

A network diagram consisting of numerous grey circular nodes of varying sizes connected by thin, light grey lines, creating a complex web-like structure across the top half of the page.

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THE FOOTPRINT OF TREND-FOLLOWING
Can CTAs really move the market?

#12 | 8 DECEMBER 2022

Executive summary

In this note, we estimate the market participation of the trend-following CTA industry on the most liquid equity, fixed income & rates, currency, and commodity futures markets. More specifically, we provide what we believe a realistic estimate of the trend-following industry's share of positions held and volume traded in these different markets.

For the purpose of measuring the market participation of a trend-following Managed Futures Program or CTA¹, we adapt two widely used metrics – total open interest and total daily volume traded – and exclude any non-directional calendar-spread related trading activity. To this end, we introduce a systematic method to estimate the share of directional trading activity across asset classes. We find that for equities, fixed income, and currency futures, the calendar-spread related activity is limited, while for commodities and short-term interest rates futures, less than 70% of the open interest represents outright risk, and less than 50% (for commodities) and 65% (for STIRs) of the reported total volume is directional.

We conclude that, assuming the size of the trend-following industry at approximately \$300bn, trend-following CTAs account on average for less than 10% of the total directional open interest and less than 1% of the total directional traded volume across global futures markets since 2020. We show that the net aggregate notional exposure in equities of trend-followers has evolved in a range between \$-100bn and \$+500bn over the past three years. This compares to an average global equity market capitalization above \$100tn² and an

average global equity futures open interest of \$1.3tn³.

According to our model, the equity market participation of trend-following has never exceeded 3.5% of total futures directional volume measured over any five-day period since 2020, even during periods characterized by extreme changes in positioning, like the sell-off of March 2020 or the bear market rally in summer 2022. Our results do not indicate that trend-following CTAs have grown too large to execute trades effectively in the markets they operate in, nor do they suggest that their size would enable them to move markets significantly in the direction of their trading in any of the asset classes.

Moreover, despite the size of the CTA industry increasing more than tenfold since 2000, the market participation has remained in a relatively narrow range (at both aggregate and asset class level), reflecting a simultaneous increase in the capacity of cash and underlying futures markets.

Our results support the thesis that the capacity limit of CTAs in terms of the participation rate is far from being reached. The high liquidity of the underlying markets and the still moderate participation rates suggest that CTAs are unlikely to move underlying market prices significantly.

¹ We use both terms synonymously throughout this note.

² Source: Statista. <https://www.statista.com/statistics/274490/global-value-of-share-holdings-since-2000/>

³ Source: Quantica Capital.

Introduction

With an estimated \$350 billion in assets under management⁴, trend-following CTAs have become one of the largest and most attractive alternative, systematic and liquid investment strategies, driven by their ability to deliver positive returns that are largely uncorrelated to traditional global markets and risk factors. Their aggregate size makes trend-followers seemingly an important player in the futures markets of all major asset classes.

The Managed Futures / CTA industry is still a small subset of global investments. Based on an estimate that the global total assets under management recently passed \$100 trillion⁵, CTAs account for less than 0.5% of this amount in a global asset allocation context.

Today, there are numerous models and research groups seeking to quantify and monitor the supposed market positioning of trend-followers. The motivation is clear: Any indication of extreme long or short positioning in the sector could hold the potential to amplify subsequent trend reversals caused by the unwinding of these positions. Headlines like “Trend-followers are expected to buy (or sell) an aggregate \$billion notional of equities next week” are making the rounds on a regular basis. These reports usually implicitly suggest that the trend-following industry does have a meaningful footprint on the markets they trade. While reports about buying and selling activity of trend-followers are widespread, there is surprisingly little information on the assumptions being made behind these estimates.

How much of the volume traded, and risk held in today’s financial and commodity futures markets is linked to directional trend-following trading activity? Can the CTA industry, at its current size,

really move the futures markets they are trading? Has the industry already reached capacity, and how much room is left for further growth?

In this note, we estimate the footprint (i.e., market participation) of the trend-following industry in terms of the proportion of directional traded volume and open interest in a systematic and well-defined framework and provide some perspective and answers to these questions.

We start with a definition of the “market footprint” and address the key factors that affect this metric from the perspective of a trend-following CTA. Because market participation is first and foremost a function of the size, i.e., open interest and trading volume, of the underlying futures market, we estimate the available capacity of every liquid asset class that typically forms part of a trend-follower’s investment universe. We highlight the importance of calendar-spread trading activity, which may represent in certain cases a sizeable portion of the overall trading volume and open interest held. This non-directional volume and the associated open interest represents a type of liquidity that a directional strategy such as trend-following cannot directly access. We also address the case of the currency futures markets, whose liquidity is in fact much deeper than what exchange-traded metrics imply.

Having established realistic estimates of the directional capacity in global equity index, government bond & short-term interest rate, commodity, and major currency futures, we estimate the market participation of the trend-following industry in each of these markets. To this end, we rely on the positions and the trades generated by a generic trend-following model designed to closely replicate the average trend-following CTA positioning and trading activity. Our analysis covers long-term data since 2000,

⁴ Source: BarclayHedge. BarclayHedge estimates the size of the “systematic” managed futures industry at \$362bn as of Q3-2022 (represents estimated assets under management for the systematic managed futures industry utilizing AUM information provided by contributing CTA managers for the third quarter of 2022). Estimating the size (in terms of assets managed) of the trend-following industry is a topic in itself. For the interested reader, Appendix 1 offers more details.

⁵ Source: Statista. <https://www.statista.com/statistics/323928/global-assets-under-management/>

but also focuses specifically on recent periods of extreme trend positioning followed by subsequent market reversals.

Finally, we analyze how the average market participation of the industry has evolved over time, and as a function of its assets under management. We seek to address the question of whether the estimated capacity and liquidity metrics of the futures markets may indicate an upper bound on the capacity and future growth of the trend-following industry.

Defining the market footprint of a trend-following CTA

We define the footprint or participation of a Managed Futures, or CTA trading strategy⁶ in one or a group of markets as a pair of two complementary metrics:

- The percentage of the market's directional positions (i.e., directional open interest)
- The percentage of the market's directional daily traded volume

Total open interest (i.e., the total number of outstanding futures contracts) and daily traded volume (i.e., the total number of futures contracts traded for a given day) are typical metrics used to quantify the liquidity and size of a given futures market. However, as we show in a subsequent section, these metrics also include non-directional activity (such as the rolling of futures contracts⁷ or the activity related to calendar-spread strategies⁸), which falsely inflate the actual outright risk held and directional volume traded on the market. By taking this into account, the market participation of a CTA can be measured more realistically and leads to a

more conservative estimate of its market footprint.

The drivers of a CTA's market participation: the importance of volatility and price

Changes in price and volatility of a market increase or decrease the market participation of a trend-follower. Risk-based strategies target a specific level of risk in each instrument of their investment universe, whereas asset-based strategies target a specific level of notional exposure. Typically, trend-following CTAs follow a risk-based approach to position sizing, which essentially means that market exposures and trades are sized inversely proportional to risk. The number of contracts traded by a trend-following CTA is therefore a function of the price and the risk (such as measured by volatility) of the underlying market. An increase in the underlying market's risk and/or price leads to a decrease in number of contracts traded, and vice-versa.

A compelling illustration of these dynamics is highlighted in Figure 1, taking the US Natgas futures market as an example. Since 2020, the total size of outstanding contracts in the market has declined from 13 to around 10 billion MMBtu (million British thermal units). That means that the market participation of a producer or a consumer seeking to hedge a constant fraction of its production or consumption with futures, would have increased by more than 20% over that period. However, US Natgas prices almost doubled, hence the notional dollar size of this market went up from \$30bn to \$55bn, implying a reduction in the market participation of a fixed notional investment by almost 50%. Finally, as not only prices, but also volatility doubled over

⁶ We use both terms synonymously throughout this note.

⁷ The action of simultaneously closing a position on a futures contract expiring soon and re-opening the same position on a contract expiring further in the future to avoid cash or physical settlement of the position.

⁸ Taking a neutral long-short position between different delivery months of the same instrument to profit from the change in price difference between the different expiries.

this period (from an annualized volatility of 30% to more than 60%), one futures contract is not only worth more US Dollars, but it also carries much more risk. This decreases the footprint for risk-based strategies targeting a specific risk exposure. In fact, from a CTA’s perspective, the US Natgas market size, or capacity, has increased by a factor 4 since 2020, although the open interest reported in number of contracts has declined by 20%!

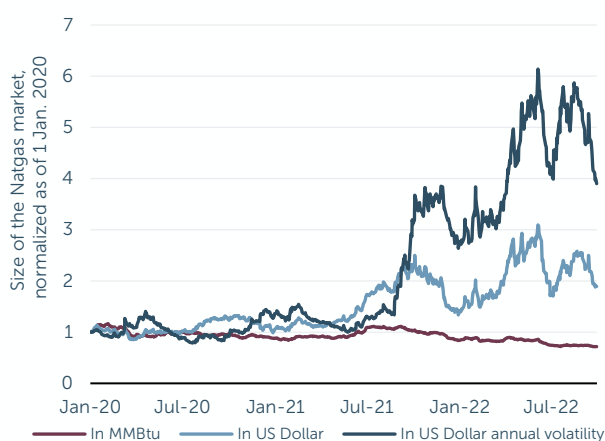


Figure 1: Evolution of the size of the Natgas futures market in energy units (MMBtu), notional (US Dollar) and risk (US Dollar annual volatility), normalized as of 1 January 2020. Source: Quantica Capital.

The above example shows that a decrease in the number of open contracts in a futures market does not necessarily imply less liquidity or a larger footprint for a trend-follower. In fact, for a trend-following strategy, market liquidity should be measured in risk-adjusted notional open interest and traded volume.

In summary, the market participation of a trend-follower is affected by three key factors:

- Total number of contracts in open interest, or traded in the market
- Market price
- Market volatility

Not all futures markets are the same, and not all volume is directional

The accurate estimation of trend-followers’ market participation is predicated on an accurate estimation of the accessible liquidity of the futures markets in its investment universe. In this section, we estimate what share of daily traded volume and open interest is directional and therefore relevant to CTAs.

The dynamics of futures markets vary strongly between asset classes. A simple way to illustrate this is to look at the distribution of open interest across the maturity term-structure of the most liquid futures contracts across major asset classes. Table 1 (first column) shows the average ratio between the open interest not held in the front-month contract and the total open interest across all contracts on the curve since 2020 and across all instruments in each major asset class and commodity sub-sector (the per-instrument values can be found in Appendix 2).

	% of contracts NOT held in the front month	% of daily volumes coming from calendar spreads	% of open interest held as calendar spread risk
Equities	8%	15%	4%
Fixed Income	4%	15%	6%
Currencies	6%	12%	3%
STIR	86%	35%	37%
Energy	76%	63%	41%
Agriculturals	59%	54%	28%
Metals	52%	20%	12%

Table 1: The varying importance of calendar-spread trading activity for asset classes as measured by three different ratios averaged across all instruments in each asset class and the past three years: (1) ratio between the open interest not held in the front-month contract and the total open interest across all contracts on the curve. (2) ratio of total traded volume and (3) of total open interest that are related to calendar-spread trading activities. Source: Quantica Capital.

For the great majority of equity, government bond, and currency futures, this ratio is close to 0, which means that most of the open positions are concentrated on the front-month contract (i.e., almost all of the total open interest is held

on the first contract of the curve). Consequently, calendar-spread positions should be almost non-existent in such markets. For most commodity futures, this ratio is well above 0.5. This means that more than 50% of the total open interest is not held in the front-month contract. The same ratio is even higher for Short-Term Interest Rates (STIR) futures where on average more than 85% of the total open interest is not held in the front-month contract. Commodity and STIR futures markets differ from equity, bond, and currency futures markets as activity is distributed across a wider range of maturities across the curve. This suggests that calendar-spread activity (both in terms of volume traded and open interest held as time-spread positions) might not be happening only during “roll windows”, but likely is more continuous in time, and represents a bigger share of the total activity. Still, this activity may vary greatly across the commodity spectrum.

Quantifying the contribution of calendar-spread trading activity to overall volumes and open interest

Based on the previous observations, we seek to quantify how much of the overall traded volume and open interest are related to calendar-spread trading activities, and how its share varies by asset class. Trend-following trading activity is implemented via directional outright futures trades, which are generally not matched against calendar-spread trades. We are therefore interested in subtracting the corresponding share of open interest and traded volume tied to spread trading activities from the raw metrics to come up with a more realistic and more conservative measure of the market liquidity that a trend-follower may be able to access. To account for the effect of calendar-spreads on daily volumes, we break down the total daily volume for each instrument between non-directional volume (i.e., the daily volume coming from the activity on

calendar-spread instruments) and directional volume (the remainder of the activity which is not coming from calendar-spreads). Details about the methodology used can be found in Appendix 3.

While calendar-spread volumes can be estimated in a relatively straightforward manner, there is no equivalent data available that would allow us to estimate how much of the total open interest in a futures market is offset by opposite positions on other maturities of the curve (e.g., positions tied to relative value bets between different maturities, as opposed to directional outright bets). In futures markets with a large calendar-spread positioning, the total reported open interest is inflated by these non-directional spread positions.

While open interest tied to calendar-spreads for equity, government bond and currency futures is insignificant, it is relevant in the case of commodity and STIR futures. For those markets, the commitment of traders (COT) reports from the Commodity Futures Trading Commission (CFTC) offer valuable additional insights. Indeed, such data allows to estimate a plausible proportion of open interest that is held directionally as opposed to time-spread positions. Please refer to Appendix 4 for more details about the methodology used.

A summary of the numbers averaged across instruments for each asset class can be found in Table 1 (columns 2 & 3). Calendar-spread related trading activity is limited in equity, fixed income, and currency futures markets: it accounts on average for less than 15% of the total volume and represents only around 5% of the total open interest. Such activity is, however, much more relevant in commodities and short-term rates futures. For commodities, calendar-spreads represent on average more than 50% of the total volume and more than 25% of open interest. Within commodities, there are significant differences between sectors. While calendar-

spreads account for more than 60% of the total volume and 40% of open interest in energy markets, they represent only 20% of the total volume and less than 15% of open interest in metals markets. In the case of STIR futures, the share of calendar-spread activity ranges between 30% and 40% for both the overall traded volume and the total open interest.

The above results confirm our initial assumption: the more open interest is distributed across different maturities on the curve, the more the calendar-spread trading activity should have an impact on the total traded volume and the open interest.

To estimate the market footprint of trend-following accurately, we therefore restrict ourselves to the fraction of market liquidity that is not tied to calendar-spread trading and positioning. Again, this is most relevant when estimating the market footprint in commodity and STIR futures, which are subject to a lot more spread trading activity than their equity, government bond and currency counterparts. Failing to account for spread trading would lead to overestimate the market's capacity to "absorb" directional trades, and therefore to an underestimation of a trend-follower's market footprint.

Also, it is worth highlighting that a series of other factors may adversely affect, but likely to a lesser extent, the share of liquidity that is accessible for trend-followers. Some of those factors are listed in Appendix 5.

The "true" size of currency futures markets

Finally, we cannot move on to measuring a trend-follower's market footprint without reviewing the particular liquidity characteristics

of currency markets. As currency markets are primarily traded over-the-counter (OTC), the open interest and traded volumes of exchange-traded currency futures do not reflect the depth of the trading activity taking place in their underlying cash and forward markets. A simple, yet intuitive way, to work out a better estimation of the "true" size of currency markets is to rely on the Bank for International Settlements (BIS) Triennial Central Bank Survey⁹, which shows that daily OTC volume for major currencies appears to be on average between thirty and forty times bigger than the volume traded on futures exchanges. Therefore, we use a multiplier of 30 on the reported open interest and average daily traded volume for the currency futures in our universe. A more detailed comparative overview of OTC versus on-exchange market activity in currency markets can be found in Appendix 6.

Calculating the market footprint of trend-followers

Having established realistic estimates of the available liquidity across the main asset classes allows us to accurately measure the aggregate footprint of the trend-following industry across these asset classes.

For this purpose, we rely on our generic trend-following model which has been designed to closely track (with a correlation close to 90% since 2005) the SG Trend Index, an industry benchmark composed of the ten biggest trend-following CTA managers, that is representative of the trend-following CTA industry. The generic strategy is applied to a universe of 101 of the most liquid futures markets across equities, fixed income, interest rates, currencies, and commodities. The chosen universe covers the great majority of available liquidity across global futures exchanges. While this universe may be

⁹ The BIS Triennial Central Bank Survey defines their survey as "the most comprehensive source of information on the size and structure of global over-the-counter (OTC) markets in foreign exchange (FX) and interest rate derivatives." Source: BIS. https://www.bis.org/statistics/rpfx22_fx.pdf

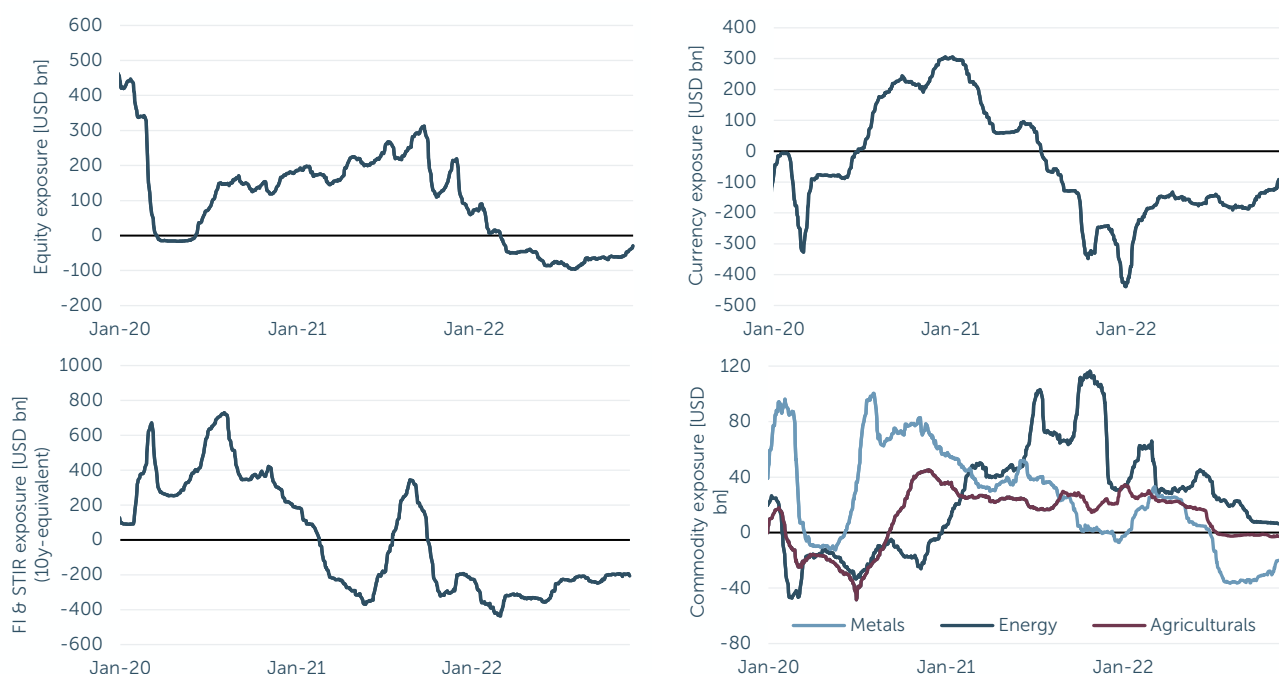


Figure 2: Evolution of the aggregate net notional US Dollar exposure for four different asset classes between Jan. 2020 and Nov. 2022: equities, currencies, fixed income & rates, and commodities. Exposures are generated by a generic medium-to-long-term trend-following model that closely tracks the SG Trend Index, and is assumed to manage \$300bn assets under management subject to a target volatility of 12% p.a. Source: Quantica Capital.

further complemented with a range of smaller or alternative markets, such extension would in our view have only a limited impact on the results presented in this note, as only a small proportion of the aggregated risk positions of CTAs are allocated to those markets.

In order to match the long-term realized volatility of the SG Trend Index, the generic strategy is scaled to target a long-term volatility of 12% per annum.

In 2022, the size of the total managed futures or CTA industry (including systematic and discretionary strategies) is generally estimated to be around \$400bn¹⁰. However, only a subset of CTA managers follows a systematic approach. And only a portion of systematic CTAs do follow a trend-following approach. While the true size of the trend-following CTA industry can only be guessed, we estimate that the *average* assets

under management invested in trend-following *over the past three years* to be around \$300bn. The rationale for this estimate is laid out in the Appendix 1.

Targeting a 12% annualized volatility on \$300bn of assets translates into variable net notional US Dollar exposures for each asset class in the past three years that are outlined in Figure 2.

More specifically, between 2020 and 2022, net notional US Dollar exposures produced by our generic trend-following model varied within the ranges provided in Table 2.

To estimate a trend-follower’s market footprint in a given asset class, we rely on the notional exposure and trades generated by the generic model and on the previously estimated total directional open interest and daily volume traded for each instrument in this asset class¹¹.

¹⁰ Source: BarclayHedge. <https://www.barclyhedge.com/solutions/assets-under-management/cta-assets-under-management/cta-industry/>

¹¹ More details about the methodology used to aggregate instrument exposure and liquidity metrics into asset class participations rates may be found in Appendix 7.

	Maximum short exposure (USD bn)	Maximum long exposure (USD bn)
Equities	-100	500
Currencies	-450	300
FI & STIR	-450	750
Energy	-50	120
Metals	-50	100
Agriculturals	-50	50

Table 2: Maximum net long and short exposures reached between Jan. 2020 and Nov. 2022 for each main asset class, as obtained from a generic medium-to-long-term trend-following model that closely tracks the SG Trend Index. FI & STIR in 10-year duration equivalent exposures. Source: Quantica Capital.

Table 3 reports the estimated average market participation of trend-following CTAs over the past three years as well as the maximum market participation reached over any five-day window over that period, aggregated across all markets, and per asset class.

	% of directional open interest held on average	% of directional volume traded on average	Max. % of directional open interest held over a 5-day rolling window	Max. % of directional volume traded over a 5-day rolling window
Equities	10.1%	0.6%	35.0%	3.4%
FI & STIR	12.3%	1.3%	28.4%	5.9%
Currencies	4.3%	0.3%	9.3%	1.5%
Commodities	14.7%	2.3%	31.1%	9.4%
All asset classes	9.4%	0.8%	17.6%	3.0%

Table 3: Estimated market footprint of the trend-following industry in terms of directional risk held and volume traded. Average values between Jan. 2020 and Nov. 2022. Source: Quantica Capital.

The following key findings can be derived from our analysis:

- Less than 1% of the total aggregated directional volume can be attributed to trend-following CTAs.
- Less than 10% of the total aggregated directional open interest can be attributed to trend-following CTAs.
- The maximum directional volume participation of trend-following CTAs over any five-day window has been below 10%, for all asset classes.

The specific market footprint of trend-following CTAs in equity markets usually attracts most of the attention and speculation. According to our estimates, their market participation rate is surprisingly low: on average, only around 0.6% of total directional traded equity volume and only around 10% of total open equity interest can be attributed to trend-following CTAs.

Furthermore, the maximum participation in equity futures trading volume reached over any five-day window in the past three years did not exceed 3.5%. These numbers need to be put into perspective. In fact, the notional value of all outstanding open interest across the 26 equity futures in our investment universe has varied in a range between \$1-2tn since January 2020 and compares to a global cash equity market capitalization of around \$100tn¹². Equity futures markets form only a small subset of the overall equity market capitalization and represent only a few percent of the total available cash market liquidity.

Compared to equities, trend-followers record a slightly higher footprint in commodity and fixed income & rates markets, both from a traded volume and open interest perspective. The average share of outright risk held is below 15% for both asset classes, and average directional volume participation range between 1.5% and 2.5% of total directional volume. The maximum volume participation over a five-day period since 2020 reached 5.9% across fixed income and rates markets, and 9.4% across commodity markets.

Unsurprisingly, trend-following records its lowest market participation in currency markets, accounting for only 0.3% and 4.3% of the directional daily traded volume and open interest, respectively.

Finally, Figure 3 and Figure 4 complement the above past three-year averages by outlining the

¹² Source: Statista. <https://www.statista.com/statistics/274490/global-value-of-share-holdings-since-2000/>

estimated historical rolling five-day market participation of our trend-following industry proxy for each asset class since January 2020. As shown in Figure 3, the instantaneous participation rates in directional risk vary significantly over time. This is a reflection of the factors (such as changes in market volatility and prices) that we listed in a first section of this note, and that will affect the footprint of a risk-managed strategy such as trend-following.

As displayed in Figure 4, trend-following participation, when measured as a fraction of directional volume traded over any five-day window, remained mostly immaterial in the past three years. While it is true that sharp changes in trend-signals or market volatility can at times generate larger trades, our results indicate that the maximum participation rate reached since January 2020 over any five-day window have been below 10% of directional volumes for all asset classes, and in most of the cases below 4%.

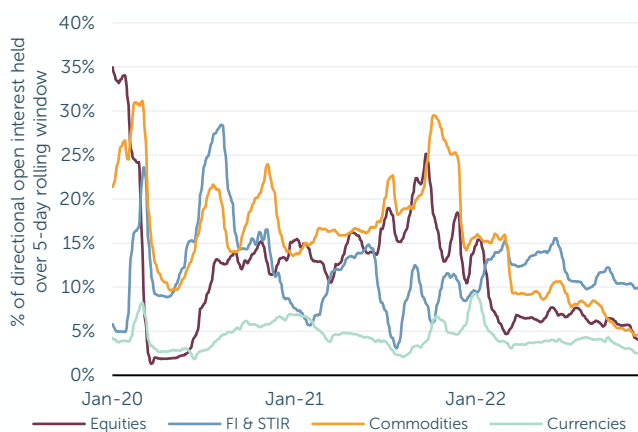


Figure 3: Estimated asset class participation of trend-followers as a percentage of total directional open interest over a five-day rolling window between Jan. 2020 and Nov. 2022. Source: Quantica Capital.

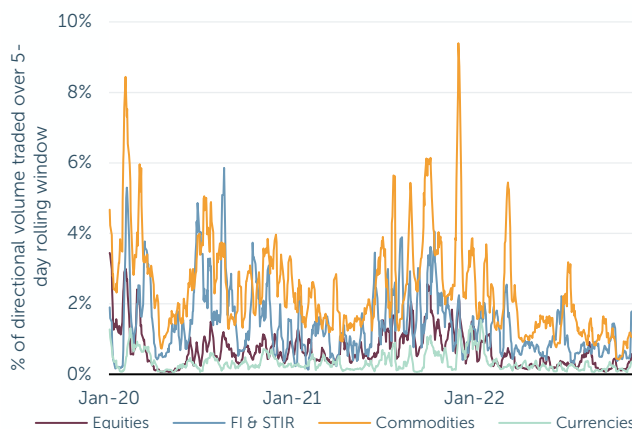


Figure 4: Estimated asset class participation of trend-followers as a percentage of total directional daily volume traded over a five-day rolling window between Jan. 2020 and Nov. 2022. Source: Quantica Capital.

The equity market footprint of trend-followers in 2020 and 2022

To illustrate more specifically the market participation of CTAs in equity markets, we look at two recent periods characterized by substantial trend-reversals:

- January – August 2020, a period that includes the Covid-19 induced equity sell-off and subsequent recovery.
- July – September 2022, a period characterized by a strong equity bear market rally within a prolonged equity drawdown.

January – August 2020:

Trend-followers started 2020 with an estimated aggregate net long notional exposure in equities of \$500bn. The combination of a strong trend-signal in equities at the beginning of 2020, and a historically low equity market volatility translated into a high trend-following equity market participation rate of up to 35% of open interest and 3.5% of directional volume in that period. The March 2020 equity sell-off led CTAs to fully unwind those long positions by the end of March 2020. Trend-following related order flow accounted for approximately \$500bn of equity selling over that 6-week period. Driven by the

subsequent market reversal, the CTA industry bought back a total notional of \$150bn in the subsequent months until August 2020.

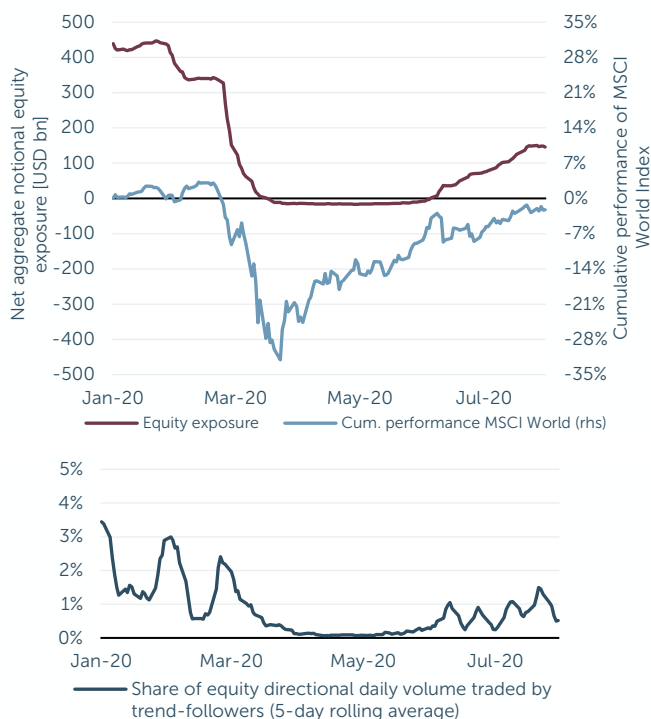


Figure 5: Estimated net aggregated equity notional exposure of the trend-following industry between Jan. 2020 and Aug. 2020 compared to the performance of the MSCI World Index over the same period (top). Estimated five-day rolling average market-participation of the trend-following industry as a percentage of the daily directional equity futures volumes (bottom). Source: Quantica Capital.

As Figure 5 highlights, despite these exceptional price and positioning dynamics, the trend-following industry never accounted for more than 3.5% of outright traded equity futures volume measured over any five-day window during that period.

This example illustrates the strong liquidity properties of trend-following: Even in periods of stressed cash market liquidity, trend-followers are able to execute their trades with low impact, adjusting their risk exposures cost-efficiently and at scale.

July – September 2022:

Figure 6 illustrates a more recent example: the summer 2022 equity bear market rally.

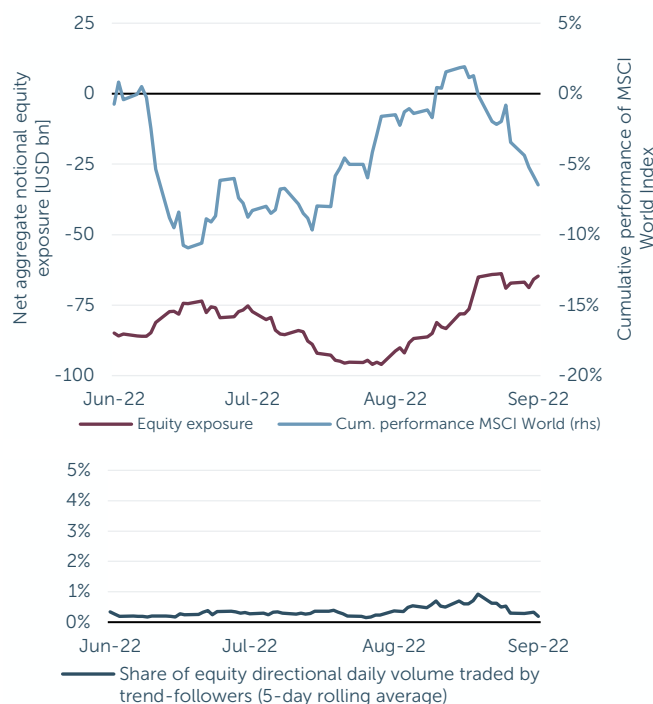


Figure 6: Evolution of the estimated aggregated net equity position of trend-followers along with the performance of the MSCI World during the 2022 equity bear market rally (top). Estimated five-day rolling average market-participation of the trend-following industry as a percentage of the daily directional equity futures volumes (bottom). Source: Quantica Capital.

During the sustained equity drawdown of 2022, the MSCI World Index experienced a sharp 14% rally between mid-June and mid-August 2022. Market commentaries were quick to relate the move in part to “extreme” short positioning by trend-followers, caught into short-covering.

Our model confirms that trend-followers bought back an estimated \$40bn notional in global equity futures over a period of 30 days, starting in mid-July 2022, effectively reducing their net notional short position from \$-100bn to \$-60bn. However, Figure 6 shows that the short-covering induced order flow by trend-followers never accounted for more than 1% of the overall weekly traded directional volume. Put differently, it is

highly unlikely that trend-followers had any material impact on, or even were the source of this bear market rally.

To conclude, our results demonstrate that the participation rates of CTAs in equity markets are surprisingly low, even in extreme scenarios. Maybe less surprising, the participation rates in FX markets are even lower and clearly insignificant.

When it comes to fixed income and interest rates markets, our results indicate a slightly higher footprint with a maximum participation rate in traded volume of up to 6%.

If there is one asset class where CTAs may, at times, have a more substantial footprint on directional activity, it is clearly commodities. However, even in commodities, the maximum participation rate is limited to 10% of traded directional volume and 35% of directional open interest. Whether these numbers are high enough to indicate a material impact on price formation is less clear, especially in some of the less liquid commodity markets. However, this does not change our overall assessment that the footprint of the CTA industry in the most liquid futures markets is surprisingly low overall.

Historical market footprint and industry size

We conclude this note with a longer-term view addressing the relationship between trend-following CTA industry size and market capacity. For that purpose, we analyze the historical relationship between the two variables since 2000. Figure 7 shows the estimated assets managed by systematic trend-following CTAs¹³ since 2000. To get a longer-term perspective, we apply our generic trend-following model on those varying assets under management (as opposed to keeping these assets constant at the past three-year average of \$300bn).

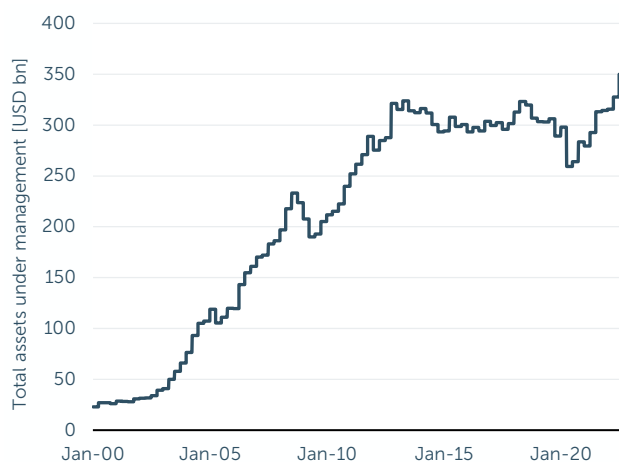


Figure 7: Estimated total assets under management in trend-following CTA strategies since 2000. Source: BarclayHedge.

The resulting rolling five-year average market participation rates in terms of directional traded volume and open interest since 2000 are provided in Figure 8 and Figure 9, respectively. Strikingly, the trend-following footprint across asset classes has stayed in a notably tight range between 2000 and 2022, although the systematic CTA industry grew from an estimated \$23bn to \$350bn over that 22-year period.

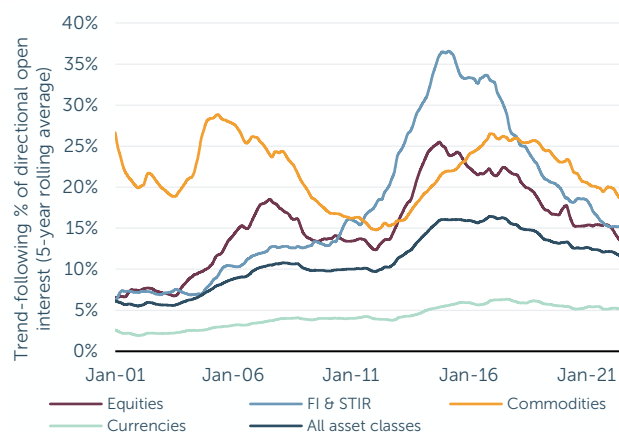


Figure 8: Estimated rolling five-year average market participation of the trend-following CTA industry for each major asset class as a percentage of directional open interest. Source: Quantica Capital.

¹³ Please refer to Appendix 1 for the methodology used to estimate the size of the trend-following CTA industry.

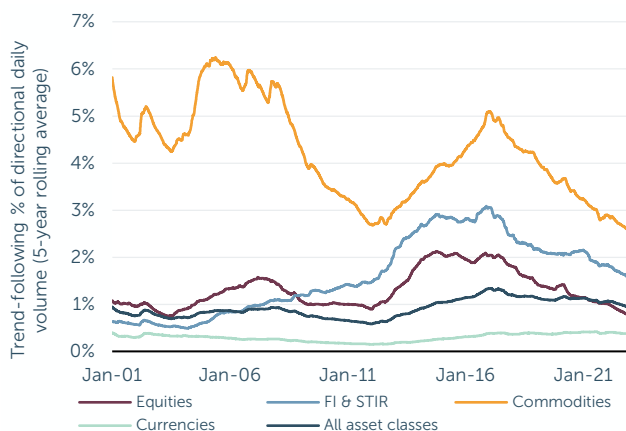


Figure 9: Estimated rolling five-year average market participation of the trend-following CTA industry for each major asset class as a percentage of directional traded volume. Source: Quantica Capital.

What is even more surprising at first glance is that participation in directional trading volume in the commodities sector has rather decreased over time, and the same effect is also observable for the participation in equities, fixed income and rates over the last 5-7 years.

The long-term participation as a fraction of directional open interest has averaged at around 20% for fixed income & rates and commodities, 15% for equities and 5% for currencies. In terms of directional volume participation, the long-term footprint of trend-followers is bigger on commodities. This likely relates to our conservative estimation approach acknowledging that a significant portion of the liquidity in commodity markets is tied to calendar-spreads and therefore not directly accessible for trend-followers. That said, the long-term participation of trend-followers in directional commodity volumes remains below 5%. While this long-term participation rate is below 2.5% for equities and fixed income, it is below 0.5% for currencies.

While there have never been more assets invested in trend-following strategies as there are today, the aggregate market participation of the trend-following industry remains in line with its longer-term average. This reflects the fact that

the capacity of futures markets has been increasing simultaneously with the growth of the trend-following industry in the past decades.

Historically, there has been no linear relationship between trend-following industry growth and its market participation. Our results show that as of today, at an estimated \$300bn, the industry accounts on average only for 1% of global traded directional futures volume and only 10% of open interest. This gives the industry room for further growth without any significant market footprint, even in the unlikely event that such growth would not be accompanied by some increase in the liquidity of the underlying futures markets.

Conclusion

Estimating the footprint of the trend-following CTA industry on the underlying markets requires the estimation of different input variables: the exposures and trading activities of the aggregated CTA portfolio as well as the liquidity of the futures markets that a CTA has access to.

To estimate the positioning of a representative trend-following portfolio, we relied on a generic medium-to-long-term trend-following model based on a representative investment universe of around 100 of the most liquid futures markets across equities, government bonds, interest rates, currencies and commodities. Our generic strategy was designed to closely replicate the SG Trend Index that covers 10 of the largest trend-following CTAs, and hence to represent the industry. We scaled the generic strategy to target a volatility of 12% p.a. and derived exposures and trading activities assuming a total portfolio size of \$300bn, which is our best estimate of the average aggregated size of the trend-following industry over the past 3 years. To estimate the proportion of the liquidity in futures markets that can be traded directionally, we introduced two metrics that have been calculated for each instrument: the "directional" daily traded volume, and the "directional" open interest held in the market. Both metrics exclude any activity related to calendar-spread trading, which represents liquidity that trend-following cannot directly access. Hence, our approach mitigates the risk of underestimating the market footprint of trend-following in asset classes such as commodities and short-term interest rates, where calendar-spread-trading activity can be significant. Indeed, we estimate calendar-spread trading accounts on average for more than 50% and 30% of the overall trading volume in commodity and interest rate futures markets, respectively. Similarly, less than 70% of the total open interest of rates and commodity futures is held directionally. On the

other hand, non-directional trading in equities, fixed income and currency futures is not relevant enough to affect the analysis.

Relying on the above assumptions, we showed that on average, since 2020, the trend-following CTA industry in aggregate across all markets traded:

1. held less than 10% of the directional market risk (i.e., excluding calendar-spread related open interest)
2. traded less than 1% of the daily directional traded volume (i.e., excluding calendar-spread related trades).

However, these participation rates are not uniform across asset classes.

While the specific market footprint of trend-following CTAs in equity markets usually attracts most of the attention and speculation among investors, we show that their participation rate is surprisingly low: Since 2020, on average only around 0.6% of total directional traded volume and only around 10% of open interest can be attributed to trend-following CTAs. Furthermore, the maximum participation in directional equity futures trading reached by our model over any five-day period since 2020 is only 3.5%. We also highlighted that even in extreme trend-reversal scenarios such as the Covid-19 crisis in the first quarter of 2020 or the more recent bear market rally in the summer 2022, trend-following CTAs were able to implement their risk-based strategies without any noticeable market participation in the equity futures market.

In fixed income and interest rates markets, the footprint of trend-following is higher than in equities, but still accounts on average for less than 15% of directional exposure, and less than 1.5% of the total directional volume.

Unsurprisingly, trend-following market participation is lowest in currency markets, accounting for around 4% of the estimated directional open interest and 0.3% of traded volume, respectively.

Even in commodities, where we found the CTA footprint to be highest on average, the maximum participation rate is limited to 10% of traded directional volume and 35% of directional open interest.

Taking all the various factors and considerations into account, our overall assessment is clear: the CTA industry's footprint in the most liquid futures markets is surprisingly small overall.

Finally, we showed that, despite a more than tenfold increase in its assets since 2000, the market participation of the trend-following industry has remained in a relatively narrow range over time across all asset classes, which is the reflection of a simultaneous increase in the capacity of the underlying futures markets.

We conclude that the trend-following CTA industry is far away from full capacity, and there is plenty of room for further growth without any significant market footprint on the most liquid futures markets.

Appendix 1 – Estimation of the trend-following CTA assets under management

When it comes to estimating the size of the trend-following industry (i.e., how many assets are invested in trend-following strategies), studies often refer to estimates provided by the BarclayHedge database. However, BarclayHedge reports the assets under management for the “managed futures” or CTA industry as a whole. But not all CTAs are trend-followers, and the term “managed futures” includes other strategy types than trend-following (e.g., systematic mean reversion, relative value, carry, and even discretionary trading).

At the same time, BarclayHedge publishes assets under management estimates for the following industry subgroups (see Figure 10 for their historical evolution since 2000):

- **Diversified** – managed programs that trade a diversified portfolio.
- **Systematic** – managed programs whose approach is at least 95% systematic.
- **Financials/Metals** – managed programs that trade primarily financial or financial and metals.
- **Discretionary** - managed programs whose approach is at least 65% discretionary or judgmental.

Table 4 provides an overview of the monthly return correlation of each of the four subgroups to the SG Trend Index. The monthly returns of the systematic subgroup, which accounts quite consistently across time for around 85% of total industry assets, correlate more than 90% with the monthly returns of the SG Trend Index.

While each constituent within the Systematic subgroup may not strictly abide to the definition

of “trend-following”, the cross-correlation with the industry benchmark is sufficiently high to rely on the assets reported for this subgroup in the context of this note¹⁴.

Therefore, we choose to use in this note the historical assets under management reported for the Systematic subgroup and its most recent three-year average (i.e., \$300bn) as an estimate of the current size of the trend-following industry.

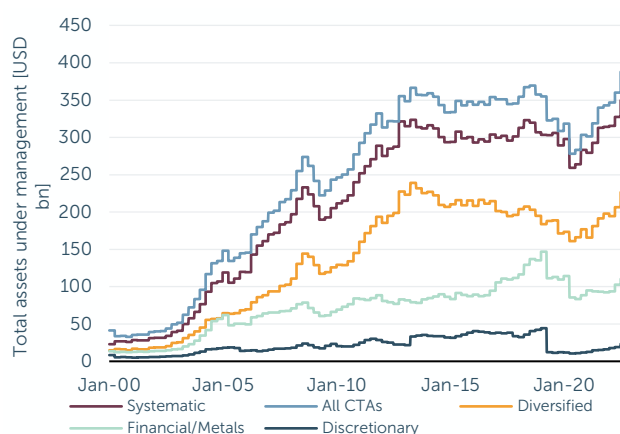


Figure 10: Assets under management for different subsets of the CTA universe. Source: BarclayHedge.

	SGTrend	CTA	Financial/ Metals	Systematic	Diversified	Discretionary
SGTrend	1.00	0.92	0.81	0.93	0.90	0.41
CTA	0.92	1.00	0.85	0.98	0.98	0.53
Financial/ Metals	0.81	0.85	1.00	0.85	0.79	0.34
Systematic	0.93	0.98	0.85	1.00	0.98	0.46
Diversified	0.90	0.98	0.79	0.98	1.00	0.54
Discretionary	0.41	0.53	0.34	0.46	0.54	1.00

Table 4: Correlation of monthly returns between different subsets of the CTA universe. Source: BarclayHedge, Société Générale, Quantica Capital.

¹⁴ While not all assets within that subgroup are tied to trend-following strategies, it is also worth keeping in mind that an unknown amount of assets is invested in trend-following programs that do not report into public fund databases and are typically managed internally by institutions such as pension, sovereign wealth and larger multi-strategy funds.

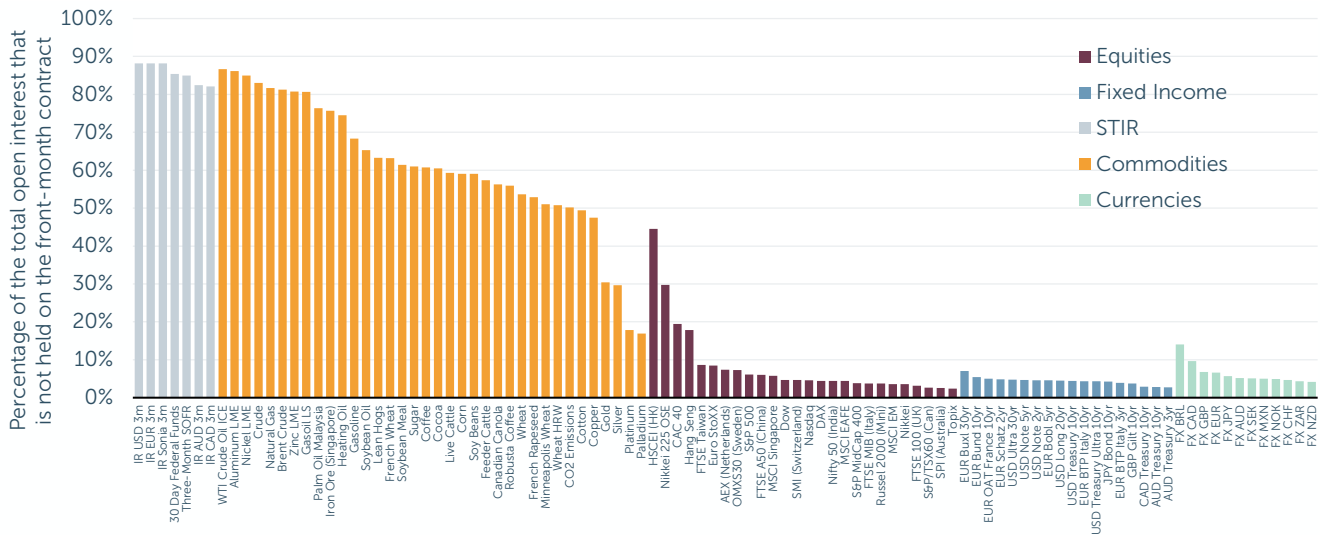


Figure 11: Percentage of the total open interest that is not held on the front-month contract for a representative universe of futures instruments across major asset classes. Average values over the period 2020-2022. Source: Quantica Capital.

Appendix 2 – Percentage of the total open interest that is not held on the front-month contract for a representative universe of futures instruments across major asset classes

The universe of instruments is shown in Figure 11.

Appendix 3 – Estimation of the share of total daily volume coming from calendar-spread instruments

We define *DirectionalVolume* as the sum of the total daily traded volume on all contracts of the curve from which we subtract two times¹⁵ the sum of all daily volumes traded on all calendar-spread instruments.

$$DirectionalVolume = \sum_{i=1}^n Volume_i - 2 * \sum_{\substack{i=1 \\ j=1 \\ i < j}}^n SpreadVolume_{i,j}$$

n is number of futures contracts listed by the exchange, *Volume_i* is the daily total reported volume on *Contract_i*, *SpreadVolume_{i,j}* is the daily volume on the calendar-spread [*Contract_i*, *Contract_j*].

$$NonDirectionalVolume = 2 * \sum_{\substack{i=1 \\ j=1 \\ i < j}}^n SpreadVolume_{i,j}$$

$$TotalVolume = DirectionalVolume + NonDirectionalVolume$$

Figure 12 gives an overview of the percentage of total volume that is coming from calendar-spread instruments since 2020 for a representative set of futures within each major asset class.

Figure 13 illustrates the evolution of *DirectionalVolume* and *NonDirectionalVolume* over time for the US Natgas futures contract. These figures give an estimation of the magnitude of over-estimation of outright activity that would be introduced by using the raw volume data to measure market participation as opposed to *DirectionalVolume*.

¹⁵ 2 times because 1 unit of spread instrument is reported as one unit of each of its legs.

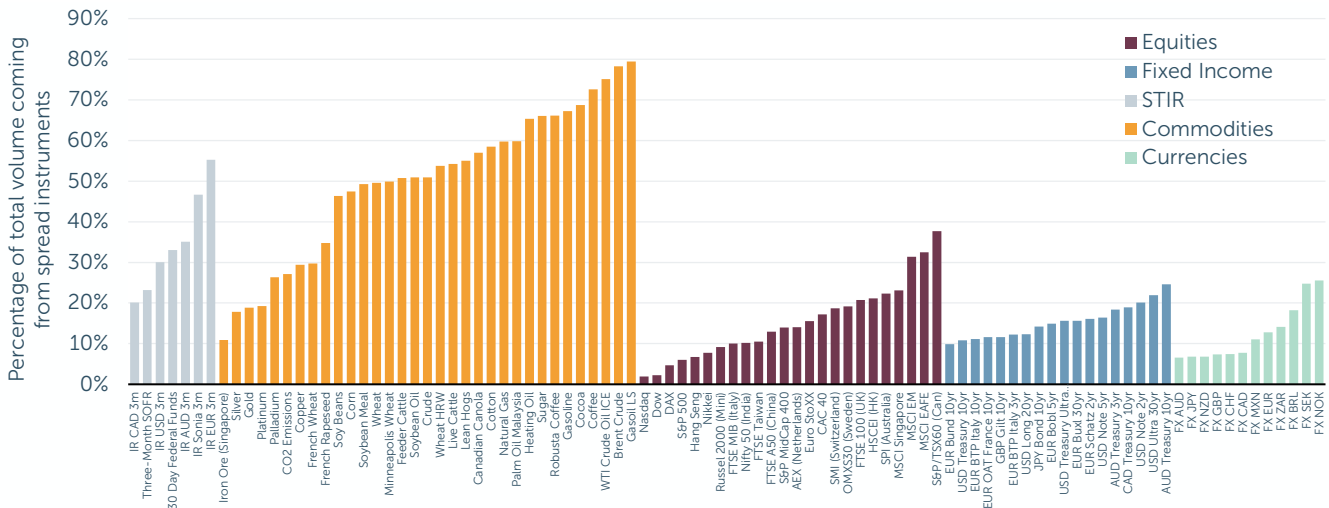


Figure 12: Percentage of the total volume that is attributed to calendar-spread trading activity for each instrument. Average since 2020. Source: Quantica Capital.

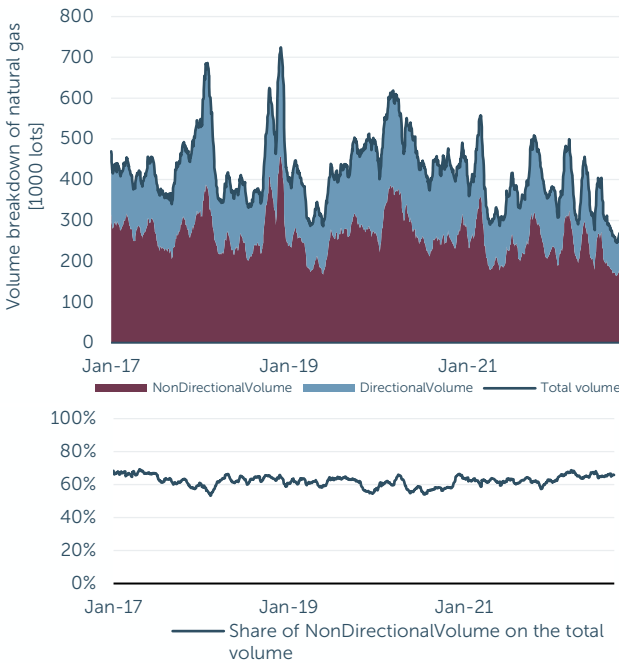


Figure 13: Evolution of the rolling twenty-day average of DirectionalVolume and NonDirectionalVolume in number of lots for the US Natgas futures market (top). Evolution of the share of NonDirectionalVolume on the total volume (bottom). Source: Quantica Capital.

Appendix 4 – Estimation of the share of total open interest that may be tied to calendar-spread positions

The Commodity Futures Trading Commission (CFTC) publishes a weekly Commitments of Traders (COT) report¹⁶ providing a breakdown of open interest across long and short positions between three categories of market participants: Non-Commercial¹⁷, Commercial and Non-Reportable.

For the Non-Commercial category (and only for that one), the report specifies the aggregated positions tied to calendar-spreads (reported as "spreading" positions¹⁸). Such data allows to break down for each instrument the proportion of open interest that is held directionally as opposed to spreading by a fraction of market participants, i.e., those falling under the Non-Commercial CFTC classification. We extrapolate from this public information an estimate of the

¹⁶ Source : CFTC. <https://www.cftc.gov/MarketReports/CommitmentsofTraders/index.htm>

¹⁷ A market participant would be defined as "Non-Commercial" if they have no business activity in relation to an instrument in which they hold a future or option position. More information can be found on the CFTC website: <https://www.cftc.gov/MarketReports/CommitmentsofTraders/ExplanatoryNotes/index.htm>

¹⁸ The CFTC defines "spreading" positions as: "For the futures-only report, spreading measures the extent to which each non-commercial trader holds equal long and short futures positions. For the options-and-futures-combined report, spreading measures the extent to which each non-commercial trader holds equal combined-long and combined-short positions. For example, if a non-commercial trader in Eurodollar futures holds 2,000 long contracts and 1,500 short contracts, 500 contracts will appear in the "Long" category and 1,500 contracts will appear in the "Spreading" category. These figures do not include intermarket spreading, such as spreading Eurodollar futures against Treasury Note futures." Source: <https://www.cftc.gov/MarketReports/CommitmentsofTraders/ExplanatoryNotes/index.htm>

fraction of total open interest held directionally by all participants.

As spreading positions are only reported by Non-Commercial traders, assumptions need to be made for the two other categories. Commercial traders typically use futures to hedge a business exposure to the underlying instruments: their trading activity should be driven by outright trades, and therefore they are less likely to be as active in calendar-spreads as Non-Commercial traders.

We assume that Commercial traders have 25% of the spreading activity that Non-Commercial traders have relative to their gross position (to reflect the fact that a bigger portion of their activity should be outright hedging and not time-spread positions). We further assume that Non-Reportable traders have the same spreading activity than Non-Commercials traders relative to their gross position.

For each report, we know by design that:

$$\sum Long + spreading = \sum Short + spreading = Total\ Open\ Interest$$

We introduce 2 variables, $C_{Spreading}$ and $NR_{Spreading}$, the spreading positions of Commercial and Non-Reportable traders, and recalculate the report such that the following conditions are met:

$$\frac{NR_{Spreading}}{NR_{Long} + NR_{Short}} = \frac{NC_{Spreading}}{NC_{Long} + NC_{Short}}$$

$$\frac{C_{Spreading}}{C_{Long} + C_{Short}} = 25\% * \frac{NC_{Spreading}}{NC_{Long} + NC_{Short}}$$

$$NC_{Long} + C_{Long} + NR_{Long} = NC_{Short} + C_{Short} + NR_{Short}$$

We want to keep the same net positions as the official report, therefore:

$$C_{Long} - C_{Short} = C_{Long\ Official\ Report} - C_{Short\ Official\ Report}$$

$$NR_{Long} - NR_{Short} = NR_{Long\ Official\ Report} - NR_{Short\ Official\ Report}$$

We then re-process the weekly official reports and use the equations above to deduct $C_{Spreading}$ and $NR_{Spreading}$ by solving a system of linear equations with constraints (all numbers must be positive).

Below is an example of applying the above approach based on the report for WTI Oil as per 20 September 2022.

	Official report	Re-processed report
Non-Commercial		
Long	342,588	342,588
Short	102,710	102,710
Spreading	476,269	476,269
Net	239,878	239,878
Spreading / (Long + Short)	1.07	1.07
Commercial		
Long	589,445	338,421
Short	851,013	599,989
Spreading	-	251,024
Net	-261,568	-261,568
Spreading / (Long + Short)	-	0.27
Non-Reportable		
Long	73,243	30,717
Short	51,553	9,027
Spreading	-	42,526
Net	21,690	21,690
Spreading / (Long + Short)	-	1.07
Total Reportable and Non-Reportable OI	1,481,545	1,481,545
Share of spreading activity	32%	52%

Table 5: Commitment of traders report for WTI crude oil re-processed using the assumption that Commercial traders have 25% of the spreading activity of Non-Commercial traders and Non-Reportable traders have the same spreading activity as Non-Commercials traders (relative to their gross position). Metrics shown in red are re-calculated from the official report. Data as of 20 September 2022. Source: CFTC, Quantica Capital.

Out of the total open interest of 1,481,545, a third of it (476,269, 32% of total open interest) comes from Non-Commercial spreading positions according to the official CFTC positioning report. Using our approach, we extrapolate and find that a further 251,024 + 42,526 contracts (bringing the total spreading activity to 52% of total open interest) would be held by Commercial and Non-Reportable traders using our assumption that their spreading activity relative to their gross

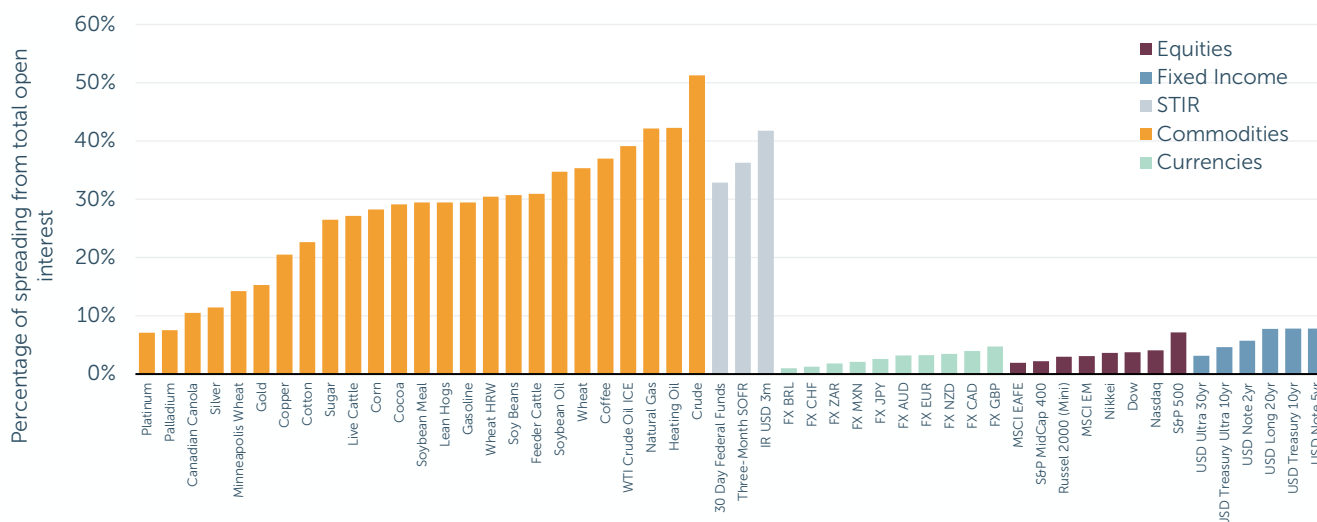


Figure 14: Estimated percentage of the total open interest that is attributed to calendar-spread positions for each instrument. Average since 2020. Source: CFTC, Quantica Capital.

position is respectively 25% and 100% of the one reported by Non-Commercial traders.

An overview of the metric for our representative set of liquid futures contracts across all asset classes is provided in Figure 14.

Appendix 5 – List of market effects that may adversely affect the share of liquidity that is accessible for trend-followers

For the sake of simplicity, we have purposely ignored a number of futures market characteristics that may impact market participation. Notably:

Inter-market spreading (i.e., trading simultaneously offsetting spread positions between different but related instruments). For example, trading a spread between WTI crude oil and Brent crude oil futures will create volume and open interest on both market and not represent “directional” activity.

We assumed that participants either trade calendar-spread instruments to take spread positions or roll their outright position, or outright instruments to take outright risk; we did not consider the volume coming from the trading of derivatives (e.g. options, structured

products). For example, the futures leg of a delta-hedged option trade would not represent a “directional” trade.

We did not consider the fact that some of the volume and open interest on futures could be part of a calendar-spread between an OTC or spot leg and a futures leg, or between two futures legs reported as outright trades, and therefore not be “directional” risk. For example, trading a calendar-spread through a broker and clearing the trade via two outright trades.

Appendix 6 – Break down of the OTC versus on-exchange trading activity for the main currencies

Table 6 provides a summary overview of the average daily OTC traded volumes in US Dollars (combining spot and forward markets) as of April 2022 and the average daily on-exchange futures traded volumes in the second quarter of 2022. The table suggests that daily OTC volume appears to be on average between thirty and forty times bigger than the volume traded on futures exchanges for a set of major currencies.

	OTC spot + forward (\$bn / day) as of April 2022	Exchange (\$bn / day) as of Q2 2022	Ratio OTC/Exchange volumes
EUR	903	31	29
GBP	368	10	38
CHF	134	4	36
CAD	190	7	28
JPY	622	15	41
AUD	222	7	30
NZD	58	2	30
MXN	62	2	35

Table 6: Average daily volumes happening OTC and on-exchange for different currencies. Data as of April 2022. Source: BIS.

Appendix 7 – Calculation of a participation rate at asset class level

The aggregation of instrument exposures and volume traded into asset class market participation rates is done using the following formulas:

$$OI_{MarketParticipation}_{AC} = \frac{\sum_{i=1}^{n_{AC}} | \$Exposure_{TF_i} * \sigma_i |}{\sum_{i=1}^{n_{AC}} | DirectionalOI_i * \$ContractValue_i * \sigma_i |}$$

$$Volume_{MarketParticipation}_{AC} = \frac{\sum_{i=1}^{n_{AC}} | \$Trade_{TF_i} * \sigma_i |}{\sum_{i=1}^{n_{AC}} | DirectionalVolume_i * \$ContractValue_i * \sigma_i |}$$

$\$Exposure_{TF_i}$ is the US Dollar exposure of instrument i generated by the trend-following model.

$\$Trade_{TF_i}$ is the US Dollar trades for instrument i generated by the trend-following model.

$\$ContractValue_i$ is the US Dollar value of one lot of futures of instrument i.

$DirectionalOI_i$ and $DirectionalVolume_i$ are the estimated directional number of contracts for open interest and daily traded volume for instrument i.

σ_i is the volatility of instrument i.

n_{AC} is the number of instruments included in the asset class AC.

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