

Systematic Flows Monitor

Equities dip, could trend followers push the dip lower before it's bought?

Trend follower equity longs near stop loss triggers

This week both the S&P 500 and NASDAQ-100 ended their nine-week winning streaks after posting their first weekly declines since last October. According to our model, in the last two months CTAs could have significantly increased their long positions in both markets. Stretched positioning makes the threshold for reversals tighter so actual CTAs which utilize stop loss triggers could be close to hitting their limits. Based on our model, trend followers could be larger sellers of the S&P 500 at 4644 (1.1% lower) and NASDAQ-100 at 16215 (0.6% lower). Dip buying could perhaps keep both markets supported, however if not, then the current dip could potentially become even more attractive should trend followers unwind. In other equity markets Russell 2000 and EURO STOXX 50 longs also face unwind risk and in Exhibit 1 we list our trigger levels.

CTAs still building their US Treasury longs

Our CTA model indicates that trend followers could still be accumulating longs in US Treasury bond futures. Their positions have been growing at a steady pace in recent weeks with continued buying expected in the near-term. In contrast, our model's stretched long Bund position was covered on Friday but with pricing finding support near our model's level, it's reasonable that actual CTAs could still be in the process of unwinding their longs and therefore perhaps adding continued selling pressure on Bunds next week. In our daily CTA model update (please email us to be added) we cover more bond markets globally and generally non-US fixed income appears more stretched long.

Trend follower USD short to move with spot

According to our model trend followers are short USD against major currencies we track, namely EUR, GBP, AUD, JPY, MXN, and CAD. Of these, their AUD and CAD longs are most stretched; AUDUSD stop loss at 0.6605 (1.6% lower) and USDCAD at 1.3495 (1% higher). Next week changes in USD shorts look to move with spot.

CTAs could be covering their Oil shorts next week

Trend followers are likely short Oil but next week according to our model their positions could see covering and notably in any price path. In other commodities, we have CTAs long Gold with that position to move with spot and Soybeans shorts could see continued increases in size.

Equity leverage via vol control is elevated

Declines in realized volatility have likely led to increases in leverage from strategies that employ volatility control on equity and risk parity portfolios.

Trading ideas and investment strategies discussed herein may give rise to significant risk and are not suitable for all investors. Investors should have experience in relevant markets and the financial resources to absorb any losses arising from applying these ideas or strategies.

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Refer to important disclosures on page 22 to 23.

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Timestamp: 05 January 2024 06:30PM EST

05 January 2024

Equity Derivatives
Global

BofA

Data
Analytics



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Global Equity Derivatives Rsch
BofAS

Chintan Kotecha
Equity-Linked Analyst
BofAS
+1 646 855 5478
chintan.kotecha@bofa.com

Nicholas Dunne
Equity-Linked Analyst
BofAS
+1 646 855 2631
nicholas.dunne@bofa.com

Benjamin Bowler
Equity-Linked Analyst
BofAS
benjamin.bowler@bofa.com

Nitin Saxena
Equity-Linked Analyst
BofAS
nitin.saxena@bofa.com

Abhinandan Deb >>
Equity-Linked Analyst
MLI (UK)
abhinandan.deb@bofa.com

Lars Naeckter >>
Equity-Linked Analyst
Merrill Lynch (DIFC)
lars.naeckter@bofa.com

See Team Page for List of Analysts

Trend Following (CTA) Model

For each component we apply our CTA model over the next five trading sessions under bullish, neutral, and bearish price paths. Exhibit 1 summarizes our model applied to 13 common CTA underlyings within equities, fixed income, commodities and FX.

To illustrate how to interpret Exhibit 1, using the first row as an example, the takeaways are: (1) Our CTA model's S&P 500 position is long, (2) The current trend signal is 89% where -100% is max short and +100% is max long, (3) Over the next 5 trading sessions and based on price paths using historical data, the trend signal is projected to decline, and (4) a full unwind (sell trigger) of the long position could come with a 1.1% decline (4644 index level).

Exhibit 1: Summary of BofA Trend Following (CTA) Model Positions, Projections, and Key Levels

An important consideration with buy & sell triggers is they are hard to model as they can vary based on trend-following model construction. Our analysis supports the idea that the further we get from our model's trigger, it's increasingly likely more (and eventually most) CTAs will have executed their position. Please see the appendix for details on how we determine trend strength, bearish/median/bullish price projections, and buy & sell triggers.

Asset Class	Underlying	Model CTA Position	Trend Strength	5-day Trend Projection			Current Spot	Sell Trigger	% -age	Buy Trigger	% -age
				Bearish	Median	Bullish					
Equities	S&P 500	Long	89%	76%	85%	86%	4697	4644	-1.1%	--	--
	NASDAQ-100	Long	83%	75%	80%	81%	16306	16215	-0.6%	--	--
	Russell 2000	Long	91%	79%	90%	90%	1951	1934	-0.9%	--	--
	SX5E	Long	93%	64%	79%	81%	4464	4440	-0.5%	--	--
	SX7E	Long	83%	57%	75%	77%	122	117	-4.1%	--	--
	NIKKEI 225	Long	48%	39%	50%	55%	33377	--	--	--	--
Bonds	10yr Tsy Futures (TY)	Long	45%	35%	50%	55%	111.67	108.48	-2.9%	--	--
	Bund Futures (RX)	Neutral	100%	88%	97%	97%	136.03	--	--	--	--
	Korea Treasury Bond (KAA)	Long	89%	71%	88%	85%	113.63	112.55	-0.9%	--	--
Commodities	Gold	Long	43%	32%	48%	57%	2051.1	--	--	--	--
	Oil	Short	-53%	-38%	-41%	-28%	73.9	--	--	--	--
	Aluminum	Short	-18%	3%	12%	20%	2239.1	--	--	--	--
	Copper (BCOM, HG)	Long	16%	6%	20%	26%	380.3	--	--	--	--
	Copper (GSCI, LP)	Short	-57%	-47%	-44%	-27%	8383.3	--	--	8646	3.1%
	Soybeans	Short	-47%	-74%	-65%	-51%	1257.0	--	--	--	--
	Soybean Oil	Short	-65%	-72%	-72%	-68%	47.6	--	--	--	--
FX	Soybean Meal	Short	-40%	-47%	-56%	-45%	369.4	--	--	--	--
	EUR/USD	Long	49%	43%	55%	62%	1.0939	1.0594	-3.2%	--	--
	GBP/USD	Long	58%	47%	58%	68%	1.2718	1.2361	-2.8%	--	--
	AUD/USD	Long	80%	65%	77%	84%	0.6714	0.6605	-1.6%	--	--
	USD/JPY	Short	-48%	-49%	-42%	-28%	144.8	--	--	150.7	4.1%
	USD/MXN	Short	-56%	-66%	-64%	-49%	16.8709	--	--	--	--
	USD/CAD	Short	-81%	-85%	-81%	-71%	1.3364	--	--	1.3495	1.0%

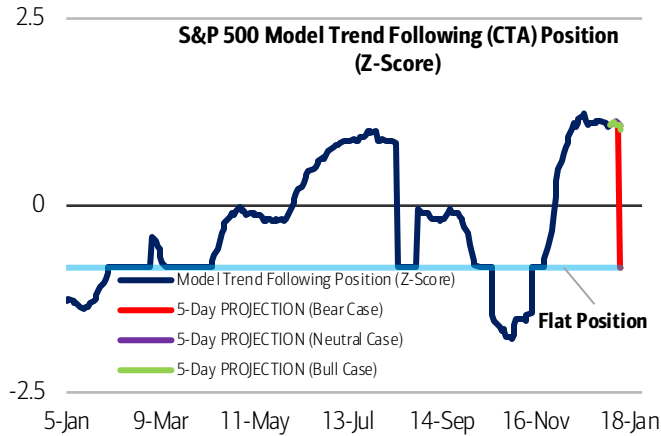
Source: BofA Global Research. Data as of 5-Jan-2024.

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Equities

Exhibit 2: BofA Model Trend Following (CTA) S&P 500 Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

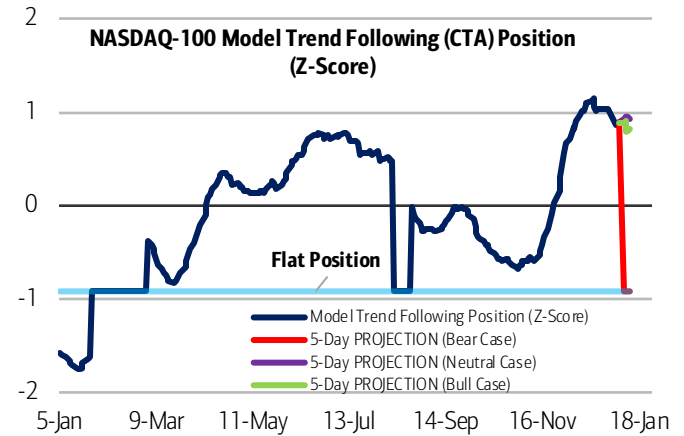


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 3: BofA Model Trend Following (CTA) NASDAQ-100 Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

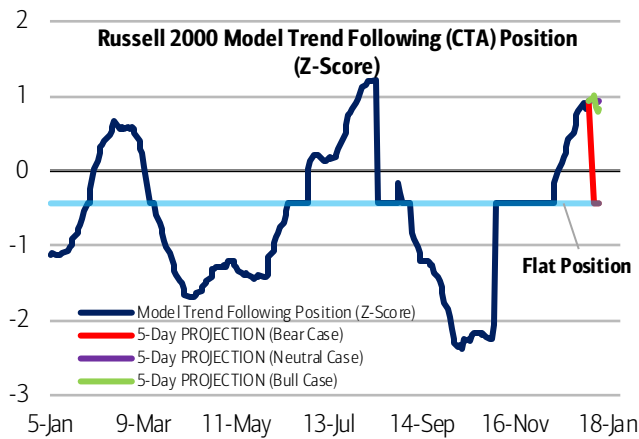


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 4: BofA Model Trend Following (CTA) Russell 2000 Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

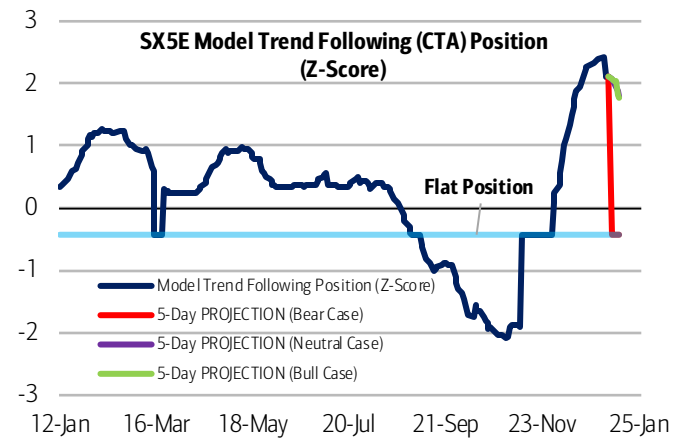


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 5: BofA Model Trend Following (CTA) ESTX50 Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



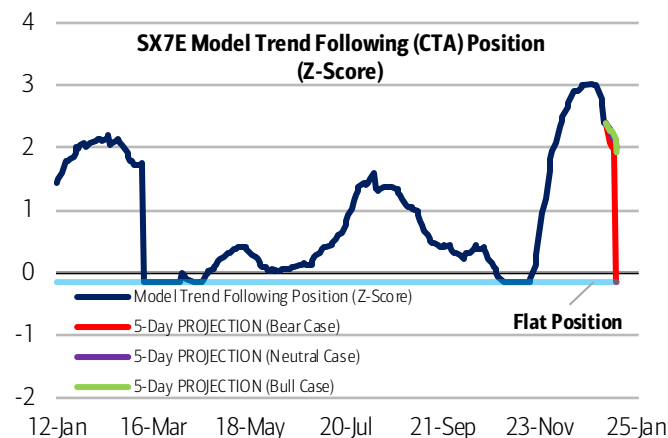
Source: BofA Global Research. Data as of 5-Jan-2024.

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Equities (continued)

Exhibit 6: BofA Model CTA EURO STOXX Banks Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

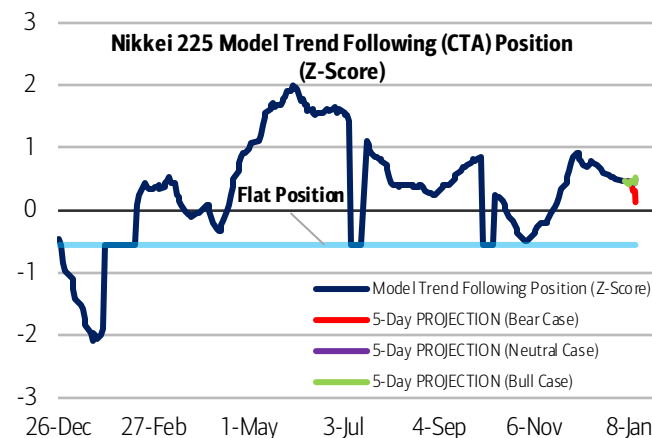


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 7: BofA Model Trend Following (CTA) NIKKEI 225 Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



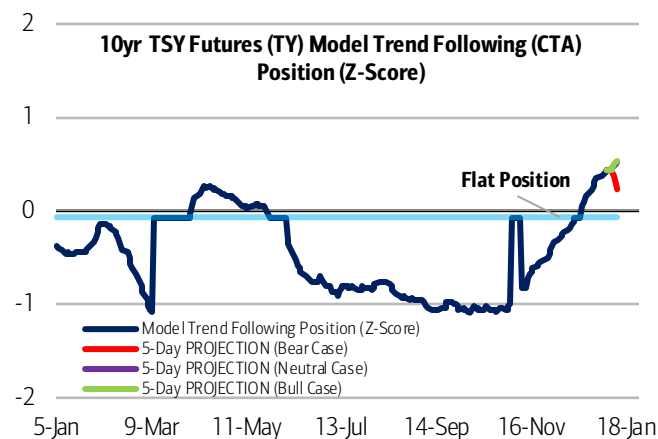
Source: BofA Global Research. Data as of 5-Jan-2024.

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Fixed Income

Exhibit 8: BofA Model Trend Following (CTA) TY Futures Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

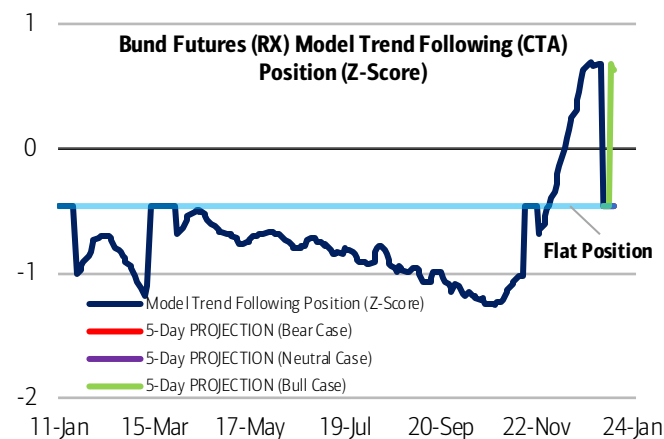


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 9: BofA Model Trend Following (CTA) Bund Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



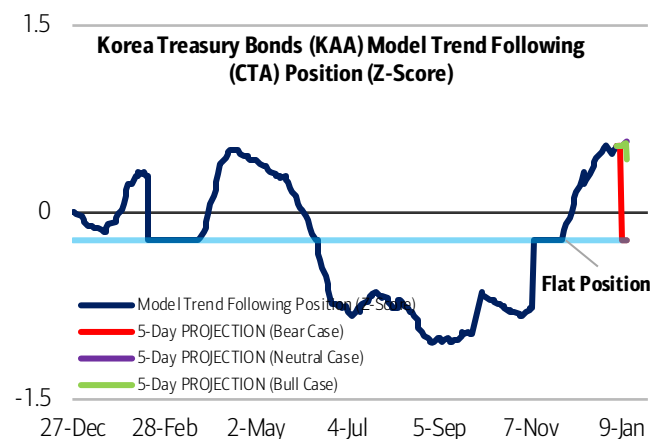
Source: BofA Global Research. Data as of 5-Jan-2024.

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Fixed Income (continued)

Exhibit 10: BofA Model Trend Following (CTA) KTB Futures Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



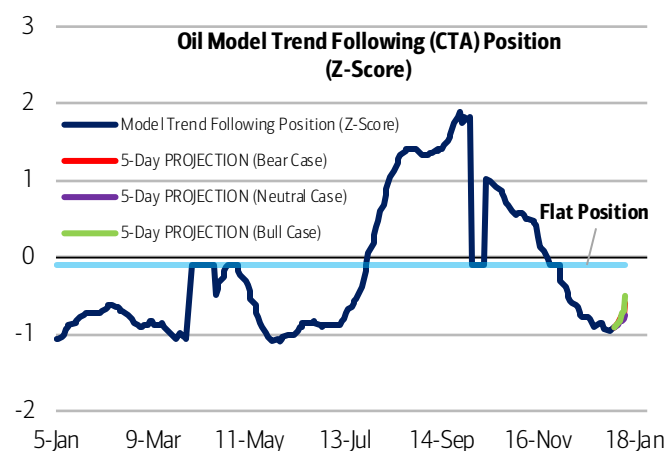
Source: BofA Global Research. Data as of 5-Jan-2024.

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Commodities

Exhibit 11: BofA Model Trend Following (CTA) Oil Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

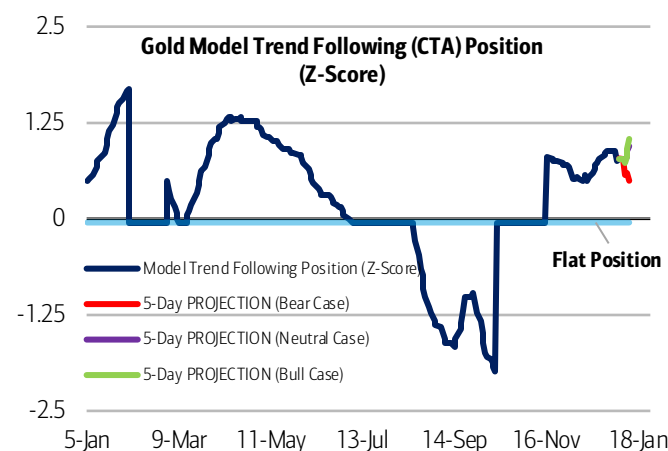


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 12: BofA Model Trend Following (CTA) Gold Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



Source: BofA Global Research. Data as of 5-Jan-2024.

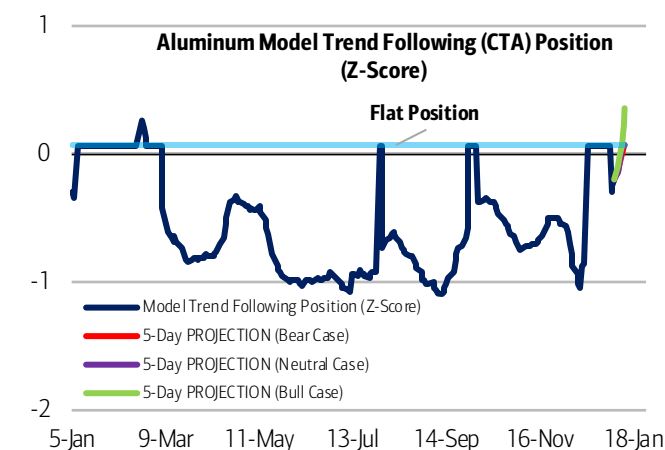
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Commodities (continued)

Exhibit 13: BofA Model Trend Following (CTA) Aluminum Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

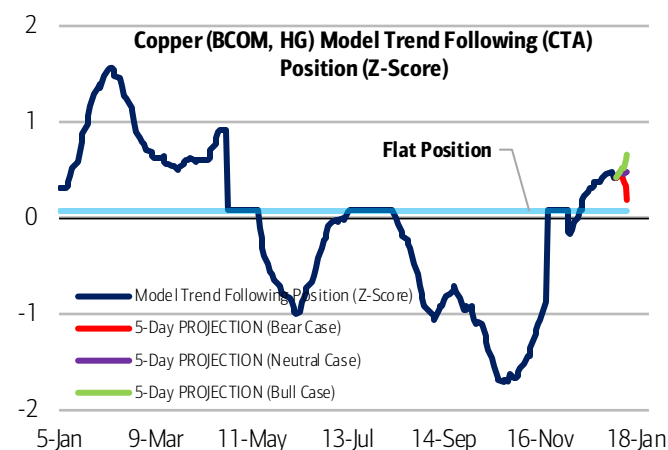


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 14: BofA Model Trend Following (CTA) Copper (HG) Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

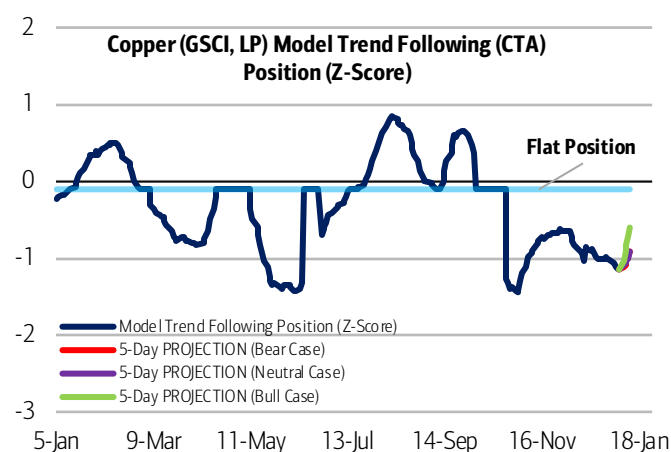


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 15: BofA Model Trend Following (CTA) Copper (LP) Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

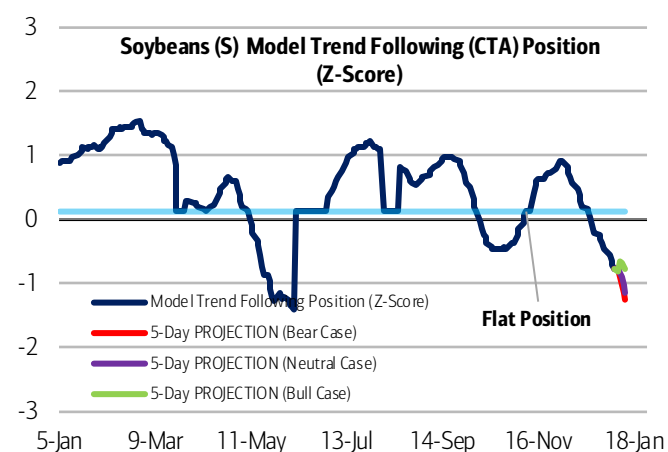


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 16: BofA Model Trend Following (CTA) Soybean (S) Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



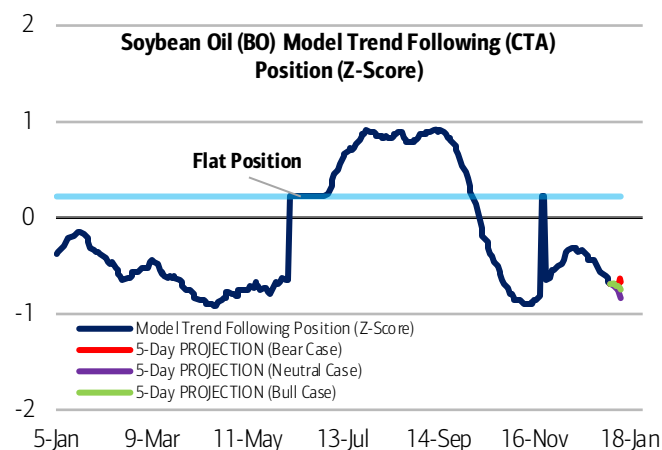
Source: BofA Global Research. Data as of 5-Jan-2024.

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Commodities (continued)

Exhibit 17: BofA Model Trend Following (CTA) Soybean Oil Position

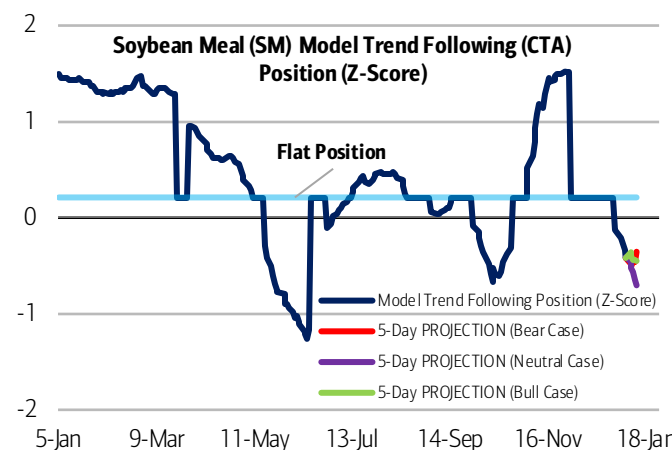
Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



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Exhibit 18: BofA Model Trend Following (CTA) Soybean Meal Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

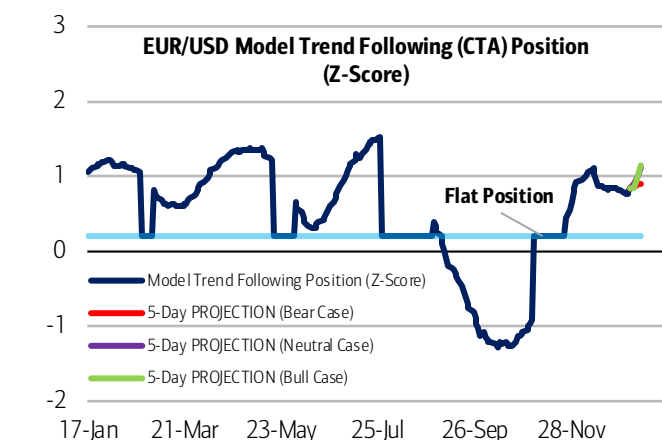


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Foreign Exchange (FX)

Exhibit 19: BofA Model Trend Following (CTA) EUR/USD Position

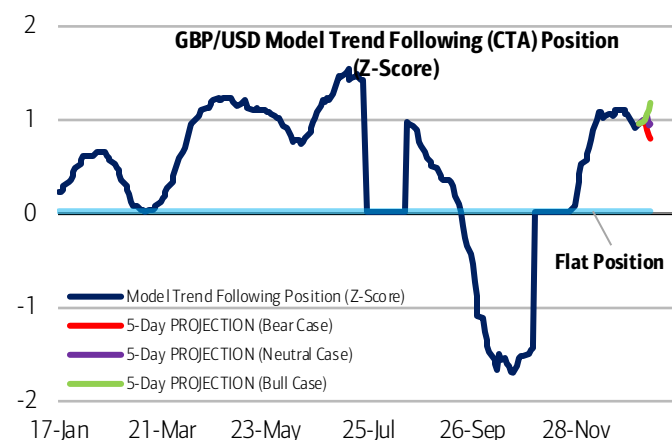
Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



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Exhibit 20: BofA Model Trend Following (CTA) GBP/USD Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

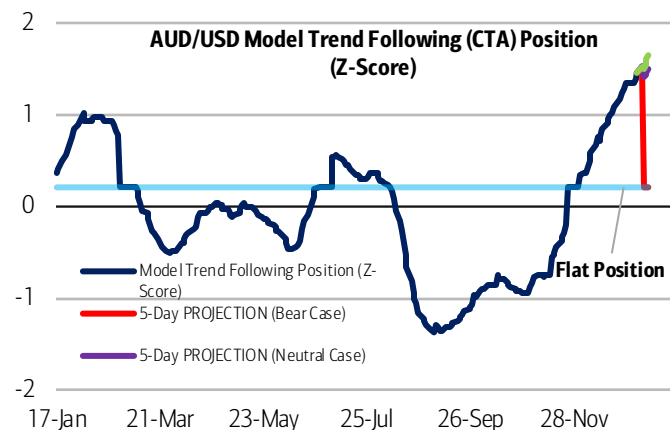


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FX (continued)

Exhibit 21: BofA Model Trend Following (CTA) AUD/USD Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

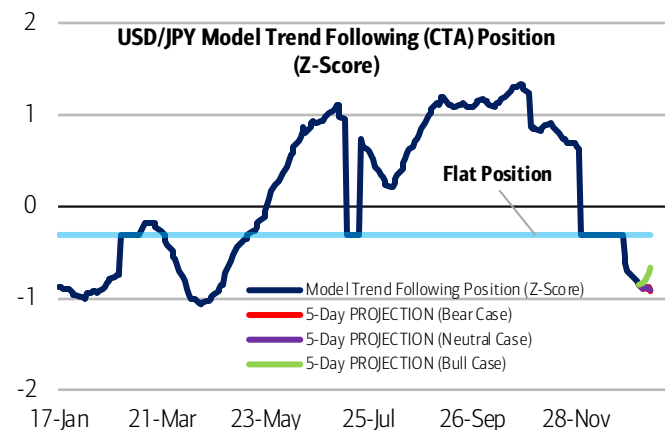


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 22: BofA Model Trend Following (CTA) USD/JPY Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

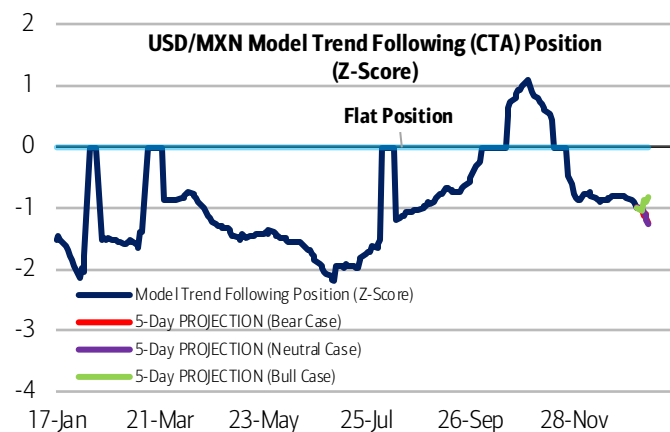


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 23: BofA Model Trend Following (CTA) MXN/USD Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios

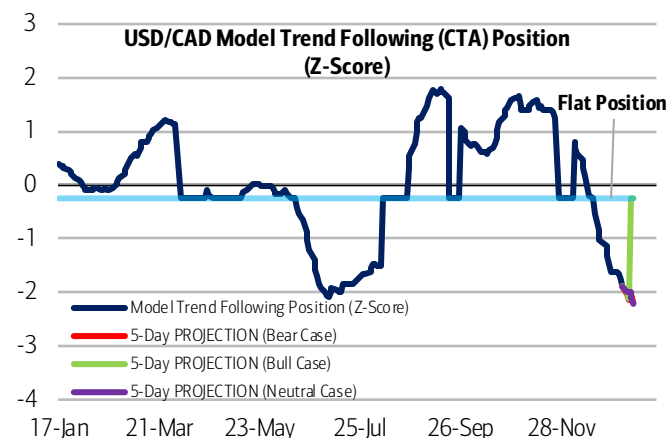


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 24: BofA Model Trend Following (CTA) CAD/USD Position

Z-score of position shown below along with projection of how the position could evolve over the next 5 trading sessions based on bullish, neutral, and bearish scenarios



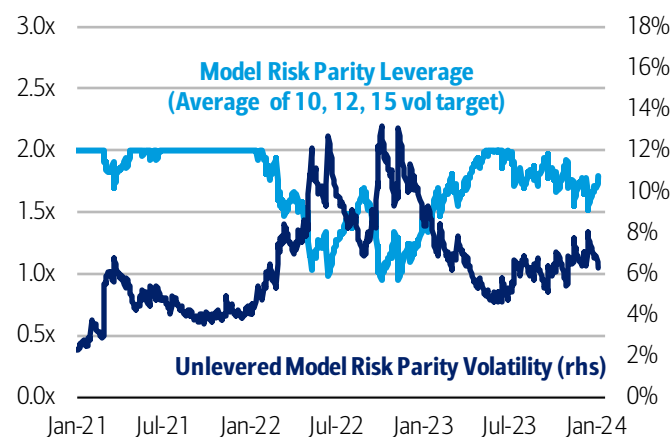
Source: BofA Global Research. Data as of 5-Jan-2024.

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Risk Parity Model

Exhibit 25: BofA Model Risk Parity Realized Volatility & Leverage

Our model risk parity leverage is a function of the prevailing volatility and below we show the average for three popular risk targets

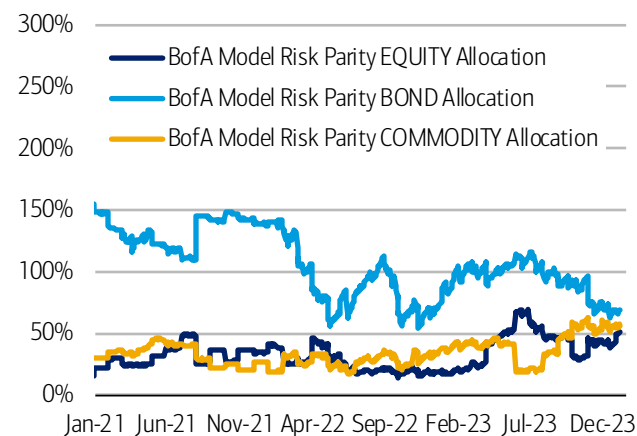


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 26: BofA Model Risk Parity Asset Class Allocations

Allocations are inversely proportional to an asset's volatility, that is, lower volatility assets have higher allocation



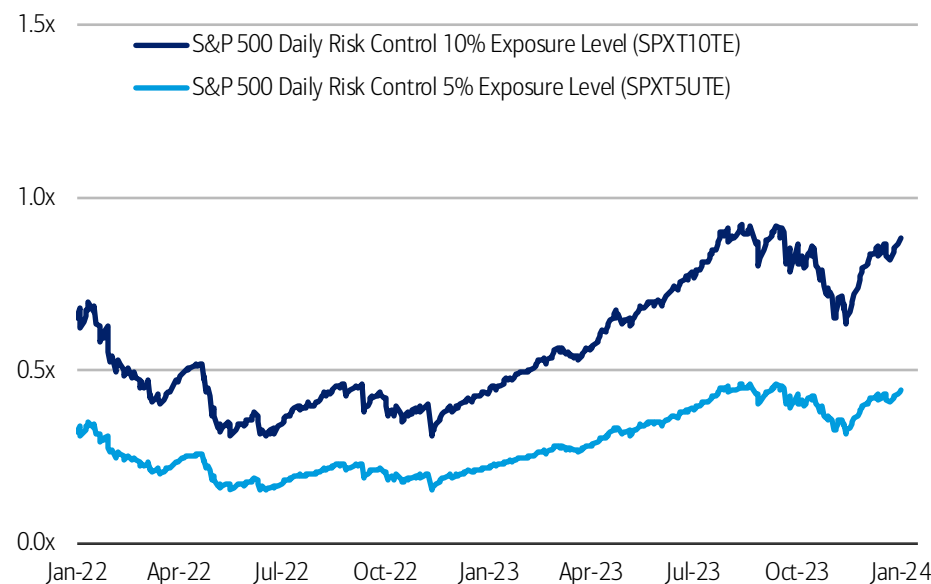
Source: BofA Global Research. Data as of 5-Jan-2024.

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S&P 500 Equity Vol Control

Exhibit 27: S&P 500 Daily Risk Control (10% and 5%) Exposure Level

To model equity vol control, we show the exposure for the S&P Daily Risk Control Index (both 10% and 5%)



Source: BofA Global Research. Data as of 5-Jan-2024.

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Recent price action around CTA model trigger points

Exhibit 28: Russell 2000 trigger in week ending 3-Nov-2023

Accelerated covering through our model's trigger



Source: BoFA Global Research, Bloomberg

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Exhibit 29: EUR/USD stop loss triggered week ending 3-Nov-2023

Accelerated covering through our model's trigger



Source: BoFA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 30: 10yr Tsy Futures (TY) trigger in week ending 3-Nov-2023

Accelerated covering through our model's trigger



Source: BoFA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 31: Ultra Long Term Tsy Futures (WN) trigger on 3-Nov-2023

WN futures featured in our daily update, please email us to be subscribed



Source: BoFA Global Research, Bloomberg

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CTA model trigger points (continued)

Exhibit 32: Soybean Meal trigger in week ending 27-Oct-2023

Accelerated covering through our model's trigger



Source: BoFA Global Research, Bloomberg

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Exhibit 33: Gold stop loss triggered week ending 13-Oct-2023

Accelerated covering through our model's trigger



Source: BoFA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 34: Oil stop loss triggered week ending 6-Oct-2023

Increased selling at our model's trigger point

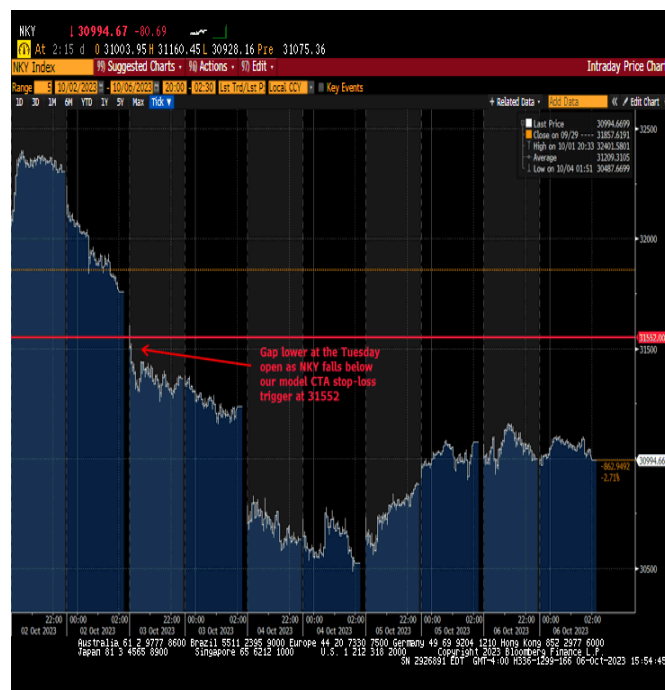


Source: BoFA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 35: Nikkei stop loss triggered week ending 6-Oct-2023

Increased selling at our model's trigger point



Source: BoFA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

CTA model trigger points (continued)

Exhibit 36: CAD/USD stop loss triggered week ending 22-Sep-2023

Acceleration upward post our model's buy to cover trigger



Source: BofA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 37: SPX stop loss triggered week ending 18-Aug-22

Persistent downside following a sell trigger on 15-Aug consistent with CTAs fully exiting a stretched long SPX position



Source: BofA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 38: CAD/USD stop loss triggered week ending 11-Aug-23

Increased selling at our model's trigger point



Source: BofA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 39: MXN/USD stop loss triggered week ending 4-Aug-23

Increased selling at our model's trigger point



Source: BofA Global Research, Bloomberg

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CTA model trigger points (continued)

Exhibit 40: MXN/USD stop loss triggered week of 17-Mar-23

Accelerated selling through our model's trigger



Source: BofA Global Research, Bloomberg

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Exhibit 41: RX stop loss triggered week of 17-Mar-23

Accelerated covering through our model's trigger



Source: BofA Global Research, Bloomberg

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Exhibit 42: TY stop loss triggered week of 17-Mar-23

Accelerated upside through our model's trigger



Source: BofA Global Research, Bloomberg

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Exhibit 43: SX5E stop loss triggered week of 17-Mar-23

After testing, SX5E accelerated declines through model trigger



Source: BofA Global Research, Bloomberg

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CTA model trigger points (continued)

Exhibit 44: Russell 2000 stop loss triggered week of 10-Mar-23

Our model's stop loss coincided with a significant drop in RTY



Source: BofA Global Research, Bloomberg

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Exhibit 45: AUD/USD stop loss triggered week of 24-Feb-23

Ceiling at our model's exit level and as well further downside



Source: BofA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 46: JPY/USD stop loss triggered week of 24-Feb-23

Acceleration in downside post our model's trigger



Source: BofA Global Research, Bloomberg

BoFA GLOBAL RESEARCH

Exhibit 47: EUR/USD stop loss triggered week of 24-Feb-23

EUR/USD saw a ceiling post our sell trigger and as well continued downside



Source: BofA Global Research, Bloomberg

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CTA model trigger points (continued)

Exhibit 48: TY futures expected to see large shorts week of 24-Feb-23

Persistent downside post a sell trigger early in the week



Source: BofA Global Research, Bloomberg

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Exhibit 49: KTB futures stop loss triggered week of 17-Feb-23

Downside continued through our model's long unwind trigger



Source: BofA Global Research, Bloomberg

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Exhibit 50: MXN/USD stop loss triggered week of 10-Feb-23

While the move did accelerate around our model stop loss, Mexican central bank actions later in the week propelled the peso higher



Source: BofA Global Research, Bloomberg

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Exhibit 51: RTY outperformance vs SPX week of 3-Feb-23

In the week prior our model forecasted outsized buying pressure in the Russell 2000 relative to the S&P 500

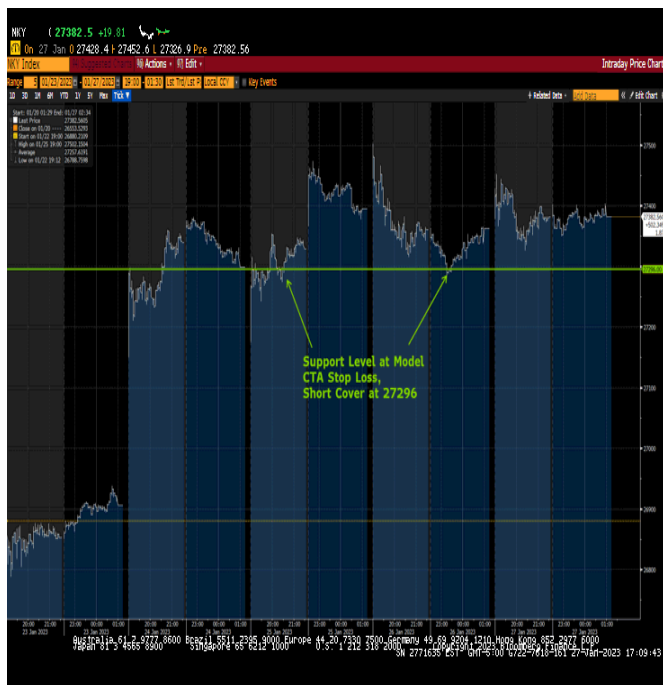


Source: BofA Global Research, Bloomberg

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Exhibit 52: Nikkei-225 stop loss triggered week of 23-Jan-23

After hitting our CTA model's stop loss, the index showed support for the remainder of the week



Source: BofA Global Research, Bloomberg

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Exhibit 53: NASDAQ-100 stop loss triggered on 27-Jan-23

The index saw upward price action which is consistent with CTA short covering



Source: BofA Global Research, Bloomberg

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Appendix

Background on trend following strategies (CTAs)

Trend following strategies have their roots in the commodity asset class as some of the earliest known applications were applied to futures within that asset class. Correspondingly, these trend following strategies were referred to as CTAs which is short for Commodity Trading Advisor. Today, however, global futures markets also comprise stock index, interest rate, currency, and commodity futures. To leverage the benefits of diversification that exists across these asset classes, trend following strategies have broadened their investment universe but are often still referred to as CTAs. Assets in trend following strategies are tracked in a database maintained by BarclayHedge and **as of 2023-Q2 stood at \$352.2bn.**

CTAs can be trend followers but also can be fundamental discretionary

CTA managers often implement rules-based systematic trend following strategies but also can make investment decisions based on fundamental analysis and market views. Those that are systematic could be allocating to futures across multiple asset classes as a function of both trend and volatility. Discretionary CTAs, on the other hand, may also allocate in some part or fully based on fundamentals and economic factors. This class of CTAs may become more concentrated in a given asset class based on outlook and may not be as broadly allocated across markets at any given period.

Benchmark CTA explained by x-asset, risk controlled, trend following

Despite the inclusion of fundamental, discretionary trading strategies and/or a focus on a subset of asset classes, our analysis suggests CTA performance can largely be explained by:

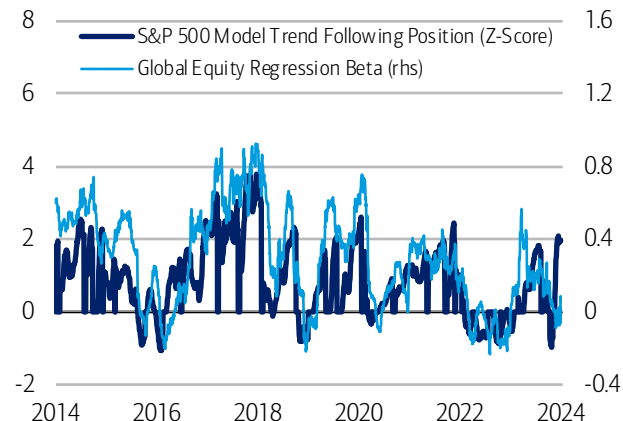
1. Investments across multiple asset classes (i.e., equity, interest rates, commodities, and currencies)
2. The use of trend following signals to determine long or short allocations
3. Risk control mechanisms to determine sizing and increase diversification.

To this effect, we built a top-down multi-factor regression model to explain the performance of a representative benchmark CTA index using a set of cross-asset investments. The CTA benchmark we reference is the SG CTA Index which is comprised of approximately 20 of the largest CTAs by assets, reconstituted yearly with members held in equal weight, and published with daily data. Then, specifically, the multi-factor regression is of global equities, global bonds, commodities, and currency daily returns on the SG CTA index's daily returns. For more details on the top-down multi-factor regression and a discussion on CTA benchmarks, please see our report titled *Quantitative Investment Strategies Panorama*, "Trends aren't going out of fashion", pages 14-19 published in Mar-2017.

In Exhibit 48 and 49 we show the regression beta of both global equities and bonds on the SG CTA Index alongside the z-score of our bottom-up estimate of CTA model sizing (the data displayed in the CTA section earlier) within the S&P 500 and TY futures respectively. Our bottom-up estimate of the position size is estimated by the ratio of component trend to its prevailing volatility. Importantly, our simple bottom-up estimate calculation closely tracks the respective regression betas over time.

Exhibit 54: BofA bottom-up model CTA allocation in the S&P 500 alongside a top-down regression beta of global equities on the SG CTA Index (a popular benchmark CTA index)

Our bottom-up model is in-line with a top-down regression



Source: BofA Global Research. Data as of 5-Jan-2024.

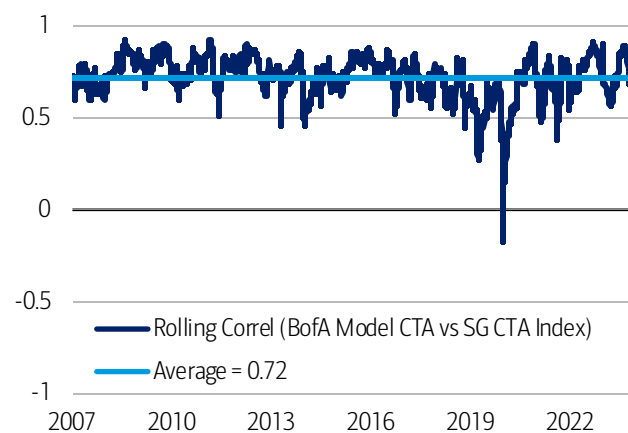
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BofA model CTA strategy tracks the benchmark index well

We also constructed a bottom-up CTA strategy using a wide range of futures investments across multiple asset classes. To do so, for each underlying we started with the trend/vol ratio, then assumed equal risk across asset classes and layered on top both rules for stop losses & subsequent re-initiation of positions. In Exhibits 50 and 51 are the rolling correlation and beta of returns for our bottom-up CTA strategy and the SG CTA benchmark index. Correlation of daily returns averages around 0.7 with beta close to 1.

Exhibit 56: Rolling correl. of daily returns of BofA bottom-up model CTA strategy and the SG CTA Index (a popular benchmark CTA index)

Our bottom-up CTA model sized using trend/vol ratios, equal risk across asset classes, and with rules governing stop loss and re-initiation of positions tracks the benchmark CTA index well through time.

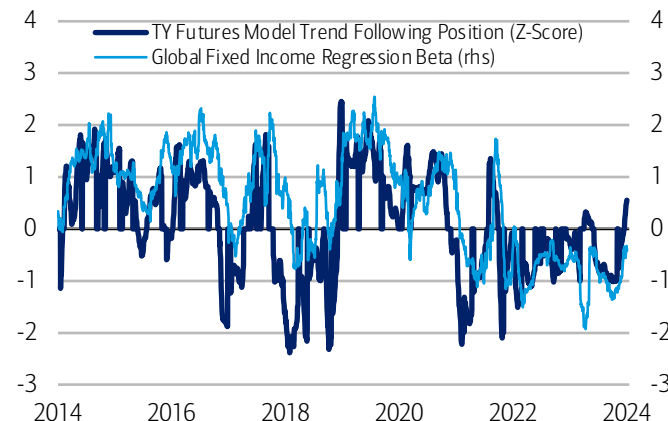


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 55: BofA bottom-up model CTA allocation in TY futures alongside a top-down regression beta of global bonds on the SG CTA Index (a popular benchmark CTA index)

Our bottom-up model is in-line with a top-down regression

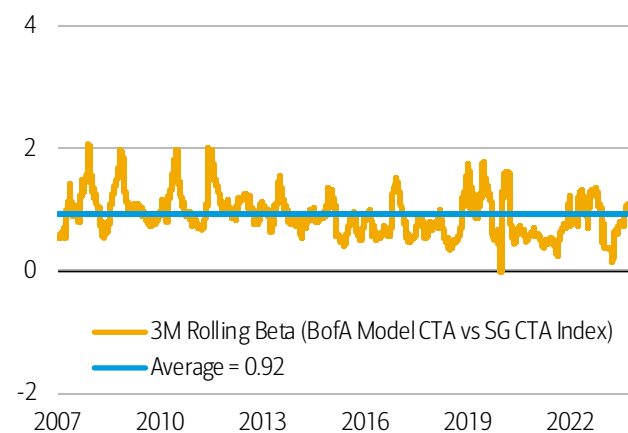


Source: BofA Global Research. Data as of 5-Jan-2024.

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Exhibit 57: Rolling 3M beta of daily returns of BofA bottom-up model CTA strategy and the SG CTA Index (a popular benchmark CTA index)

Our bottom-up CTA model sized using trend/vol ratios, equal risk across asset classes, and with rules governing stop loss and re-initiation of positions tracks the benchmark CTA index well through time.



Source: BofA Global Research. Data as of 5-Jan-2024.

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Background on risk parity strategies

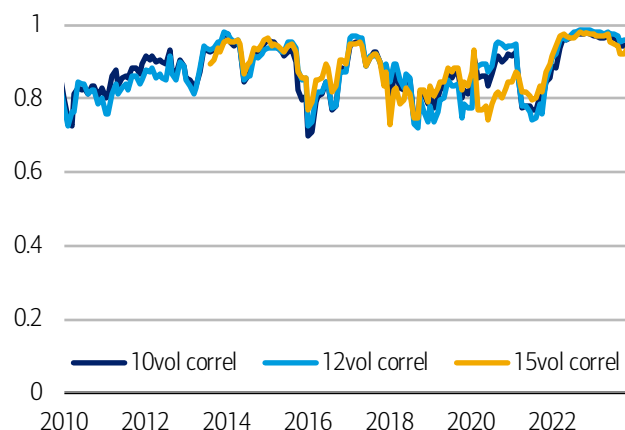
Similar to CTAs, our analysis indicates that risk parity strategies may allocate across the major asset classes and also size their positions as a function of prevailing volatility. However, risk parity strategies are agnostic to price trend and remain fully long each asset class. Risk parity strategies are popular for their ability to target diversification and have a strong track record of positive performance. In 2017, HFR (Hedge Fund Research) launched a suite of benchmark risk parity indices that are comprised of some of the largest risk parity funds. These benchmark indices are published monthly.

The BofA risk parity model is a simple risk parity application applied to equities (S&P 500), bonds (10Y Treasury Futures Total Return), and commodities (S&P GSCI index) rebalanced monthly using the prior three months of data to determine volatility and correlation forecasts. In Exhibits 53 through 55 we show applications of the BofA risk parity model with risk targets of 10, 12, and 15 and in each case compare to the respective HFR risk parity benchmark over monthly periods. Then in Exhibit 52 is the rolling one-year correlation of prior twelve monthly returns for each HFR index and BofA model pair. Correlation tends to be high (> 0.8). As well, the betas are close to 1 with each model strategy closely fitting the respective HFR benchmark.

Unlike for CTAs, there is no database of risk parity funds from which we could gather an estimate of assets tracking the strategy. However, **commonly used estimates have ranged from \$200bn to \$750bn.**

Exhibit 58: Rolling 1-year correlation of HFR risk parity and BofA model risk parity monthly returns

HFR risk parity indices with 10, 12, and 15 vol are highly correlated to the respective BofA model risk parity strategies with similar vol targets.

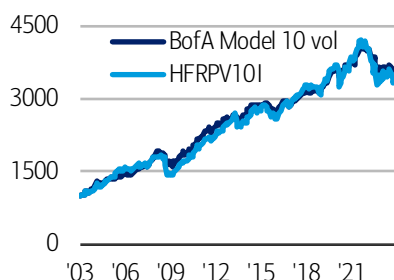


Source: BofA Global Research. Monthly data from Jan-2010. HFR institutional risk parity indices are used.

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Exhibit 59: BofA Model Risk Parity (10% vol target, 1.5x max leverage)

BofA model risk parity tracks the benchmark HFR risk parity index

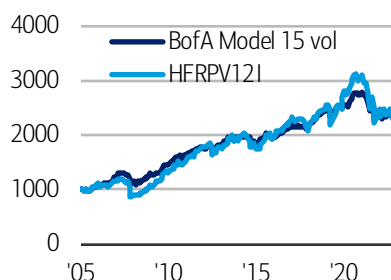


Source: BofA Global Research. Data as of 30-Nov-2023.

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Exhibit 60: BofA Model Risk Parity (12% vol target, 1.5x max leverage)

BofA model risk parity tracks the benchmark HFR risk parity index

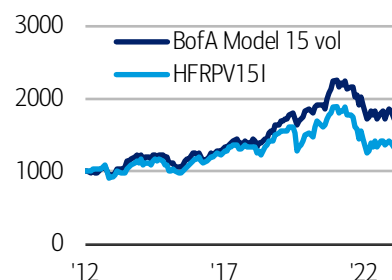


Source: BofA Global Research. Data as of 30-Nov-2023.

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Exhibit 61: BofA Model Risk Parity (15% vol target, 3.0x max leverage)

BofA model risk parity tracks the benchmark HFR risk parity index



Source: BofA Global Research. Data as of 30-Nov-2023.

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Background on equity vol control strategies

Equity vol control is a more simple quantitative strategy relative to CTAs and risk parity. This class of quant dynamically adjusts leverage to target a predefined level of risk based on prevailing equity volatility. For example, if the prevailing level of S&P 500 volatility was 20%, then an S&P 500 10% vol controlled strategy would set leverage to 0.5x, or 50% of total AUM. If on the other hand prevailing volatility was 5%, then leverage would be set to 2x, or 200% of total AUM. Equity vol control strategies are often applied to equity indices with the largest market cap and volumes in order to improve tradability. Risk targets tend to range from 5% to 15%. Versus CTAs and risk parity, assets in equity vol control are the least publicized **but estimates of \$300bn can be reasoned.**

CTA model parameters and outputs explained

Trend strength is calculated using a collection of moving average crosses

Our model trend following strategy requires the measurement of an asset's price trend and we do so using a collection of moving average crosses. The key parts of the calculation are the use of both near and far moving average crosses, weighted equally. A simple example of this would be to measure the 1-month, 3-month, and 10-month moving averages for an asset. Then we compare the 1-month to each the 3-month and 10-month where if it is higher we score it +1 and lower then -1. The two scores are then averaged such that if the 1-month was higher than both the 3- and 10-month the trend strength would be +1 (max long) and if the 1-month was lower than both the 3- and 10-month the trend strength would be -1 (max short). Our actual calculation uses a greater number of crosses and also prorates the crosses based on component volatility in order to make trend strength more continuous over time. Importantly, we do not use the spot price in any cross as our analysis leads us to conclude that actual trend following strategies do not as well.

Bearish/median/bullish price paths are determined using historical data

For each underlying that we apply our trend following model on we also show a projection of how the model position can evolve over the next five trading days. We do this by applying our CTA model on bearish, median, and bullish price paths over the next week. These price paths are determined using historical data for each underlying. Price paths are in part a function of the prevailing volatility of an asset so when determining the various paths we sample only those historical data where volatility is similar to current. Then from this subset of data we can determine low (bear), neutral (median), and high (high) price paths to apply one week ahead.

Rules governing buy and sell triggers in our CTA model

At any given point in time our bottom-up trend following model applied on an underlying asset can be either in a position (long or short) or flat. If in a position, then should a price trend strongly to reverse, our model could potentially hit a stop loss. We assume the stop loss is set such that in an extreme event where every component hits a stop loss simultaneously in the overall model, the loss to the portfolio is approximately 10%. For an underlying asset which our trend following model is currently flat, we assume re-entry occurs under two conditions. If the asset's price hits a local high and its trend strength is positive, a long is initiated. Vice-a-versa, if an asset hits a local low and its trend strength is negative, a short is initiated. The local high/low level can range from lookbacks over the prior five to ten days.

Timescale of leverage changes

CTAs, risk parity, and equity vol control strategies monitor and adjust leverage daily. However, the lag between a model prescribed change in leverage and the actual adjustment varies. Our models and analysis indicate that CTAs are the fastest to respond to model changes, potentially even intraday. Risk parity and equity vol control, however, tend to move slower with adjustments to leverage occurring in the one to two subsequent trading sessions.

A comment on model diversity and market impact

It is important to note that the analysis in this report on trend following and risk parity is based on one implementation of each class of strategy that attempts to track a respective benchmark for each. Actual trend following and risk parity strategies that compose the benchmark indices could vary in their rules-based implementations. This is an important consideration with regards to market impact from this class of strategies. That is, to the extent the models have more diversity, the potentially less impact they can have on the market as trading may not occur at the same levels and/or at the same time. This is a crucial point that is commonly not discussed surrounding this type of analysis.

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Research Analysts

Global

Benjamin Bowler

Equity-Linked Analyst
BofAS
benjamin.bowler@bofa.com

Americas

Nitin Saxena

Equity-Linked Analyst
BofAS
nitin.saxena@bofa.com

Chintan Kotecha

Equity-Linked Analyst
BofAS
chintan.kotecha@bofa.com

Nicholas Dunne

Equity-Linked Analyst
BofAS
nicholas.dunne@bofa.com

EMEA

Abhinandan Deb >>

Equity-Linked Analyst
MLI (UK)
abhinandan.deb@bofa.com

Asia-Pac

Lars Naeckter >>

Equity-Linked Analyst
Merrill Lynch (DIFC)
lars.naeckter@bofa.com

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