Prospects for CTAs in a Rising Rate Environment: A Refresh

May 2018

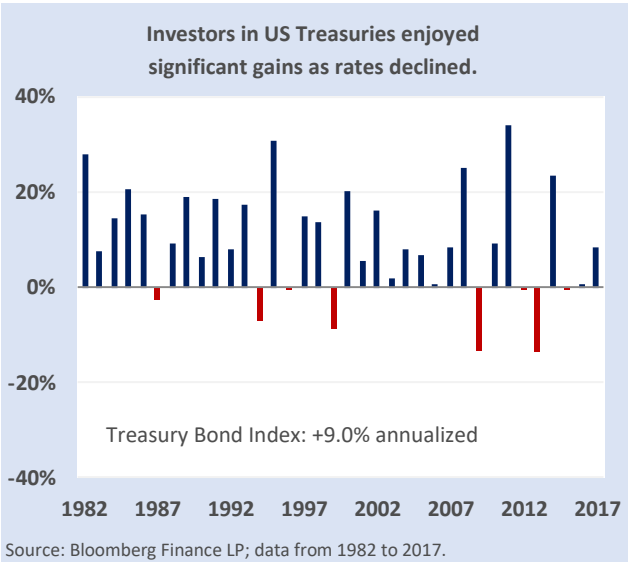
In January 2013, Campbell & Company published a white paper entitled, "Prospects for CTAs in a Rising Rate Environment." At that time, the 10Y Treasury yield was 1.8% - extremely low by historical standards, but more than 40 basis points higher than the low of 1.39% hit some six months earlier. With many concerned about the potential impact of a further increase in yields, our paper sought to evaluate the potential implications of such a shift. Our findings at that time were as follows:

- Traditional assets, like US Equities, Treasuries, or a 60/40 blend, have historically underperformed when interest rates (specifically the Federal Funds Target rate) are rising.
- Performance of the CTA (i.e., Managed Futures) industry in relation to the direction of rates has exhibited a distinctly different pattern than traditional assets: historically, CTA returns have *not* been rate-regime dependent.

Now, with the 10Y yield at 2.9% and the specter of rising interest rates looming again, we've updated the quantitative elements of the paper and find that the same conclusions still hold.

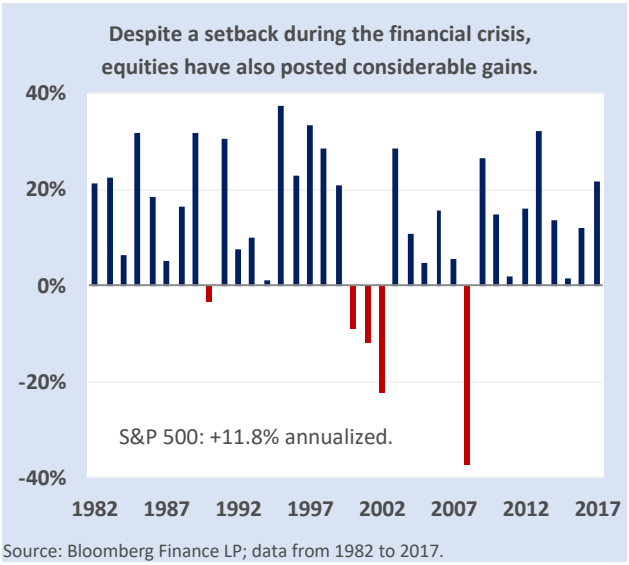
The Fed's expansionary bias since the early 1980s created a powerful tailwind for US fixed income and equity markets, which have both enjoyed significant growth since the early '80s. Exhibit 1 shows the annual return for a static long position in a portfolio of long-dated US Treasury securities since rates began to decline in 1982. During this period (through 2017), a buy-and-hold strategy would have produced annual returns of 9.0% with relatively low volatility (9.3% annualized). Exhibit 2 shows the annual performance of US equities in the same period. Equities did somewhat better than long-term Treasuries, with returns of 11.8% per annum since 1982. Realized volatility was significantly higher as well (14.8% annualized).

EXHIBIT 1 – Annual Returns:
Barclays Capital Long-Term Treasury Bond Index



Source: Bloomberg Finance LP; data from 1982 to 2017.

EXHIBIT 2 – Annual Returns:
S&P 500 Index (with dividends reinvested)



Source: Bloomberg Finance LP; data from 1982 to 2017.

Let's now consider the performance differential between equities and bonds in rising and declining interest rate environments. For this analysis, we will define the interest rate environment using the Fed Funds target rate (monthly, based on average daily value). To capture the results from the last sustained rise in interest rates, we used the entire track record of the Barclays Long-Term Treasury Bond Index, which launched in January 1972.

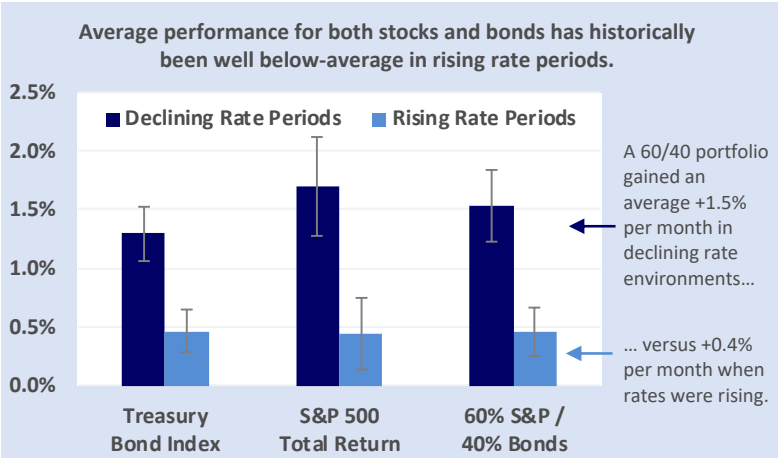
Each month t in our sample was considered to be part of either a 'Rising Rate' or a 'Declining Rate' period, based on the following rules:

- If $Rate_t > Rate_{t-1}$, month t is in a Rising Rate period.
- If $Rate_t < Rate_{t-1}$, month t is in a Declining Rate period.
- If $Rate_t = Rate_{t-1}$, month t is in the same period as month t-1.

Using this approach, the data was parsed into 38 distinct periods of varying length, alternating between Declining Rate and Rising Rate. For each period, the average monthly return was calculated for US Treasuries, US Equities and a traditional 60/40 portfolio (rebalanced monthly). The results were then averaged to determine the overall monthly return for Rising Rate and Declining Rate periods. In order to minimize the impact of several extended periods, each of the 38 periods was given an equal weight regardless of its duration.[1]

The results are summarized in Exhibit 3 (further detail is included in Exhibit A of the Appendix). As expected, US Treasuries performed significantly better in Declining Rate periods, gaining an average +1.3% per month versus +0.5% per month in Rising Rate periods. More interesting, however, is the notable difference in equity returns in the two rate environments. During this extended period, the S&P 500 gained an average +1.7% per month in Declining Rate periods and just +0.4% per month in Rising Rate periods, suggesting that equity returns may be as sensitive to the interest rate environment as fixed income returns (and possibly more so).

EXHIBIT 3 – Average Monthly Return since 1972



Source: Bloomberg Finance LP. Data from 1972 to 2017. 60/40 portfolio assumes monthly rebalancing. Each error bar extends one standard error on either side of the mean return.

The historical underperformance of US equities and fixed income in Rising Rate periods underscores the importance of portfolio diversification in such an environment. CTAs have historically been a powerful diversification tool, particularly in bear markets for equities, when beta-oriented portfolios may sustain large losses (i.e. 1990, 2000-2002, 2008) and CTAs have typically been able to profit from the presence of market trends. However, there has been some discussion recently about whether the CTA industry will be able to provide the same level of diversification in the future.

How will a rising interest rate environment impact CTA performance?

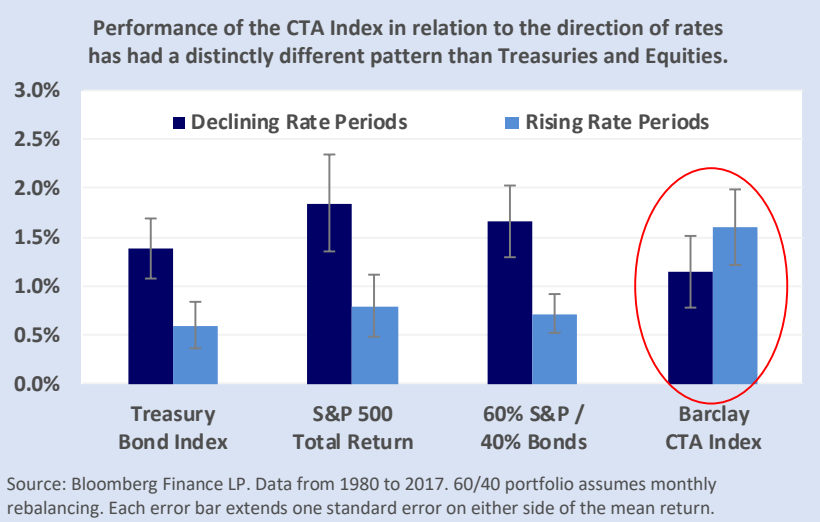
To address this question, let's first take a look at historical industry performance in relation to the direction of rates.

The Barclay CTA Index tracks the performance of a large group of established trading programs, with monthly data available since January 1980. The average monthly performance of the CTA Index in Rising Rate and Declining Rate periods (as defined earlier) is shown in Exhibit 4 (further detail in Exhibit A of the Appendix). With just a quick glance at the chart, it is

[1] We considered using an approach that included a 'Neutral' category. However, because this required a number of assumptions (i.e., How many months without a rate change signal the beginning of a Neutral period?), we opted for the simpler binary methodology.

evident that the historical performance of the CTA Index (circled in red) has exhibited a distinctly different pattern than treasuries and equities in relation to changes in the Fed Funds target rate. Since 1980, the Barclay CTA Index had *higher* average monthly performance in Rising Rate periods (though this was not a statistically significant finding, indicated in the chart by the overlapping error bars). From a statistical standpoint, the average returns of the CTA Index in Declining and Rising Rate periods are indistinguishable.

EXHIBIT 4 – Average Monthly Return since 1980



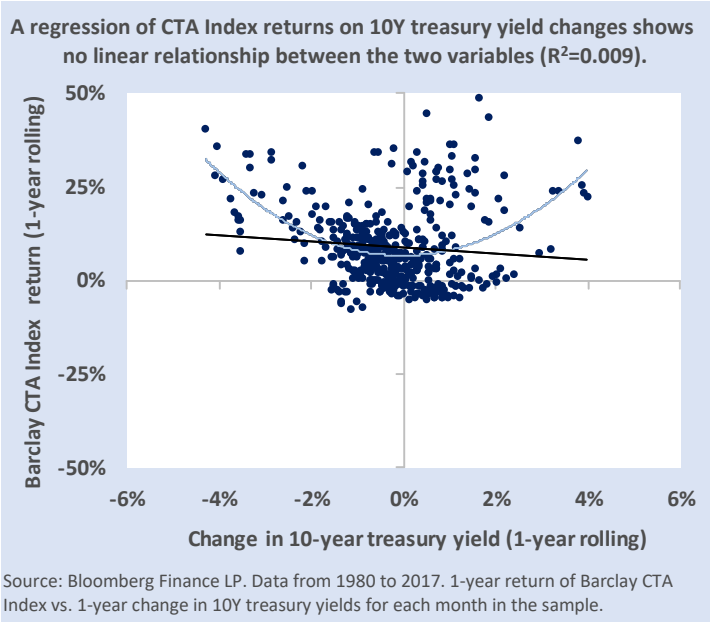
Source: Bloomberg Finance LP. Data from 1980 to 2017. 60/40 portfolio assumes monthly rebalancing. Each error bar extends one standard error on either side of the mean return.

Though this excludes data from the inflationary 1970s (unlike the prior chart, which includes data since 1972) the same relative underperformance is observed for Treasury Bonds, the S&P 500 Total Return and 60/40 portfolios in Rising Rate periods.

Another way to measure the sensitivity of CTA strategies to the interest rate environment is through a regression of historical performance on changes in treasury yields. Using 1-year rolling results (based on monthly data), we found that a simple regression of CTA Index returns on changes in the 10-year treasury yield showed no linear relationship (R^2 = 0.009; this measures the variance in performance attributable to changes in the underlying variable, with values ranging from 0 to 1). This suggests that the direction of treasury yield changes has historically had no adverse impact on CTA Index returns. The scatter plot (Exhibit 5) shows the results for each point in the regression, as well as the trendline (in black).[2]

The regression results are consistent with our previous findings (in relation to the Fed Funds target rate). Specifically, we found no apparent relationship between the direction of treasury yields and the historical performance of the Barclay CTA Index. This may surprise those readers that attribute CTA profits mostly to holding static long positions in fixed income during the 30-year rally in Treasuries.

EXHIBIT 5 – CTA Index Return vs. 10Y Treasury Yield Change



Source: Bloomberg Finance LP. Data from 1980 to 2017. 1-year return of Barclay CTA Index vs. 1-year change in 10Y treasury yields for each month in the sample.

Ideally, it would be useful to see how the CTA industry fared in the 1970s, but there is very limited index data going back that far. Even the indices going back to 1980 (like Barclay CTA) are suboptimal due to a lack of continuity in index constituency. The composition of the indices has changed dramatically as the industry has grown. For instance, Barclay CTA included 15 programs at its inception in 1980; now it includes 522 (as of Dec-17).

Instead of using a manager-based index, a second option is to use a rules-based benchmark, which tracks the performance of a simple trend following system (or group of systems) applied to a portfolio of futures markets. Though trend following is just one of several strategies used by CTAs (others include pattern recognition, macro, counter-trend, arbitrage

[2] The second order regression line (the "smile") is shown in blue. This shows that while there was no material *linear* relationship between the two variables, there was some evidence that larger yield changes (either positive or negative) have historically coincided with above average CTA Index returns. Of course, this is based on relatively few observations for yield changes of 2% or more.

and short-term trading), it is the most widely used. Several different "off the shelf" indices were considered (i.e., S&P Diversified Trend Indicator, Newedge Trend Indicator, etc.), but each was ruled out due to either limited history or a lack of diversification by sector or time horizon. Consequently, we constructed our own trend following benchmark.

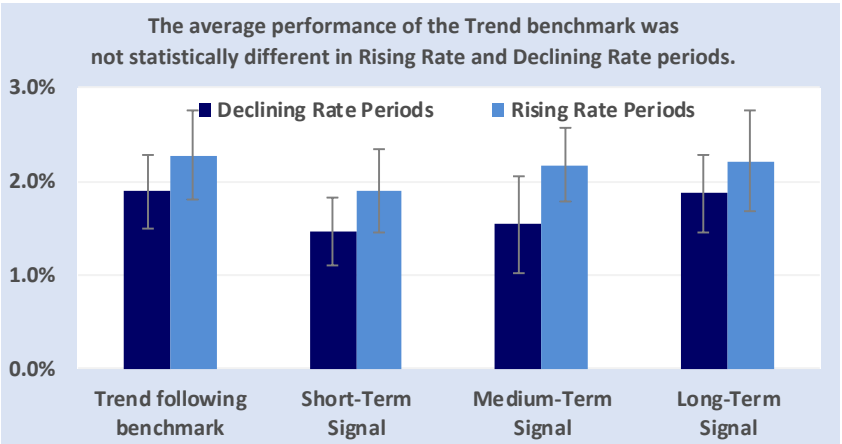
Our benchmark was created using actual futures data from Jan-72 to Dec-17. A selection of equity, fixed income, foreign exchange and commodity markets are included, based on data availability (for example, only commodity futures data is available from 1972 to 1974; please see Appendix Exhibit B for market and sector detail). Trend signals are based on the sign of cumulative returns for a short-term (1-month), medium-term (3-month) and long-term (12-month) lookback period; the composite trend signal reflects a simple average of all 3. Other assumptions include equal risk weighting by sector, constant capital, and a 2 and 20 fee structure. Slippage costs of 1-tick per contract traded are uniformly applied, and cash returns are calculated based on the T-bill rate. Portfolio volatility is normalized to approximately 15% annualized, based on monthly performance.[3]

Please note that benchmark construction was intended to be as generic as possible, and does not rely on proprietary methodologies used by Campbell.

As before, we calculated the average monthly return in Rising Rate and Declining Rate periods, this time for our benchmark and its underlying signals by time horizon. The results, shown on the right in Exhibit 6, indicate that the average performance of the trend following benchmark was not statistically different in the two interest rate environments. This was true for all three lookback periods as well.

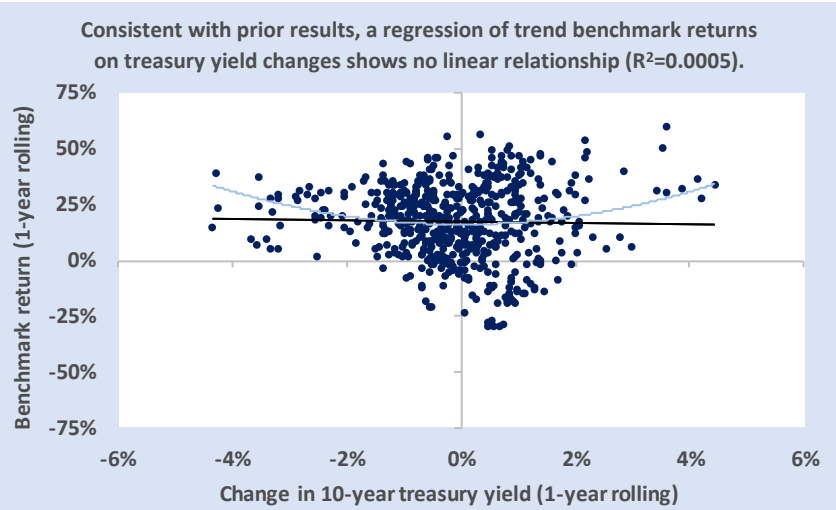
We also performed a regression of benchmark performance on the change in 10-year treasury yields (1-year rolling, based on daily data from 1972 to 2017). The R^2 of this regression, like the previous one, is approximately 0 (0.0005). A scatter plot of the 1-year benchmark return versus the 1-year change in treasury yields (daily, with every 20th data point shown) is shown in Exhibit 7, with the trendline in black.[4]

EXHIBIT 6 – Average Monthly Return for the Trend benchmark



Source: Campbell & Company. Data from 1972 to 2017. Each error bar extends one standard error on either side of the mean return.

EXHIBIT 7 – Trend Benchmark Return vs. 10Y Treasury Yield Change



Source: Bloomberg Finance LP, Campbell; data from 1972 to 2017. 1-year benchmark return plotted vs. 1-year change in 10Y yield for each day in the sample (every 20th data point shown).

[3] A leverage adjustment was made to the benchmark (prior to the inclusion of interest income) to bring its realized volatility more in line with that of the Barclay CTA Index and the S&P 500 Total Return (14.9% and 15.5% annualized, respectively). Volatility calculations are based on monthly returns from 1972 (or 1980 for the CTA Index) through 2017.

[4] The second order regression line, shown in blue, indicates that there was some evidence that larger yield changes (either positive or negative) historically coincided with above average benchmark performance, though the effect was not as strong as with the CTA Index.

These results are entirely consistent with the results from our prior analysis of the Barclay CTA Index. To summarize, an evaluation of CTA performance in relation to the direction of rates suggests that returns have not historically been rate regime-dependent.

Our quantitative assessment of CTA performance suggests that industry returns have historically been invariant to the interest rate environment. Now let's consider why this should be the case.

Perhaps the most critical consideration when evaluating the impact of *anything* on portfolio performance is the level of underlying diversification, which can either moderate or magnify aggregate factor exposure. Though there are exceptions, most CTAs take a multi-dimensional approach to diversification: portfolios tend to include a range of strategies exploiting multiple alpha sources and trading different markets, sectors, regions and time horizons, to name a few. This approach to portfolio construction will tend to offer a measure of protection from any single external risk factor. For example, a shift in the monetary policy environment in any one region should have a limited impact on a CTA with global exposure (though there can certainly be a spillover effect from policy shifts in the larger global economies).

Market and sector diversification is customary, with many CTAs trading in 60 different markets or more. It is common for trading programs to include exposure to commodities, foreign exchange, fixed income and equity index futures, limiting the effect of any one sector on overall performance (though some specialist funds do target opportunities in one sector only, most commonly foreign exchange).

Historically, it has been unusual for all four sectors to be profitable or unprofitable in any one year – typically two or three sectors have provided the best opportunities. As an example, the chart on the right (Exhibit 8) shows sector performance (positive or negative) for the CTA benchmark in each of the last 20 years. While there were four instances (most recently in 2008) when returns were positive in all sectors, you'll notice that in most years sector returns were mixed. In the 20-year sample, the only year in which all sectors were negative was 2009 - perhaps explaining why this was such a difficult year for the industry.

Strategy diversification can also be helpful. Though many trading programs rely solely on trend-based strategies, some CTAs also use non-trend strategies, which may provide profitable opportunities unrelated to the "trendiness" of markets. These strategies can include Relative Value, Carry and Mean Reversion (among others).

EXHIBIT 8 – Trend Benchmark P&L by Sector

Sector diversification has been very effective; historically, CTA performance by sector (positive or negative) has varied over time.

	Fixed Inc.	FX	Equity	Commod.
1998	+	+	+	+
1999	-	-	+	+
2000	+	+	-	+
2001	+	+	+	+
2002	+	+	-	-
2003	-	+	+	+
2004	-	-	+	+
2005	+	-	+	-
2006	-	-	+	+
2007	+	+	-	+
2008	+	+	+	+
2009	-	-	-	-
2010	+	+	-	+
2011	+	-	-	-
2012	-	+	+	-
2013	-	-	+	-
2014	-	+	-	+
2015	-	-	+	+
2016	+	-	-	-
2017	-	-	+	-

Source: Campbell. Data from 1998 to 2017.

CONCLUSION

An analysis of CTA performance in relation to the direction of interest rates (as defined by changes to the Fed Funds target rate) suggests that the strategy has *not* historically been rate regime-dependent. Using both the Barclay CTA Index and a proprietary trend following benchmark as proxies for the industry, we observed no difference between average monthly performance in rising and falling rate environments (if anything, the strategy tended to do somewhat better when rates were rising, though this result was not statistically significant). The same results were observed for short-term, medium-term and long-term trend signals. In addition, a simple regression of CTA returns on changes in the 10-year treasury yield indicated that there has, historically, been no linear relationship between industry performance and the direction of treasury yield changes. The multi-dimensional approach to portfolio diversification employed by many CTAs may be one reason why the monetary policy environment has historically had a minimal impact on performance.

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Preqin Hedge Fund Spotlight, November 2012.

APPENDIX:

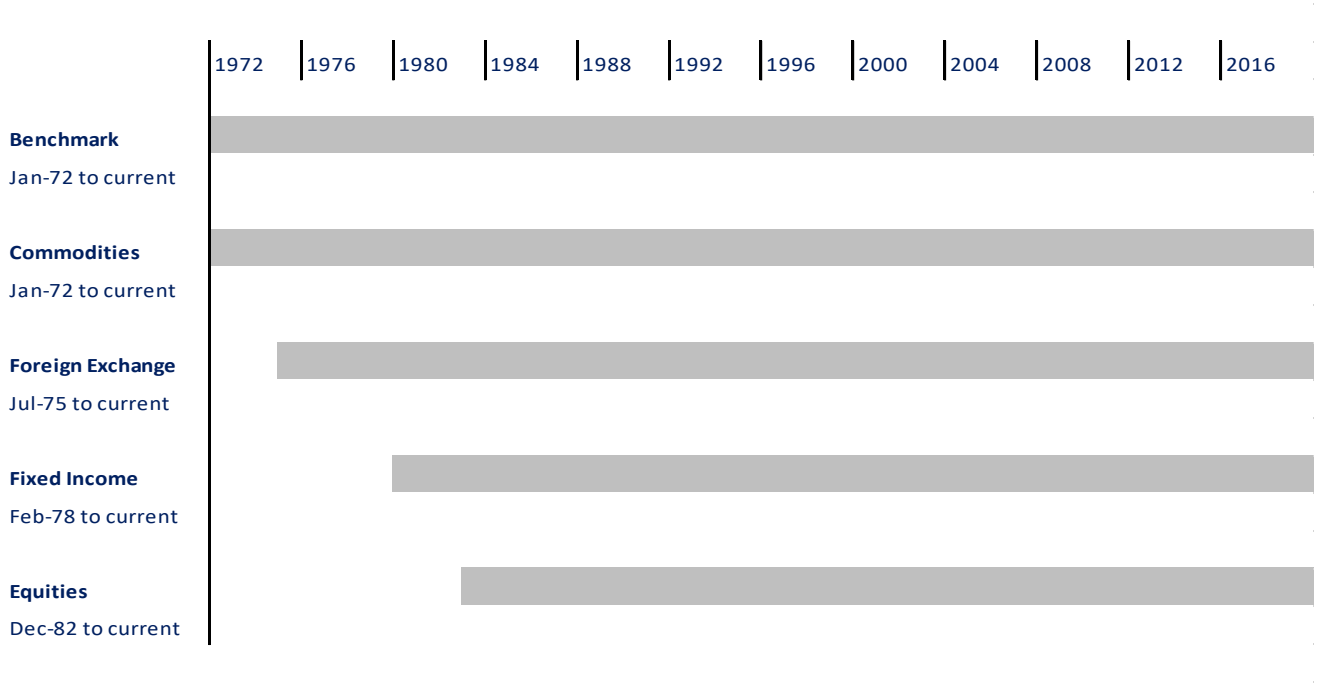
EXHIBIT A- Average monthly return in each Rising Rate and Declining Rate period since 1972

			Average Monthly Return:				
Start	End	Direction of Rates	Treasury Bond Index	S&P 500 Total Return	60/40 Portfolio	Barclay CTA Index	Trendfollowing Benchmark
Jan-72	Feb-72	Declining	0.7%	2.4%	1.7%		1.7%
Mar-72	Aug-73	Rising	0.4%	0.1%	0.2%		4.5%
Sep-73	Feb-74	Declining	0.8%	-1.0%	-0.3%		5.7%
Mar-74	Jun-74	Rising	-0.5%	-2.4%	-1.6%		-1.9%
Jul-74	May-75	Declining	1.0%	1.0%	1.0%		3.0%
Jun-75	Sep-75	Rising	0.1%	-1.7%	-1.0%		2.2%
Oct-75	Mar-76	Declining	1.3%	4.2%	3.0%		1.3%
Apr-76	Jun-76	Rising	0.4%	0.8%	0.7%		5.5%
Jul-76	Nov-76	Declining	1.4%	-0.1%	0.5%		4.5%
Dec-76	Mar-80	Rising	0.1%	0.5%	0.3%		5.9%
Apr-80	Jul-80	Declining	3.6%	5.3%	4.6%	4.1%	-0.7%
Aug-80	Dec-80	Rising	-0.4%	2.8%	1.5%	0.6%	2.4%
Jan-81	Apr-81	Declining	-0.3%	-0.1%	-0.2%	0.8%	2.5%
May-81	May-81	Rising	2.6%	0.3%	1.2%	3.6%	1.7%
Jun-81	Dec-81	Declining	1.1%	-0.7%	0.0%	2.3%	2.9%
Jan-82	Mar-82	Rising	1.1%	-2.4%	-1.0%	4.2%	3.3%
Apr-82	Apr-83	Declining	2.2%	4.3%	3.5%	1.0%	0.6%
May-83	Jul-83	Rising	-0.8%	-0.0%	-0.3%	1.2%	0.3%
Aug-83	Feb-84	Declining	0.9%	-0.1%	0.3%	1.5%	-0.3%
Mar-84	Aug-84	Rising	0.6%	1.4%	1.1%	0.7%	2.8%
Sep-84	Jan-85	Declining	2.3%	2.0%	2.1%	1.3%	2.2%
Feb-85	Mar-85	Rising	0.1%	0.7%	0.4%	1.8%	1.1%
Apr-85	Jun-85	Declining	2.6%	2.4%	2.5%	-1.8%	2.4%
Jul-85	Nov-85	Rising	1.2%	1.4%	1.4%	3.1%	3.7%
Dec-85	Nov-86	Declining	1.5%	2.3%	2.0%	1.1%	1.6%
Dec-86	Oct-87	Rising	-0.4%	0.4%	0.0%	3.4%	1.8%
Nov-87	Feb-88	Declining	2.4%	1.9%	2.1%	3.0%	1.9%
Mar-88	May-89	Rising	0.6%	1.7%	1.3%	2.4%	4.3%
Jun-89	Jan-94	Declining	1.4%	1.3%	1.4%	0.4%	3.7%
Feb-94	Jun-95	Rising	0.4%	1.0%	0.8%	0.7%	1.6%
Jul-95	Feb-97	Declining	0.5%	2.5%	1.7%	1.1%	2.1%
Mar-97	Aug-98	Rising	1.6%	1.3%	1.4%	0.4%	3.4%
Sep-98	May-99	Declining	-0.4%	4.2%	2.3%	0.4%	-0.9%
Jun-99	Dec-00	Rising	0.9%	0.2%	0.5%	0.3%	1.0%
Jan-01	Jun-04	Declining	0.6%	-0.2%	0.1%	0.5%	1.1%
Jul-04	Aug-07	Rising	0.5%	1.0%	0.8%	0.3%	1.0%
Sep-07	Nov-15	Declining	0.8%	0.7%	0.7%	0.3%	0.4%
Dec-15	Dec-17	Rising	0.4%	1.4%	1.0%	-0.1%	-1.2%

Source: Campbell, Bloomberg Finance LP. Data from Jan-72 to Dec-17.

EXHIBIT B – Trend Following Benchmark Composition

Sectors included, by date (based on availability of actual futures data):



Markets included:

10Y Japanese Govt Bond	Crude Oil	Long Gilt	South African Rand Synthetic
10Y Treasury Notes	Euribor	Mexican Peso	Soybeans
5Y Treasury Notes	Euro	Mini SP 500 Index	SPI200 Index
Amsterdam Exchange Index	Euro-BOBL	NASDAQ 100 E-MINI Index	Sugar #11 (World)
Australian 10Y 6% Bond	Euro-Bund	Natural Gas	Swedish Krona
Australian 3Y 6% Bond	Eurodollar	New Zealand Dollar	Swiss Franc
Australian Bank Bills	FTSE Index	Norwegian Krona	Synthetic Aluminum
Australian Dollar	DAX Index	NY Gasoline RBOB	Synthetic Copper
British Pound	Gold	OMX Stock Index	Synthetic Nickel
CAC 40 Stock Index	Hang Seng Index	S&P Canada 60 Index	Synthetic Zinc
Canadian 10Y Govt Bond	Japanese Yen	Short Sterling	US Bond
Canadian Dollar	Lean Hogs	Silver	Wheat
Coffee	Live Cattle	SIMEX MSCI Taiwan Index	
Corn	London Brent Crude	Simex Nikkei	
Cotton	London Gas Oil	Singapore Dollar Synthetic	

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