8-Jun-09	4.5	-10.8%	-4.5%	-7.0%	-7.0%	-1.7%
16-Jun-03	2-Sep-03	2.5	-9.9%	-2.1%	-5.6%	+1.7%	+5.0%
8-Nov-01	14-Mar-02	3.9	-8.7%	-9.5%	-17.6%		+1.1%
3-May-13	5-Sep-13	4.0	-8.4%	-5.3%	-8.1%	-3.0%	-11.4%
17-Mar-04	14-Jun-04	2.8	-8.0%	-4.9%	-10.9%	-5.0%	+2.9%
5-Nov-10	3-Mar-11	3.7	-7.8%	-1.2%	-0.5%	+0.6%	+4.0%
18-Mar-08	13-Jun-08	2.8	-7.2%	-1.5%	+0.1%	+0.0%	+4.0%
18-Sep-08	17-Oct-08	1.0	-5.6%	+2.2%	+3.7%	-2.5%	+17.0%
28-Jun-05	4-Nov-05	4.1	-5.5%	+2.9%	+4.0%	+3.9%	+2.4%
1-Dec-09	5-Apr-10	3.9	-5.1%	-0.4%	+1.2%	-1.5%	-12.5%
	Average	3.3	-7.7%	-2.4%	-4.1%	-1.4%	+1.1%

Largest daily drawdowns for US 10-year note futures since Jan-00, with a duration of 100 trading days or fewer.
Source: Bloomberg, Newedge, HFR. Data from 1-Jan-00 to 31-Dec-13. HFR Global Macro data available since Apr-03.

We examined the 10 largest drawdowns for US 10-year note futures to see if there were any patterns in CTA and global macro hedge fund performance. As shown in *Table 4*, CTA performance in rapid interest rate rises (declines in fixed income prices) has been challenging. (We started in 2000 because daily index data was not fully available before then).

The average performance of the Newedge CTA Index was -2.4% in the largest 10-year note futures drawdowns. The average performance for the Newedge Trend Index (using daily data) was -4.1% during these drawdowns.

These results must be interpreted with a grain of salt, however, as most of the rises in interest rates during this period occurred following a rapid decline in rates, and during the huge overall downward trend in rates. It is not surprising that trend following strategies struggled since they were likely to be long fixed income at the beginning of these declines.

10. A steepening yield curve can make problems worse for CTAs

As we discussed previously, the slope of the yield curve determines the size of the roll yield on fixed income futures. A steepening of the yield curve leads to an increase in roll yield, a flattening lowers the roll yield, and an inversion would make it negative. For long positions in the long end of the curve, a steep yield curve represents strong positive carry – and the inverse applies for shorts.

The US yield curve has been steepened a bit recently. A large move took place in 2013 between May 2nd and August 21st, where 10-year rates rose by 1.3% within just 3 1/2 months (see *Figure 16)*. From *Table 4* on the previous page we can see that this caused a drop of -8.4% in US 10-year note futures, while the Newedge CTA Index lost -5.3%. During this time short rates remained unchanged. This steepening of the yield curve made the positive carry of long positions (and negative carry of short positions) larger than it had been. And, of course, further steeping will increase the impact of the carry.

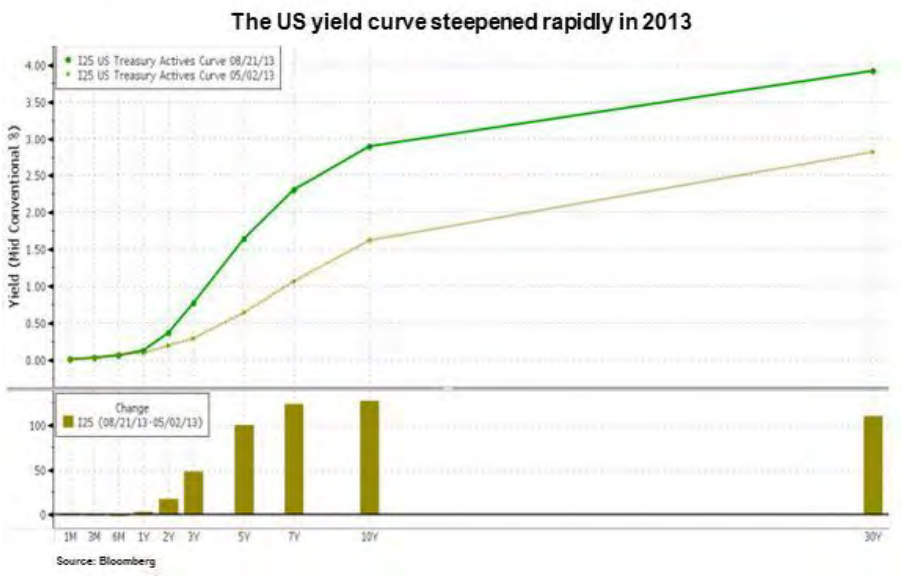


Figure 16: US yield curve in 2013

So what is the likelihood that short-term interest rates will remain low? We think that this is quite probable for several reasons. For one, the Federal Reserve seems to have lost its battle against deflation, despite pumping more than $3 trillion into the economy. We are beginning to see signs that a slowdown in inflation is going to last a while longer – we could end up with a 1% inflation rate for a long time.

Governments in developed countries have a strong incentive to keep rates low, facing massive deficits if short-term rates were to rise. The average duration of outstanding marketable Treasury securities fell to a 28-year low of 4.1 years in 2008, although it increased to 5.2 years in 2013 as the US government worked hard to extend the average maturity of its debt (via Operation Twist) to take advantage of low borrowing costs on the long end of the curve. The average interest rate on marketable US government debt fell from 6.67% in December 2000 to just 1.97% today, while total government debt increased from $5.7 trillion to $17.3 trillion over the same period.[1] The Congressional Budget Office (CBO) forecasts that US government interest payments will increase from currently 1.3% of GDP to over 5% by 2040. Therefore, we believe that the US government has a strong incentive to keep short-term rates low.

11. If fixed income will pose a challenge to CTAs in a rising rate or inflationary environment, what about opportunities from rising commodity prices?

Back in the 1970s and 1980s, when few managers managed more than $100 million, commodities like sugar, coffee, cocoa, silver and gold made a tremendous impact on CTA performance. These markets were very volatile, and CTAs were easily able to trade significant amounts in them despite the markets' small size. Today the situation is very different. Quite a few managers trade more than $1 billion and some trade more than $10 billion in CTA and related global macro strategies.

While global fixed income markets in January 2013 traded an average daily volume of $4.5 trillion, the average daily volume of all commodity futures put together was only $328 billion[2], just 1/14th of that total. And energy futures made up more than 50% of that amount.

Since the Managed Futures industry is more than $300 billion (according to Barclays Research) and there is probably another $500 billion in the hedge fund world following strategies similar to long term trend following, it is easy to see that fixed income represents a much more important area for trading than commodities.

[1] TreasuryDirect, www.treasurydirect.gov
[2] "Goldman Sachs Futures Focus", January 2013

Even if large funds wanted to take large positions in commodity futures, they would be stymied by position limits mandated by futures exchanges and regulatory authorities. This fact helps explain the rather muted performance of CTAs during the biggest gains and losses for commodities indices, as is evident from *Table 5*.

The table shows CTA performance when commodities had their largest drawdowns and run-ups between Jan-00 and Dec-13. During the 10 largest drawdowns for commodities, represented by the S&P Goldman Sachs Commodity Total Return Index (GSCI), the average return of the GSCI was -27%. During those drops, CTAs generated an average return of +1%. Conversely, during the 10 best run-ups for the GSCI, which averaged a gain of +35%, CTAs only generated an average gain of +3%.

Table 5: 10 Worst Drawdowns for the GSCI Total Return Index (1-Jan-00 to 31-Dec-13)

Start Date	End Date	GSCI TR Index	Newedge CTA Index	Crude Oil	Gold	Silver	Natural Gas	Soy	Corn	Sugar
17-Jul-08	5-Dec-08	-63%	+4%	-70%	-22%	-50%	-50%	-49%	-54%	-23%
17-Sep-01	30-Jan-02	-28%	-5%	-35%	-3%	-0%	-18%	-10%	-8%	-17%
7-Jan-09	18-Feb-09	-28%	+3%	-29%	+13%	+25%	-30%	-13%	-16%	+6%
28-Aug-06	18-Jan-07	-26%	+9%	-30%	-0%	+1%	-12%	+29%	+71%	-13%
27-Feb-12	21-Jun-12	-22%	-1%	-29%	-12%	-24%	+1%	+7%	-15%	-18%
3-Mar-03	29-Apr-03	-21%	-5%	-31%	-5%	-1%	-35%	+9%	-1%	-14%
27-Oct-04	10-Dec-04	-20%	+3%	-26%	+2%	-8%	-19%	-2%	-3%	-2%
30-Sep-05	15-Feb-06	-20%	+2%	-14%	+14%	+22%	-50%	+7%	+14%	+61%
3-May-11	22-Sep-11	-19%	-3%	-29%	+12%	-21%	-21%	-8%	-12%	+13%
7-Jan-10	25-May-10	-19%	+0%	-17%	+6%	-2%	-33%	-12%	-14%	-46%
	Average	**-27%**	**+1%**	**-31%**	**+0%**	**-6%**	**-27%**	**-4%**	**-4%**	**-5%**

10 Best Run-ups for the GSCI Total Return Index (1-Jan-00 to 31-Dec-13)

Start Date	End Date	GSCI TR Index	Newedge CTA Index	Crude Oil	Gold	Silver	Natural Gas	Soy	Corn	Sugar
24-Jan-08	12-Jun-08	+46%	+5%	+57%	-1%	+3%	+68%	+27%	+58%	+1%
19-Feb-09	11-Jun-09	+45%	-4%	+110%	-2%	+8%	-7%	+23%	+29%	+27%
14-Nov-02	7-Mar-03	+41%	+14%	+50%	+10%	+3%	+80%	+0%	-2%	+22%
23-May-05	1-Sep-05	+37%	+4%	+48%	+7%	+1%	+85%	-4%	+4%	+18%
27-Apr-00	18-Sep-00	+37%	-1%	+50%	-1%	-1%	+71%	-12%	-20%	+51%
22-Aug-07	3-Jan-08	+33%	+9%	+43%	+30%	+33%	+32%	+53%	+31%	+20%
18-Nov-10	8-Apr-11	+31%	+5%	+40%	+10%	+59%	+0%	+16%	+44%	-3%
30-Jun-04	26-Oct-04	+30%	+1%	+55%	+9%	+25%	+37%	-22%	-25%	+14%
13-Dec-04	1-Apr-05	+27%	+0%	+41%	-2%	+4%	+13%	+15%	+6%	-2%
31-Jan-02	14-May-02	+26%	-3%	+54%	+9%	+7%	+85%	+11%	+5%	-10%
	Average	**+35%**	**+3%**	**+55%**	**+7%**	**+14%**	**+47%**	**+11%**	**+13%**	**+14%**

Source: CQG, Bloomberg. Data from 1-Jan-00 to 31-Dec-13. All commodities are front month continuation contracts. Duration of 100 trading days or fewer.

The result is more pronounced if we just look at the energy sector, which accounts for 70.3% of the GSCI Index[3]. While crude oil returned +55% on average during the 10 largest run-ups for the GSCI, CTAs returned +3%.

Muted returns from CTAs while the GSCI made large gains suggests that while CTAs may profit from commodity price increases, the impact will be small. This view is confirmed by our model of CTA performance, which showed that very little money was made by CTAs on the long side in commodities and none whatsoever on the short side in commodities. Consequently, ***in a rising interest rate environment, commodity markets will not offer CTAs the ability to offset what should be challenging performance in fixed income markets.***

[3] Source: S&P Dow Jones Indices – "S&P GSCI Methodology", February 2014 (www.spindices.com)

12. How will positions in S&P 500 Futures be impacted by rising interest rates?

After long fixed income, the second-best trade for CTAs has been long equity futures, particularly since 2009. But just as in fixed income, these long equity futures positions were helped by positive carry. Historically, the S&P 500 equity futures curve has spent most of the last 60 years in contango (i.e. back months were priced higher than spot/front months) since the dividend yield of the equity index was lower than the short-term interest rate (note: equity index futures contracts did not actually exist until the late 1970s). *Figure 17* charts the carry (or roll yield) an investor would have earned by maintaining a long position in equity futures since 1954, using the S&P 500 futures contract as a proxy for equities.

Since then, and had they existed since 1963, long equity index futures positions would have earned a *negative* carry. This carry, calculated as the difference between dividend yield and the 3-month T-bill rate, has averaged -1.5% per year since 1960.

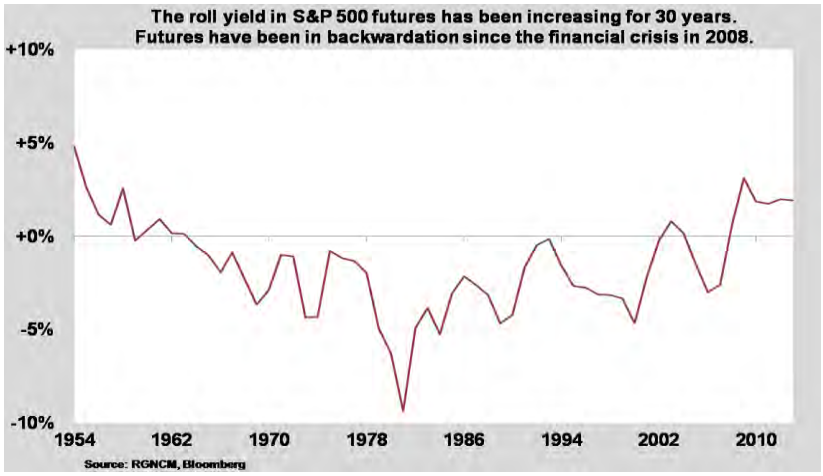


Figure 17: Carry earned by an investor with a long position in S&P 500 futures

The dividend yield of the equity index rarely exceeded the 3-month T-bill rate in the past, but since 2008 the average spread has been *+2.1%.* Thus, S&P 500 futures were in backwardation, and have provided investors a positive carry of +2.1% from long positions, the highest level since the 1950s. This means that an investor looking to short equity futures currently loses -2.1% per year in the form of negative carry. Perhaps it is no surprise that many managers have favored long positions in equity index futures.

However, if rates start to rise, it is likely that T-bill rates will once again exceed dividend yields, and provide a negative carry for long equity futures positions, just as they did as rates rose from 1960 to 1980. This negative carry may also place a drag on CTA performance, especially for managers who spend more time long than short. That being said, as long as short rates stay low, as they are right now, it is likely that CTAs will spend more time long than short to avoid the negative carry. And the result will be less portfolio protection than they have provided historically.

13. Will CTAs be protective in portfolios if interest rates rise?

Finally, we will have a look at the interaction between fixed income and equities in a typical CTA portfolio. It is certainly the case that CTAs have provided positive performance during some of the large equity declines that have occurred over the last 20-30 years. Most notably, CTAs posted good performance during 2000-2002 and 2008, as well as shorter equity selloffs such as 9/11 and during Long Term Capital Management's demise in 1998.

Since CTAs have existed primarily during a falling rate environment, and because of the factors detailed so far, CTAs have spent a lot of the time long fixed income. And during equity drawdowns, they are very likely to have been long fixed income at the time the equity drawdown began. In a rising rate environment, instead of being long fixed income, CTAs are much less likely to be long, as we have seen.

Instead, as a "flight to quality" begins during a rising rate period, CTAs holding short positions in fixed income may be stopped out at losses before they can establish more "protective" long fixed income positions.

We tried to test whether the protective value of CTAs will continue during a rising rate environment. To do this, we examined the 20 largest daily peak-to-trough drawdowns for the S&P 500 since 2004, and asked the question "How were CTAs positioned in fixed income at the start of the equity drawdown, and how did they perform?"

Table 6: 20 Worst Drawdowns for the S&P 500 from 1-Jan-04 to 31-Dec-13

Start Date	End Date	S&P 500 Index	Hedge Funds (HFRXGL)	Newedge CTA Index	RGN Diversified	CTA FI pos. at start of drawdown	Correlation of CTAs to S&P 500
6-Apr-04	12-Aug-04	-7.6%	-4.0%	-6.2%	-5.4%	Long	-0.1
1-Nov-07	10-Mar-08	-17.8%	-4.3%	+7.3%	+14.4%	Long	-0.0
1-Dec-08	1-Dec-08	-8.9%	-0.5%	+0.9%	+2.7%	Long	
7-Jan-09	9-Mar-09	-27.6%	-0.6%	+3.0%	+3.2%	Long	-0.7
10-Aug-10	26-Aug-10	-7.1%	-0.4%	+1.6%	+7.3%	Long	-0.0
8-Jul-11	3-Oct-11	-18.8%	-7.1%	+2.6%	+12.7%	Long	-0.4
31-Oct-11	25-Nov-11	-9.8%	-1.4%	+1.7%	+3.9%	Long	-0.4
17-Sep-12	15-Nov-12	-7.7%	-1.4%	-3.9%	-8.6%	Long	+0.5
	Average	-13.2%	-2.5%	+0.9%	+3.8%		
Start Date	End Date	S&P 500 Index	Hedge Funds (HFRXGL)	Newedge CTA Index	RGN Diversified	CTA FI pos. at start of drawdown	Correlation of CTAs to S&P 500
8-Mar-05	20-Apr-05	-7.2%	-2.8%	-2.9%	-1.3%	Short	+0.1
8-May-06	13-Jun-06	-7.7%	-4.5%	-5.7%	+6.6%	Short	-0.2
21-Feb-07	5-Mar-07	-5.9%	-3.2%	-5.9%	-2.9%	Short	+0.7
20-Jul-07	15-Aug-07	-9.4%	-6.8%	-7.9%	+3.8%	Short	+0.5
20-May-08	15-Jul-08	-14.8%	-2.6%	+4.1%	+9.2%	Short	-0.4
12-Aug-08	20-Nov-08	-42.4%	-17.8%	+9.0%	+26.7%	Short	-0.5
15-Jun-09	10-Jul-09	-7.1%	-0.4%	-1.7%	+1.9%	Short	+0.8
20-Jan-10	8-Feb-10	-8.1%	-1.7%	-3.5%	+8.7%	Short	+0.4
26-Apr-10	2-Jul-10	-16.0%	-4.0%	-2.2%	+4.4%	Short	+0.1
21-Feb-11	16-Mar-11	-6.4%	-2.0%	-3.0%	-0.0%	Short	+0.6
2-May-11	15-Jun-11	-7.2%	-3.1%	-5.5%	+10.4%	Short	+0.3
3-Apr-12	1-Jun-12	-9.9%	-2.2%	+3.2%	+0.8%	Short	-0.1
	Average	-12.0%	-4.5%	-2.3%	+6.1%		

Chart shows largest daily drawdowns for the S&P 500 with a duration of 100 trading days or fewer.
Source: Bloomberg, Newedge, HFR, RGNCM. Data from 1-Jan-04 to 31-Dec-13.

The upper half of *Table 6* shows the eight S&P 500 drawdowns in which CTAs were *long fixed income* (according to our model of CTAs) when the equity drawdown started. The lower half shows the 12 drawdowns in which CTAs started the equity drawdown *short fixed income.*

As you can see, CTAs were much more protective in the upper half of the chart, when they were able to start the equity drawdown with a *long* fixed income position. The correlation of CTAs to equities is mainly negative on the top of the chart and mainly positive on the bottom of the chart.

These findings support three aspects of our theory that CTAs may find it challenging to protect against equity market declines in a rising rate environment:

- After a period of 45 years, where the roll yield for S&P 500 equity index futures was negative, it is now the highest since the 1950s, making it more expensive to be short equity futures than during the period before 2009. Thus, CTAs may be less protective than they were before 2009 simply because they are less likely to be short equities given the higher cost.
- In a rising rate environment CTAs may spend more time being short fixed income (especially long duration instruments) and less time being long. We showed that CTAs have historically been less able to protect against declines in the equity markets when funds were positioned short fixed income before the equity declines began.
- If CTAs are less likely to be long fixed income before equity declines begin, their correlation to equities will likely rise. Indeed, CTAs had their highest-ever weekly correlation to equities during 2013 as rates started to rise.

14. Summary

For many years CTAs enjoyed a cozy relationship with declining interest rates, and a large fraction of their profits came from being long fixed income futures during a 32-year period of falling rates. We found that the positive carry of fixed income (futures) provided a tremendous boost to performance as well as creating smooth uptrends. We also showed that during a rising rate environment, downward trends in fixed income will be much harder to capture and in fact may not exist at all. Trend following appears to be an asymmetric, rather than a symmetric strategy in its ability to capture profits from interest rate trends.

Using a proprietary proxy with high explanatory power of CTA performance, we found evidence that CTA performance is interest rate regime-dependent. The absolute level, the direction of interest rates, and the slope of the yield curve all have a significant impact on CTA performance.

We believe that the years ahead may present significant challenges for CTAs as trend following strategies are likely to have a more difficult time in a rising interest rate environment. Expected returns of trend following strategies may be impacted further as assets increase, resulting in reduced diversification and increased exposure to the very liquid interest rate sector. Moreover, the traditional role of CTAs as a protective investment during equity declines may be reduced if rates rise.

Since most of the issues we have raised involve strategies that hold positions for long periods of time, managers with less focus on long term trends, or those who hold positions for shorter periods of time, should have less exposure to these issues. In addition, the foreign exchange market seems less clearly impacted by the factors discussed herein, and thus managers with exclusive or a greater percentage allocation to foreign exchange may be more immune.

In any case, evolution will become mandatory. Managers are likely to seek additional sources of return, such as long and long/short equity strategies or carry trades, all of which, because of their strong relationship to rising equity prices, will likely increase the correlation CTAs to equities over time. The record high 0.53 weekly correlation of CTAs to the S&P 500 in 2013 suggests that this is already occurring.

Our overall conclusion is that managers will be forced to adapt to succeed in a more challenging potential rising rate period.

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Data sources: RGNCM, CQG, Townsend Analytics, Bloomberg, HFR, Newedge, TreasuryDirect, Goldman Sachs, S&P Dow Jones Indices.

This White Paper contains hypothetical simulations based on a hypothetical rising interest rate environment (inverse path of US 10-year Treasury yield from 1-Jan-90 through 31-Dec-13) beginning 1-Jan-14.

Performance for Roy G. Niederhoffer Diversified Program ("RGN Diversified") is calculated net of all actual organizational and initial offering fees and expenses of the underlying funds, and the impact of ongoing operating fees and expenses. For RGN Diversified, performance is: (i) through June 2008, actual results for Roy G. Niederhoffer (Ireland) No. 1 Fund; and (ii) beginning July 2008, actual results for Roy G. Niederhoffer Diversified Fund (Offshore), Ltd. ("DFO") class A. As a result of a 0.50% higher administration fee carried by Roy G. Niederhoffer (Ireland) No. 2 Fund and DFO class B than the performance reported herein for RGN Diversified, the following investors would have achieved slightly worse performance than the performance reported herein during the following periods: (i) through June 2008, an investor in Roy G. Niederhoffer (Ireland) No. 2 Fund; and (ii) beginning July 2008, an investor in DFO class B.

Because performance numbers represent performance on a composite basis, performance is not representative for any particular investor. Therefore, it is possible in any particular period that certain investors may have achieved better or worse results as a result of the timing of their investments and the payment or non-payment of incentive fees.

To analyze performance in months other than the months listed, or to analyze performance for other RGNCM trading programs, please refer to the complete track records for the trading programs. Comparison to indices are for demonstrative purposes only. No representation is made that Data will track or otherwise reflect any particular index.

THIS MATERIAL DOES NOT REPRESENT AN OFFER TO SELL SECURITIES. SUCH AN OFFER CAN ONLY BE MADE PURSUANT TO A PPM. ONLY QUALIFIED INVESTORS WHO MEET SUITABILITY STANDARDS WILL BE ENTITLED TO RECEIVE A PPM.

YOU SHOULD ALREADY HAVE RECEIVED A COPY OF A PPM FOR A FUND. IF YOU HAVE NOT RECEIVED A PPM, PLEASE CONTACT US AND WE WILL SEND YOU AN APPROPRIATE PPM IMMEDIATELY. THE INFORMATION HERE SHOULD ONLY BE USED IN CONJUNCTION WITH OUR PPMs, WHICH CONTAINS ADDITIONAL INFORMATION ABOUT OUR FIRM AND INFORMATION ABOUT THE RISKS OF INVESTING IN THE APPLICABLE FUND.

PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.