How trend-following strategies navigate economic cycles

SEVENCAPITAL MANAGEMENT

For some time now, investors have been asking questions about the ability of CTA[1]-type trend-following strategies to deliver performance. Our analysis will ascertain whether this poor performance can be explained by the current environment of historically low rates and intervention by central banks. We will also examine the environment in which this strategy delivers strong performance.

The aim of this analysis is to look at how a CTA behaves in different economic environments, and it is certainly interesting for investors to understand how a CTA reacts in the event of a rate hike, renewed inflation, a slowdown in growth or severe shocks on equity or interest rate markets. We will therefore start by examining the asset classes to be favoured in different economic scenarios. Next, we will describe how a CTA is constructed, by describing its approach in terms of indicator and allocation. To conclude, we will examine how our CTA navigates various economic cycles and how it behaves in response to shocks on interest rate and equity markets.

Asset classes and economic cycles

According to Ray Dalio, Chairman of Bridgewater Associates LP[2], it is easier to understand the market by looking at it in terms of a quadrant which examines changes in inflation and growth in relation to market expectations.
Based on the current position in the quadrant, asset classes will tend to outperform differently. It is thus important to know how to select the products that will respond best to the prevailing economic phase. To this end, Bridgewater analysed the behaviour of various asset classes in differing environments over a number of years. The results were as follows:

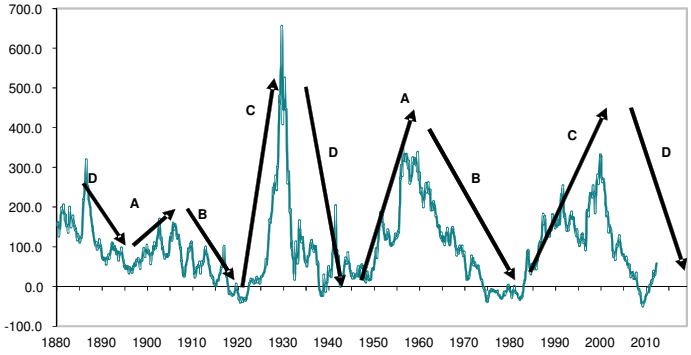
	Growth	Inflation
Rising	25% of Risk Equities Commodities Corporate Credit EM Credit	25% of Risk IL Bonds Commodities EM Credit
Market Expectations		
Falling	25% of Risk Nominal Bonds IL Bonds	25% of Risk Equities Nominal Bond

Source: "All Weather Strategy Story" Bridgewater Associates LP

- At times when growth is outstripping expectations, investment in the following assets should be preferred:
  - *Equities*
  - *Commodities*
  - *Corporate bonds*
  - *EM credit*
- At times when growth is falling more than expected, investment in the following assets should be preferred:
  - *Nominal Bonds*
  - *Inflation-linked bonds*
- At times when inflation is outstripping expectations, investment in the following assets should be preferred:
  - *Inflation-linked bonds*
  - *Commodities*
  - *EM credit*
- At times when inflation is falling more than expected, investment in the following assets should be preferred:
  - *Equities*
  - *Nominal Bonds*

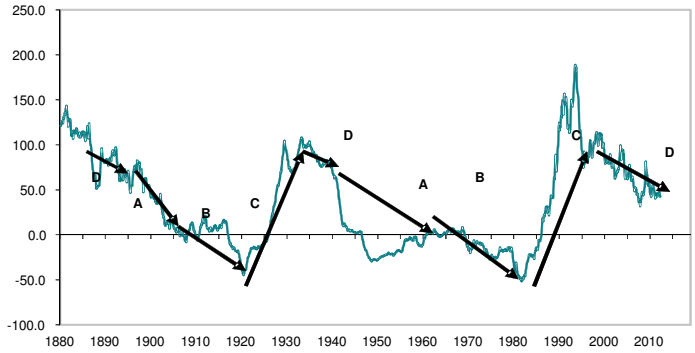
A study conducted by teams from Seven Capital Management arrives at the same conclusions as Bridgewater Associates LP.
The graphs below show market price movements during various economic phases since 1880:
A: Golden Age (period of prosperity)
B: Inflation (period when prices are increasing)
C: Disinflation (period when price increases are slowing)
D: Deflation (period when prices are decreasing)

Equities



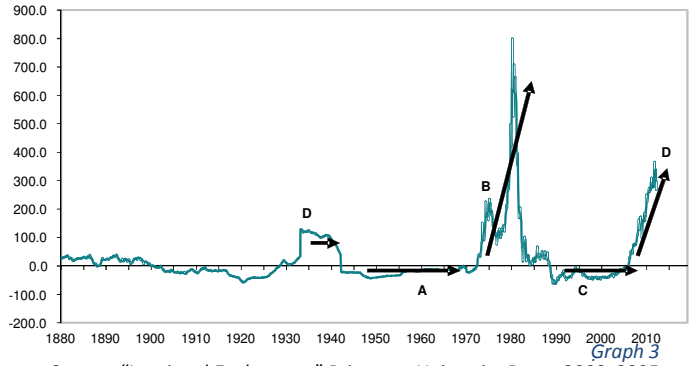
Graph 1

Bonds



Graph 2

Gold



Graph 3

Source: "Irrational Exuberance" Princeton University Press, 2000, 2005, updated. Robert J. Shiller

The conclusions are as follows:
During periods of growth and/or disinflation, investment in equities is essential. In periods of recession and/or deflation, bonds are the investment of choice, and in periods of inflation, gold is the medium to be preferred.

The major difficulty lies in knowing which phase of the economic cycle we find ourselves in, so that we know which medium to invest in; it is easier to ascertain this after the event, but by then, it is too late to invest.
"In the business world, the rear-view mirror is always clearer than the windshield." ***Warren Buffet.***

This is why Bridgewater decided on a 25% risk allocation in its "All Weather" fund for each of the scenarios outlined above (see figure 1). This type of approach helps in navigating both the good and the more turbulent phases of the market with ease. (*Source: "All Weather Strategy Story" Bridgewater Associates LP).*

	Equities	Bonds	Gold
D: deflation	---	++	+++
A: golden age	+++	--	-
B: inflation	-	---	+++
C: disinflation	++	+++	---

Source: Seven Capital

Figure 2

Description of a CTA strategy

The CTA described here will be known as CTA alpha (this is a historic backtest[3]). From our perspective, it reflects the approach taken by medium-term/long-term CTAs and thus has the same performance structure. It can therefore be said that CTA alpha is a reasonable approximation of the average of medium-term/long-term CTAs and is therefore representative of this industry.

"Life is really simple, but we insist on making it complicated." ***Confucius***
"There seems to be some perverse human characteristic that likes to make easy things difficult." ***Warren Buffet***

There are four main components to a CTA:
- The markets in which it invests
- The market allocation
- The indicator of direction (long/short/neutral)
- The risk target, expressed as volatility

The markets comprising our investment universe

Products	Bloomberg Code	Exchange	Asset class
3 Month Euro Euribor	ER7 Comdty	LIFFE	Short rate
90 Day Eurodollar	ED7 Comdty	Chicago Mercantile Exchange	Short rate
Euro-Bund	RX1 Comdty	Eurex	Bond
US 10YR Note	TY1 Comdty	Chicago Board of Trade	Bond
JPN 10Y Bond	JB1 Comdty	OSE-Osaka Exchange	Bond
S&P500 Emini	ES1 Index	Chicago Mercantile Exchange	Equity Index
Euro Stoxx 50	VG1 Index	Eurex	Equity Index
Nikkei 225	NI1 Index	Singapore Exchange	Equity Index
WTI Crude	CL1 Comdty	New-York Merchantile Exchange	Energy
Gold 100 Oz	GC1 Comdty	Commodity Exchange	Metals
Wheat	W 1 Comdty	Chicago Board of Trade	Grain

Source: Seven Capital *Figure 3*

The portfolio comprises two short rate markets, three bond markets, three equity markets and three commodities markets. Three geographical regions are covered: Europe, the United States and Japan. The underlying assets are futures contracts.

Allocation

As we do not wish to bet on which markets will perform and which will not, we give equal weighting to our allocation in terms of risk, expressed as the volatility of each product. We do not bring in the correlation[4] at any time.
To achieve this, each product receives an equal allocation in terms of volatility risk[5]: the higher the volatility of a product, the less of an allocation it receives; conversely, the lower the volatility of a product, the greater its allocation.

Indicator

By way of an indicator, we use the 250-day rate of change momentum[6]. This means that if today's closing market price is greater than the closing price 250 days ago, the CTA alpha buys; if today's closing market price is less than the closing price 250 days ago, the CTA alpha sells. This strategy therefore follows the established trend.
"Every body continues in its state of rest, or of uniform motion in a straight line, unless it is compelled to change that state by forces impressed upon it." ***Newton***

Volatility target

The target for our CTA alpha is long-term volatility of 10%.

Analysis of the CTA alpha strategy through economic cycles

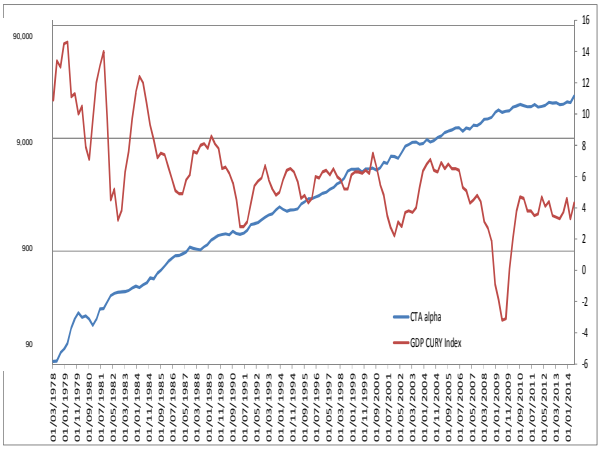
Analysis of the connection between the CTA alpha strategy and growth

The idea of this study is to examine the correlation between our CTA alpha and growth as measured by US GDP, given that growth affects companies' earnings and therefore their profitability. Their stock market value is thus impacted as a result. Our study compares the quarterly data for the CTA alpha strategy defined above with the quarterly data for US GDP *(Bloomberg code: GDP CURY Index)*[7] from 31 March 1978 to 30 June 2014.

We identified four distinct growth regimes:

- High growth rate: above 5.85%, which is the median rate for the range.
- Low growth rate: below 5.85%, which is the median rate for the range.
- Accelerating growth rate: the annual change is positive.
- Decelerating growth rate: the annual change is negative.

Aggregate NAV for CTA alpha and US growth rate



Source: Seven Capital *Graph 4*

CTA alpha	GDP: Strong GDP (>5.85%)	GDP: Weak GDP (<=5.85%)	Rising GDP	Falling GDP
Annualised return	**18.00%**	**13.94%**	**14.44%**	**16.42%**
Volatility	**14.53%**	**10.61%**	**10.44%**	**14.15%**
Sharpe ratio	**1.24**	**1.31**	**1.38**	**1.16**

Source: Seven Capital *Figure 4*

- When the growth rate exceeds 5.85%, the average return from our CTA alpha is 18%, with volatility of 14.53%, giving a Sharpe ratio of 1.24.
- When the growth rate is below 5.85%, the average return from our CTA alpha is 13.94%, with volatility of 10.61%, giving a Sharpe ratio of 1.31.
- When the growth rate is increasing, the average return from our CTA alpha is 14.44%, with volatility of 10.44%, giving a Sharpe ratio of 1.38.
- When the growth rate is falling, the average return from our CTA alpha is 16.42%, with volatility of 14.15%, giving a Sharpe ratio of 1.16.

This shows that our CTA alpha generates positive returns regardless of the growth regime. This therefore proves that the performance of our CTA alpha is not correlated with increasing or decreasing growth. In the event of recession, our CTA alpha may in fact short-sell stock market indices and buy bonds. As periods of recession often go hand-in-hand with deflation, central banks tend to lower headline rates to kick-start the economy, which encourages an increase in bonds. Conversely, periods of positive growth favour stock market indices and may have an adverse effect on bonds. When the economic machine races away, central banks tend to increase rates to prevent overheating.

It can therefore be concluded that the performance of our CTA alpha is independent of the growth rate.

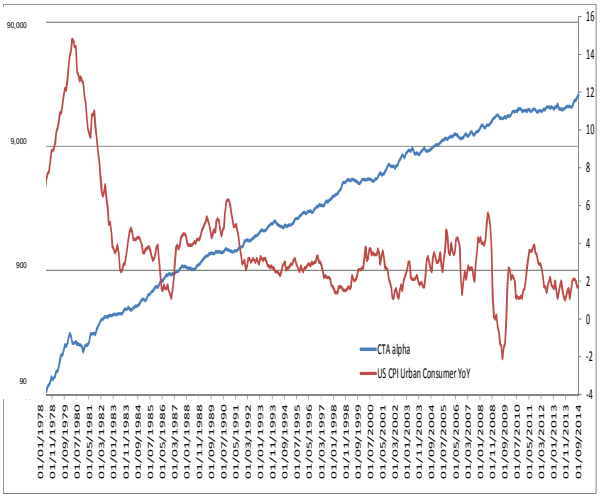
Analysis of the connection between the CTA alpha strategy and inflation

Is there a connection between our CTA alpha and inflation? In an environment, as at present, of significant monetary stimulation, a high risk of future inflation cannot be ruled out. While inflation is currently low and contained, this has not always been the case in the past and may not be in the future. Our study compares the monthly data for the CTA alpha strategy with the monthly data for the US Consumer Price Index *(Bloomberg code: CPI YoY Index)*[8] from 31 January 1978 to 30 September 2014.

We identified four distinct inflation regimes:

- High inflation: CPI above 3.1%, which is the median rate for the range.
- Low inflation: CPI below 3.1%, which is the median rate for the range.
- Rising inflation: CPI with a positive annual change.
- Falling inflation: CPI with a negative annual change.

Aggregate NAV for CTA alpha and US inflation



Source: Seven Capital *Graph 5*

CTA alpha	Inflation (CPI)			
	Inflation (>3.1)	Inflation (<=3.1)	Rise in inflation	Fall in inflation
Annualised return	17.06%	14.19%	14.30%	16.27%
Volatility	12.92%	9.77%	11.34%	10.16%
Sharpe ration	1.32	1.45	1.26	1.60

Source: Seven Capital *Figure 5*

- When the CPI exceeds 3.1%, the average return from our CTA alpha is 17.06%, with volatility of 12.92%, giving a Sharpe ratio of 1.32.
- When the CPI is below 3.1%, the average return from our CTA alpha is 14.19%, with volatility of 9.77%, giving a Sharpe ratio of 1.45.
- When the CPI is increasing, the average return from our CTA alpha is 14.30%, with volatility of 11.34%, giving a Sharpe ratio of 1.26.
- When the CPI is falling, the average return from our CTA alpha is 16.27%, with volatility of 10.16%, giving a Sharpe ratio of 1.60.

This shows that our CTA alpha generates positive returns regardless of the level of inflation, thereby demonstrating that the performance of our CTA is not linked to changes in inflation.

It can therefore be concluded that the performance of our CTA alpha is independent of inflation.

Analysis of the connection between the CTA alpha strategy and interest rates

Is there a connection between our CTA alpha and changes in interest rates? Interest rates have an impact on operators' capacity to lend and borrow money. As interest rates change over time, they may have a considerable impact on the results of our CTA alpha strategy. The current environment, characterised by exceptionally low rates, will not last forever. Our study compares the monthly data for the CTA alpha strategy with the monthly data for a US generic 10-year rate *(Bloomberg code: USGG10YR Index)* from 31 January 1978 to 30 September 2014.

We identified four distinct interest rate regimes:

- High interest rates: above 6%, which is the median rate for the range.
- Low interest rates: below 6%, which is the median rate for the range.
- Rising interest rate: rate with a positive annual change.
- Falling interest rate: rate with a negative annual change.

Aggregate NAV for CTA alpha and US 10-year rate

Source: Seven Capital

Graph 6

CTA alpha	Interest rates: High rate (>6%)	Low rate (<=6%)	Rising rate	Falling rate
Annualised return	**17.80%**	**12.98%**	**12.84%**	**17.19%**
Volatility	**12.49%**	**9.93%**	**12.72%**	**8.95%**
Sharpe ratio	**1.43**	**1.31**	**1.01**	**1.92**

Source: Seven Capital

Figure 6

- When the interest rate exceeds 6%, the average return from our CTA alpha is 17.80%, with volatility of 12.49%, giving a Sharpe ratio of 1.43.
- When the interest rate is below 6%, the average return from our CTA alpha is 12.98%, with volatility of 9.93%, giving a Sharpe ratio of 1.31.
- When the interest rate is rising, the average return from our CTA alpha is 12.84%, with volatility of 12.72%, giving a Sharpe ratio of 1.01.
- When the interest rate is falling, the average return from our CTA alpha is 17.19%, with volatility of 8.95%, giving a Sharpe ratio of 1.92.

Conclusion: Our CTA generates positive returns regardless of the level of US 10-year rates, thereby demonstrating that the performance of our CTA is not linked to changes in interest rates.

It can therefore be concluded that the performance of our CTA alpha is independent of interest rates.

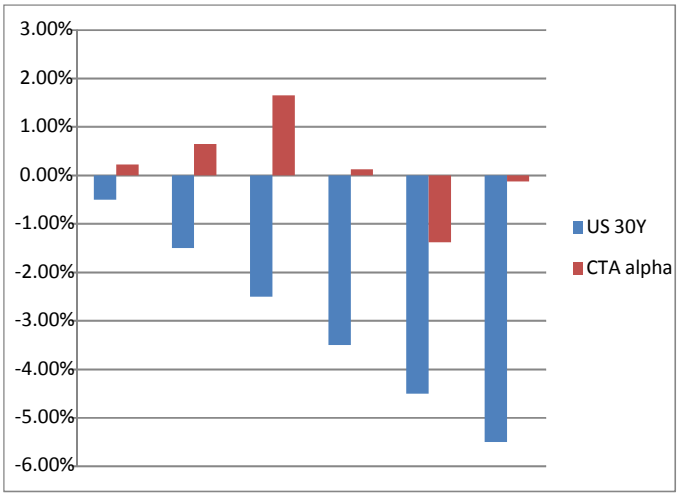
Analysis of the CTA alpha strategy in response to market shocks.

"Amateurs want to be right. Professionals want to make money." ***Jesse Livermore***

The study will now look at how the CTA alpha strategy behaves in response to rate and equity index shocks. For rates, we will use the US generic 30-year interest rate futures (Bloomberg code: TY1 Comdty) and for equities, let us consider the S&P 500, a wide-ranging US index (Bloomberg code: SPX Index). A "shock" is defined as a fall within a specific range over a short space of time (one month).

Analysis of the CTA strategy in response to a rate shock

CTA alpha performance vs. US 30-year rate shock over one month



Source: Seven Capital *Graph 7*

CTA alpha performance vs. US 30-year rate shock							Average
US 30Y	0%-1%	-1%-2%	-2%-3%	-3%-4%	-4%-5%	-5.00%	-3.50%
CTA	0.23%	0.65%	1.65%	0.13%	-1.38%	-0.12%	0.19%

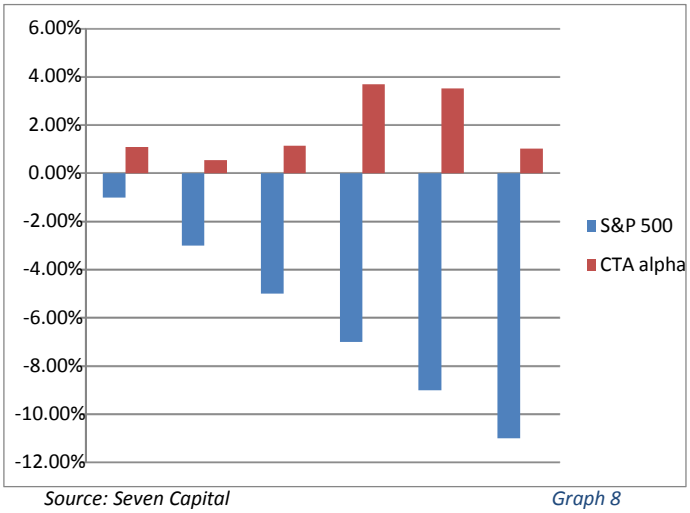
Source: Seven Capital *Figure 7*

Our CTA alpha responds well to a rate shock where the movement is within a small or average range (0 to -3%) and slightly less well to more severe shocks, although in this case the negative returns that it generates are very contained: -1.38% against an average of -3.50% for the US 30-year rate and -0.12% against an average of -6.5% for the US 30-year rate. If we take an average of the US 30-year rate shocks, our CTA alpha responds positively, at +0.19%.

It can therefore be concluded that our CTA does not lose money on bond shocks and even generates a slight gain.

Analysis of the CTA strategy in response to an equity shock

CTA alpha performance vs. S&P 500 shock over one month



Source: Seven Capital *Graph 8*

CTA alpha performance vs. S&P 500 shock							Average
S&P 500	0%-2%	-2%-4%	-4%-6%	-6%-8%	-8%-10%	-10.00%	-7%
CTA	1.09%	0.55%	1.13%	3.70%	3.53%	1.03%	1.84%

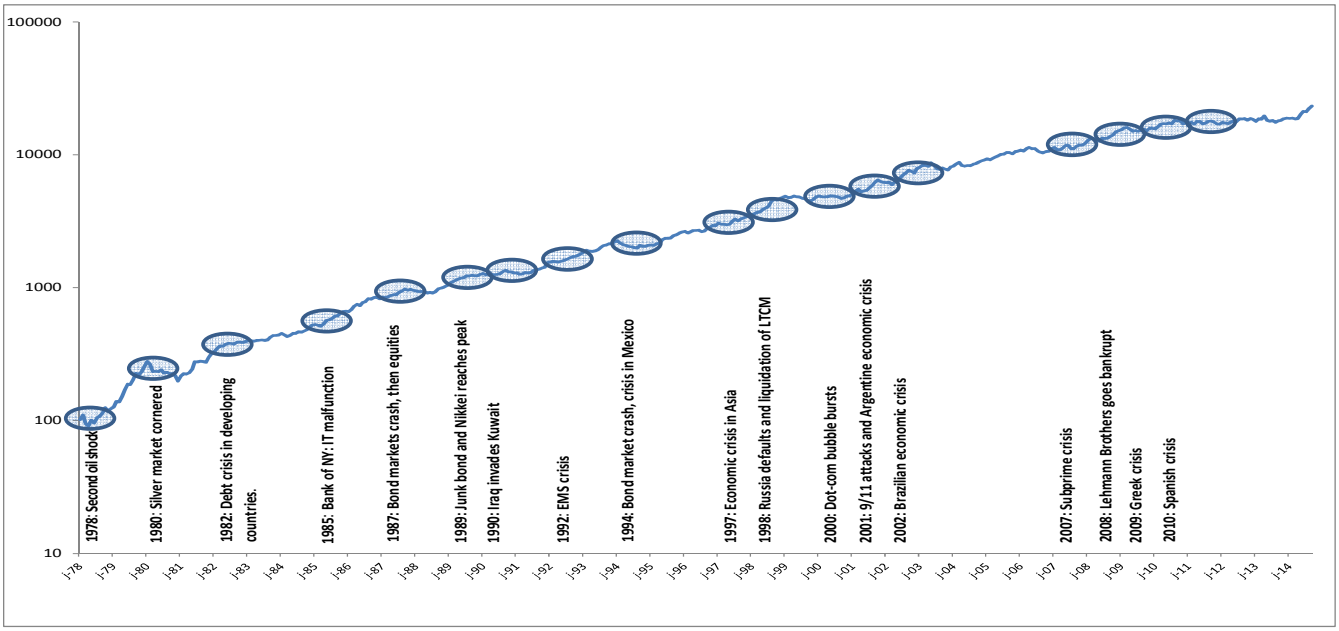
Source: Seven Capital *Figure 8*

Our CTA alpha responds well to an equity shock regardless of the range of the movement. If we take all S&P 500 shocks into consideration, our CTA alpha performs positively on average, at +1.84%.

It can therefore be concluded that our CTA alpha tends to generate gains during equity shocks. It is thus an excellent hedge for equities.

Analysis of the CTA alpha strategy in response to crises since 1978.

"I've failed over and over and over again in my life. And that is why I succeed." ***Michael Jordan***



Source: Seven Capital

Graph 9

1978: Second oil shock
1980: The Hunt brothers corner the silver market
1982: Debt crisis in developing countries, with Mexico's default and a sharp fall in the Fed's rates
1985: An IT malfunction at the Bank of New York on 21 November brings the settlement system for US government bonds to a standstill for nearly 28 hours.
1987: Bond market crash, followed by the equity markets in October.
1989: Junk bond. The return on junk bonds rises 450 basis points above the return on government bonds at over 1,000 basis points.
1989: The Japanese speculative bubble reaches its peak on 29 December.
1990: Iraq invades Kuwait on 2 August.
1992: EMS crisis in connection with the French referendum on the Maastricht Treaty. The Italian lira and the pound sterling withdraw from the ERM. The franc is attacked, increasing the overnight money market rate by over 20%.
1993: August sees the second attempt to break the parity of the Deutsche Mark and the French franc, which meets with success. The fluctuation margins for the EMS are widened considerably.
1994: Bond market crash. The market had anticipated that short rates would continue to fall. This proves to be a mistake.
1994: Economic crisis in Mexico (the "Tequila crisis")
1997: Economic crisis in Asia
1998: Russia defaults on GKO government bonds and US hedge fund LTCM is forced into liquidation.
2000: The dot-com bubble bursts.
2001: 9/11 terrorist attacks
2001: Argentine economic crisis hits in November.
2002: Brazil is put under pressure following Argentina's default. Its government bond reaches 2,300 basis points above the US bond. The real falls by more than half over the period.
2007: The subprime crisis follows the securitisation of bad loans resulting from the US property bubble of the 2000s.
2008: Lehmann Brothers goes bankrupt
2009: Crisis in Greece with debt of 120% of GDP and a budget deficit reaching close to 16%
2010: Crisis in Spain due in part to the property bubble that began in 1999.

It can be seen that since 1978 and despite the various crises, the CTA alpha strategy has kept marking new highs while its volatility and drawdown risk have remained under control[9].

Conclusion

"Cut your losses and let your profits run." ***David Ricardo***

Identifying the trend and following it is an age-old axiom. Trend following is thus a simple and long-established concept. Despite their simplicity, CTAs that adopt this approach have always been denigrated by academia. There may be several explanations for this:
The first is the theory of efficient markets: if trend following worked, everyone would do it and it would no longer work.
The second is that academics have always compared trend following to technical analysis which, in their view, is a purely esoteric approach.
The third reason is the lack of transparency. CTAs are always likened to "black boxes", making them complicated for investors to understand.
Lastly, the leverage employed through futures markets has always been a source of concern for investors.

This analysis appears to show that, despite the ubiquity of the efficient markets hypothesis in academic thought (and, indeed, in teaching), CTAs are highly effective at navigating economic cycles.
Their approach is in no way esoteric and is based on a carefully considered investment process which, unlike graphical analysis, leaves no room for interpretation.
With regard to the "black box" aspect, we have lifted the veil by describing a momentum indicator.
And while leverage is certainly present, it is an outcome of drastic risk management measures. It is therefore positive leverage that reduces the portfolio risk, rather than the opposite.

CTAs therefore offer unique diversification through their performance, which navigates time and changing economic cycles with ease. They generate strong and steady performance in an environment of controlled risk and are thus major assets that are essential components of an investor's portfolio.

Appendix

1.CTA: Commodity Trading Advisor

2. Bridgewater Associates LP: Bridgewater has $125 billion of assets under management and is based in Westport, USA.

3. Backtest: historical simulation of transactions which reflects brokerage and slippage to recreate a net asset value incorporating the monetary remuneration for non-security deposit monies.

4. Correlation: extent of the relationship between two variables as expressed by the following mathematical formula:

$$r = \frac{\sum(X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum(X - \overline{X})^2}\sqrt{\sum(Y - \overline{Y})^2}}$$

5. Volatility: Historical volatility is based on the historical changes in the price of a security. It may be calculated over different time frames according to the desired analysis.
The mathematical formula for volatility is as follows:

$$\sigma(x) = \sqrt{V(x)} = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}}$$

6. Rate of change momentum: trend-following strategy with the following parameters:
If closing price on (d) ≥ closing price on (d-250d), then the position is long
If closing price on (d) < closing price on (d-250d), then the position is short
The aim is two-fold: following the established trend and cutting losses if this proves wrong.

7. GDP CURY Index: US gross domestic product (GDP) measures the final market value of all goods and services produced in the country. It is the most frequently used indicator of economic activity. GDP as the sum of expenditure measures the total final expenditure (at purchase price) and includes exports less imports. This value is not adjusted for inflation.

8. CPI YoY Index: The US Consumer Price Index (CPI) measures the prices paid by consumers for a basket of goods and services. The monthly growth rate represents the rate of inflation.

9. Drawdown: this term describes a downward movement from the highest point (expressed as a percentage or in currencies) to the lowest point for an investment, a fund or a client account over a given period.