

May 2022

Citi Commodities Systematic Strategies

Platform Introduction

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Citi Commodities Platform

Citi Commodities Investment Strategies: a Well-Established Platform

The commercial activities of the Global Commodities Group are comprised of trading, structuring, marketing, research and origination, providing 24-hour market coverage with over 225 front office employees.

- Citi’s Commodity Investment Strategy team focuses on the design, implementation and trading of cutting-edge, indexed investment strategies and solutions for institutional investors.
- An open architecture platform designed to support both Citi-sponsored and third party indices.
- CIS leverages Citi’s extensive global trading infrastructure, structuring capabilities and research expertise.
- A cross-asset platform designed to respond to investors’ needs around innovation, risk management, transparency and liquidity.



Commodities Investment Strategies Business Profile

 25+ employees globally	 \$20bn+ Notional assets invested*	 1,200+ Indices calculated daily	 12+ Years of platform
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A Dedicated Global Team

 6 Index Developers	 11 Sales & Structuring	 4 Trading Specialists	 5 Independent Calculation Team
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Source: Citi. (*) Approximate USD notional assets tracking indices as of 30-Sep-21 across all investment formats.

Citi Commodities Global Client & Product Coverage

Citi offers global, around-the-clock coverage in various commodities markets, offering both physical and financial products, and has received numerous awards for its diverse global commodity business

Calgary

Crude Oil
Refined Products
Natural Gas
Power
Structured Origination

New York

Investor Products
Metals
Commodity Financing

Houston

Crude Oil
Refined Products
Natural Gas
Power
Commodity Financing
Structured Origination

London

Crude Oil
Refined Products
Metals
Agricultural Products
Natural Gas
Power
Emissions
LNG
Coal & Iron Ore
Commodity Financing
Investor Products
Structured Origination

Singapore*

Crude Oil
Refined Products
Petrochemicals/Feedstocks
Metals
Ags
LNG
Coal & Iron Ore
Commodity Financing
Investor Products
Structured Origination








**Our Singapore office is Citi Commodities Asia HQ with commodity specialist based in Seoul, Tokyo, and Sydney.
Coverage maintains across all major Asian cities enabling us to offer solutions to a diverse range of customers across the region.*



Source: Citi

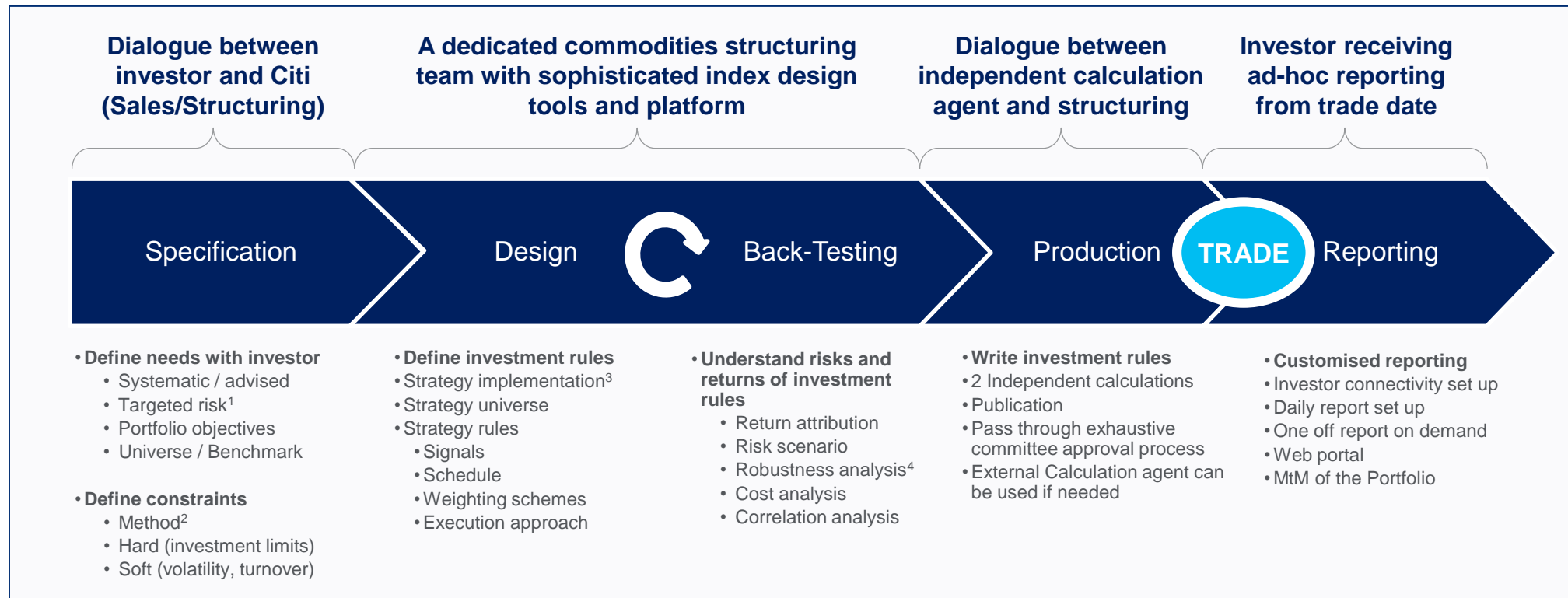
Index Based Commodity Exposure Offered

Citi offers clients market-making and risk management solutions across a full suite of commodity indices

BASE & PRECIOUS METALS	NATURAL GAS	REFINED PRODUCTS	CRUDE OIL	CARBON	AGRI/ SOFTS	BULKS
						
Gold Silver Platinum Palladium Aluminum Copper Lead Nickel Tin Zinc	US Natural Gas European Natural Gas	Heating Oil RBOB Gasoline Fuel Oil ULSD Gasoil <i>Ethanol*</i>	Brent WTI	European Carbon Emissions <i>California Carbon Allowance*</i>	Cocoa Cotton Corn Soybeans Wheat Coffee Sugar Feeder Cattle Live Cattle Lean Hogs <i>Lumber*</i>	Iron Ore

* indices to be launched

Index Development Process Cycle



- Index design can be a **flagship strategy**, **tweaked version of a flagship strategy** according to investors' needs and constraints, or **fully bespoke strategy**.
- Depending on the **complexity and implementation methodology of a strategy**, an index can usually be **launched between two weeks and a couple of months**.
- Usually, the lengthiest part of index implementation is usually the independent calculation team (internal or external) matching the structuring team.

1 Targeted risk: factor of long-term return that is persistent and sound economically and empirically

2 Method: factor investing in commodity is fairly new and mostly based on factors derived from time-series regression. Creating portfolios with specific targeted (and non-targeted) factor risk tend to benefit from using portfolio optimisation techniques.

3 implementation: investment rules are shared between mono rules, index rules and basket rules. Typically, rules based on time-series data tend to be implemented at a mono level, rules based on cross-sectional data tend to be implemented at index level and rules based on correlation at a basket level.

4 Robustness: reliance of performance on a simple factor (such as a lookback period on a trend signal), few commodities (say a commodity contributing 60% of the returns) or non targeted risk (if returns do not come from the targeted risk).

Citi Commodities Investment Strategies Suite

		PRIMARY STRATEGIES		
CARRY	Futures Curve	Roll-Yield Carry	Convexity Carry	Risk-on Risk-off Carry
	Roll Congestion	F0/F2/F3	Dynamic	Dynamic Focused
VALUE	Term Structure	Term Structure Alpha		Dynamic Backwardation Alpha
	Reversal	COT report (positioning)		Fundamental-based using Machine Learning
DEFENSIVE	Momentum	Straddles Momentum Overlay	Time Series Momentum (Trend)	Mean Reversion
	Intraday Congestion	Options-Based Intraday Congestion	Variance-Based Intraday Congestion	Intraday Congestion Filtered
Volatility	Carry	Pure Daily Short Vol	Enhanced Daily Short Vol	Intraday Daily Short Vol

 Under development

Base Metal – Long Al/Copper

Long raw materials as inflation hedge

Metals: Base Inventory Hit Lowest in Decades

The available stockpiles across the six main contracts on the London Metal Exchange have plunged to the lowest on record in data going back to 1997 in recent weeks

Inventory at historical low

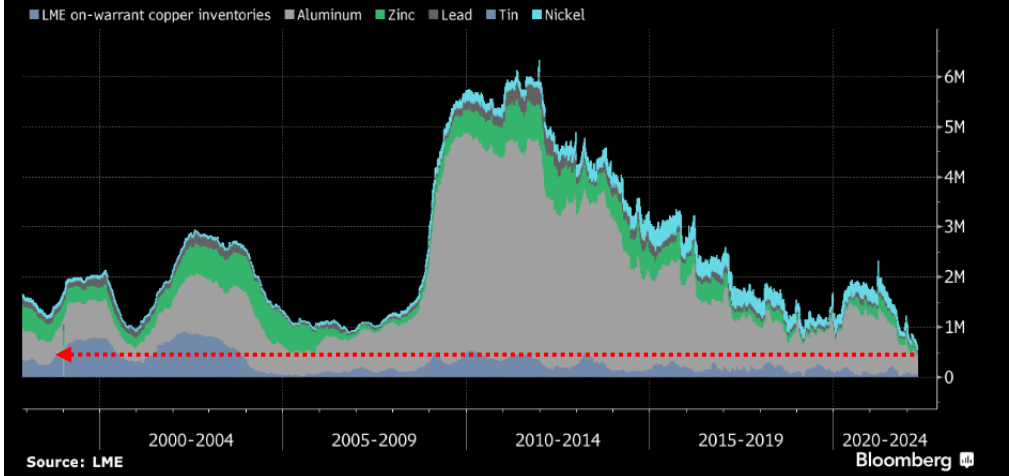
- Inventories were already dropping as industrial activity roared back last year while **global logistics and shipping systems remained snarled**
- Metals like aluminum and zinc came under pressure in Europe as **surging power prices** made some plants unprofitable, leading to closures
- More recently, **supplies from Russia's** giant metal producers have become *less desirable* and harder to ship following the country's invasion of Ukraine

	Last Price*	0-3M E	Q2 2022 E
LME Aluminum	3248	4000	3,800
LME Copper	10200.5	12000	11,000
LME Lead	2382	2200	2,150
LME Nickel	32483	30000	28,000
LME Zinc	4290	4200	4,000

Source: Citi Research, Metals Weekly - Speculators keen to look through manufacturing data weakness, with focus on China stimulus and solid early 2022 consumption, <https://www.citivelocity.com/t/r/eppublic/2LhFy>, 5 April 2022, Maximilian J Layton^{AC}

Shortages Everywhere

LME base-metal inventories are at the lowest level since at least 1997



Source: Bloomberg, LME

Industrial metals: key to energy transition

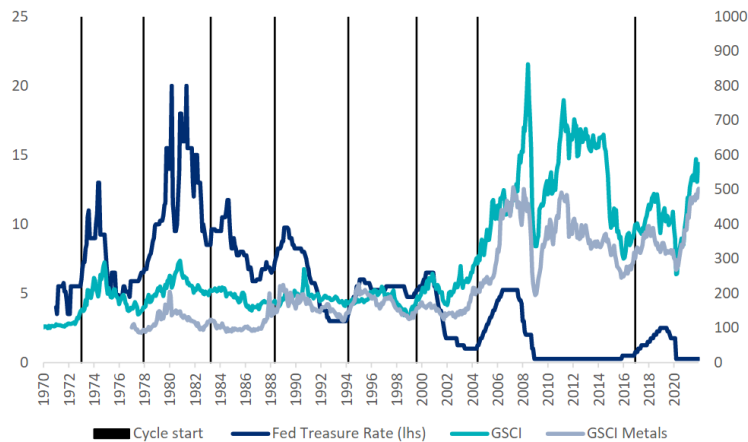
- **Copper** demand from renewables, energy storage and transmission and electric vehicles and charging infrastructure is estimated to **more than double** to 8.6 million tonnes in 2025 from 2020 levels
- **Aluminium** enables "lightweighting" of electric vehicles and increased mileage before batteries need to be recharged
- Price of key energy-transition metals (such as copper, aluminium, tin) will be supported by rising demand from energy transition initiatives and carbon emission reduction targets

Source: Reuters

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Historically, metals prices rise when Fed fund rates rises

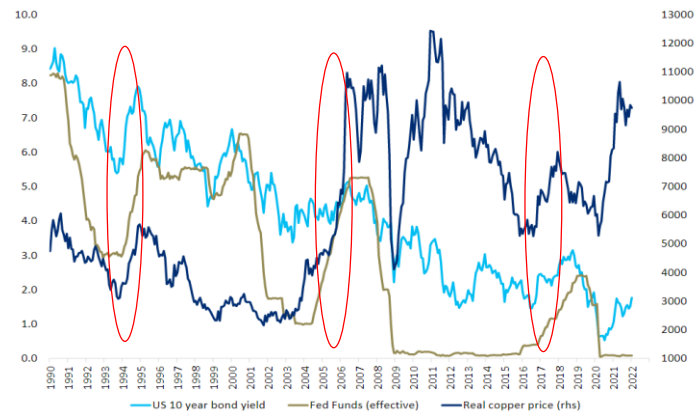
Fed Funds rate hike cycles since 1970



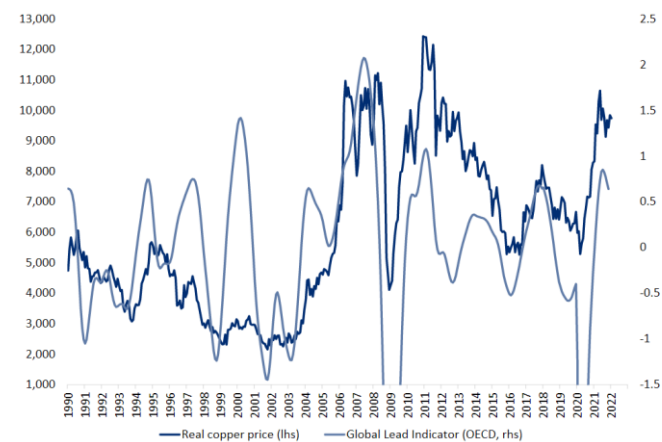
Historically, **industrial metals and copper** performed well over the **12 months following** the first Fed hike and often **outperformed** commodities as a whole during these periods.

Fed cycle start date	12m forward returns (%)		
	All commodities (GSCI)	Industrial Metals (GSCI)	Copper
Dec-16	11%	31%	31%
Jun-04	33%	10%	25%
Aug-99	35%	8%	12%
Mar-94	5%	43%	54%
May-88	6%	25%	23%
Apr-83	1%	-17%	-17%
Dec-77	21%	18%	
Jan-73	62%		
Average ('77+)	16%	17%	21%

Copper prices have been **positively correlated with early-to-mid portions** of historical Fed hiking cycles



Copper prices are **strongly correlated with the global cycle** (proxied by the Global Lead Indicator)

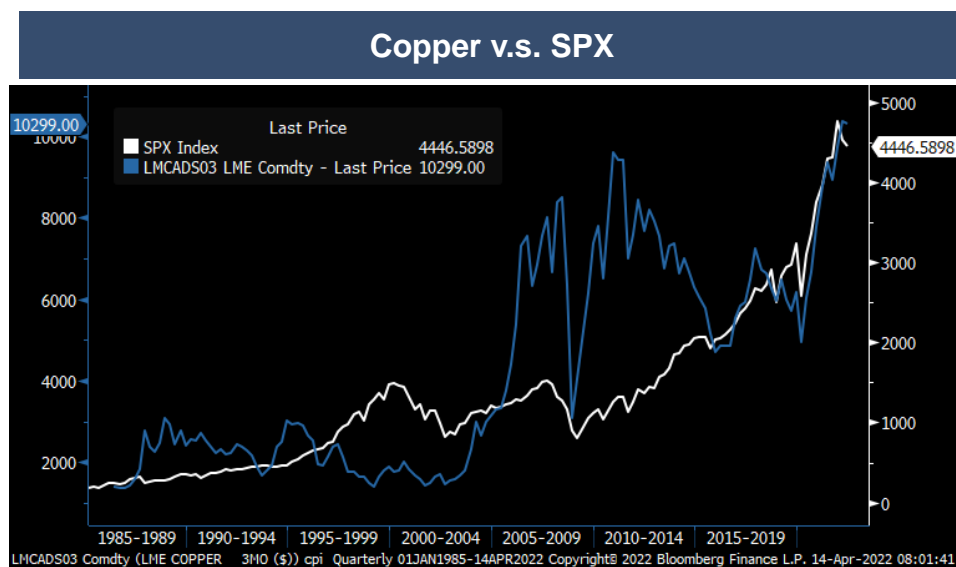
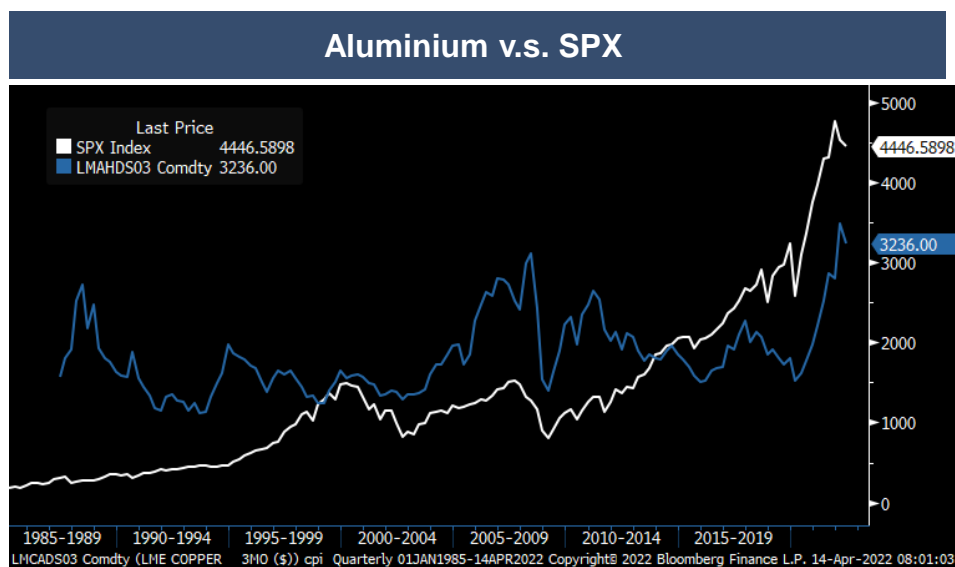
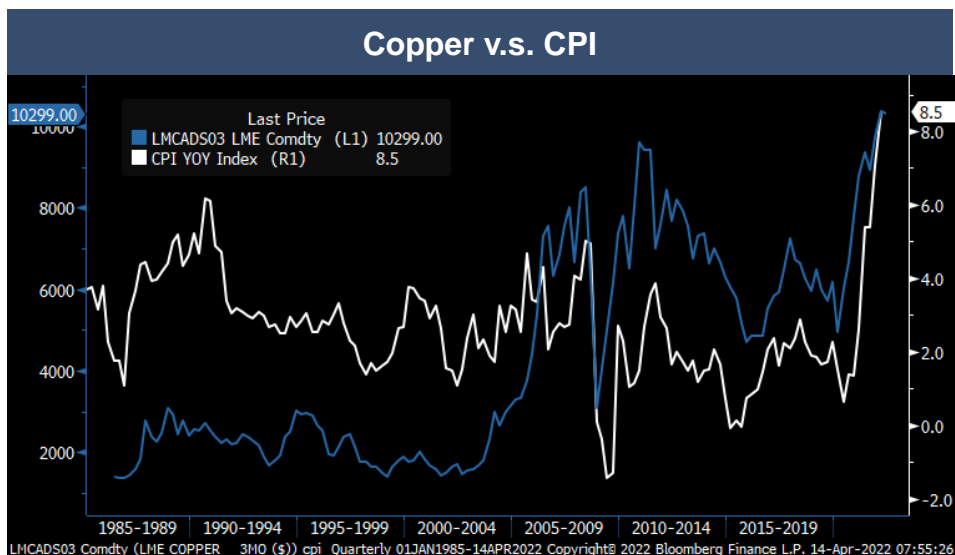
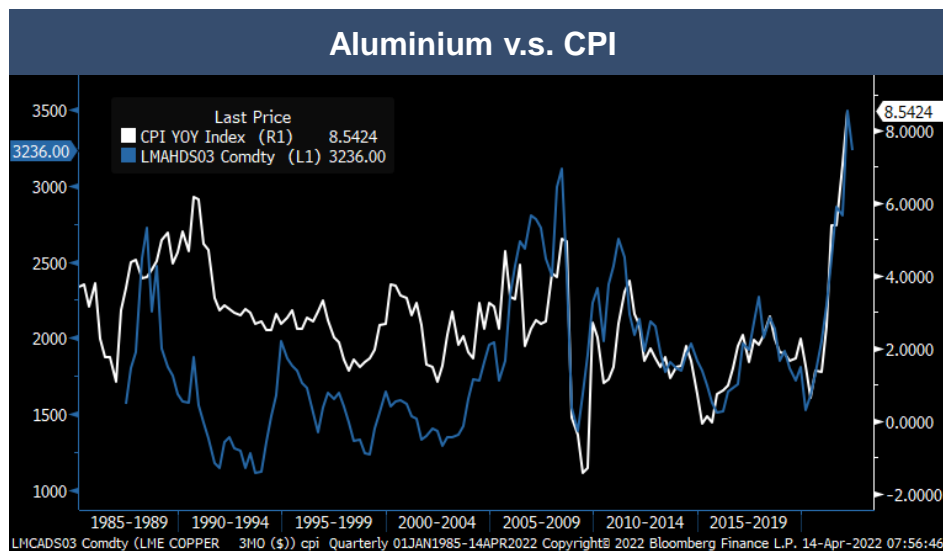


Source: Citi Research, *Global Commodities - What happens to metals when rates rise? And we dive into why ex-China aluminium deficits loom large in 2022*, <https://www.citivelocity.com/t/r/eppublic/2N4xz>, 19 January 2022, Tracy Xian Liao^{AC}

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Aluminium/Copper: positive correlation to Inflation trackers



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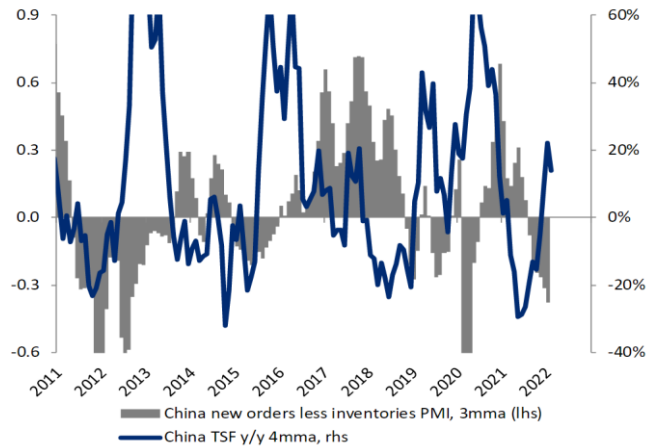
11* Subject to issuer credit risk.

Source: Bloomberg

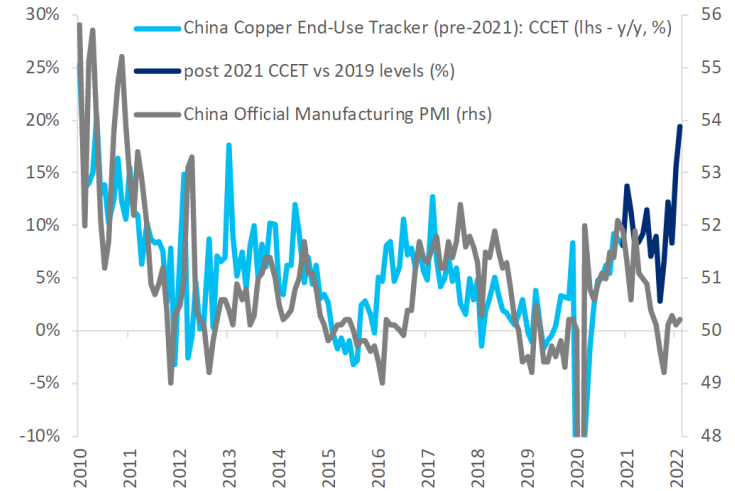


Long Copper as inflation hedge

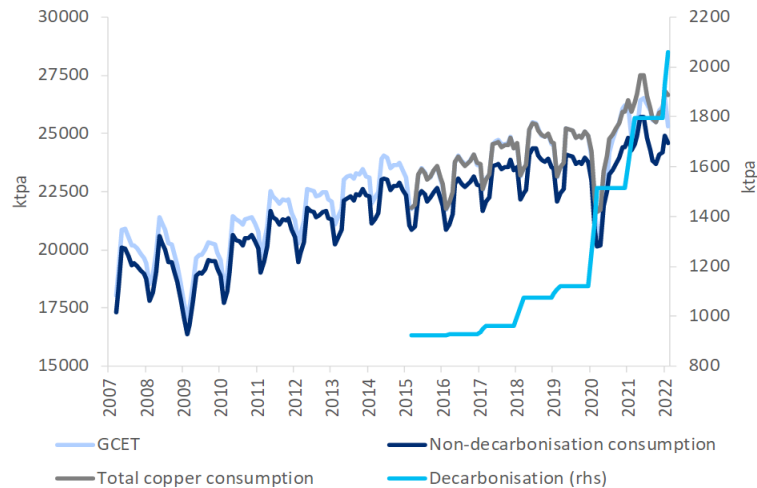
Easing would likely result in a rebound in China PMI



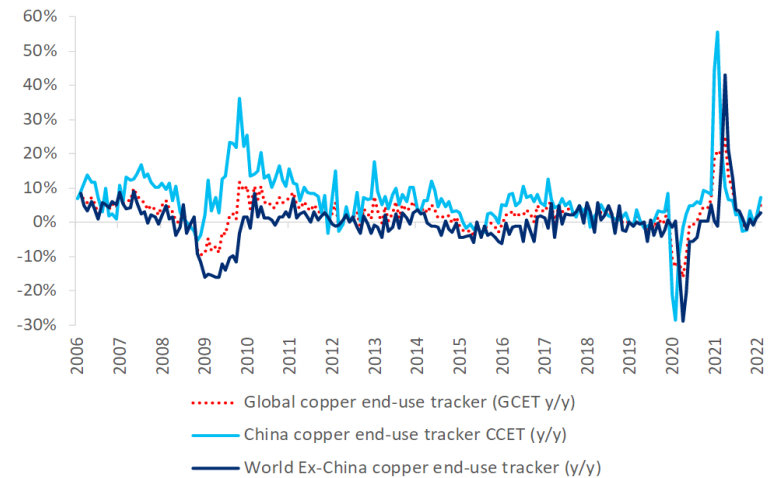
Citi's CCET shows strong corr to China PMI



End-user Consumption trackers: meaningful improvement



Copper consumption growth picked up in recent months



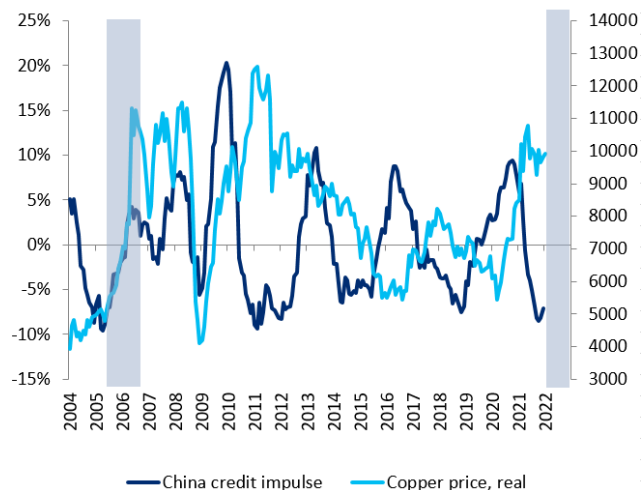
Source: Citi Research, Metals Weekly - Speculators keen to look through manufacturing data weakness, with focus on China stimulus and solid early 2022 consumption,

<https://www.citivelocity.com/t/r/eppublic/2LhFy>, 5 April 2022, Maximilian J Layton^{AC}

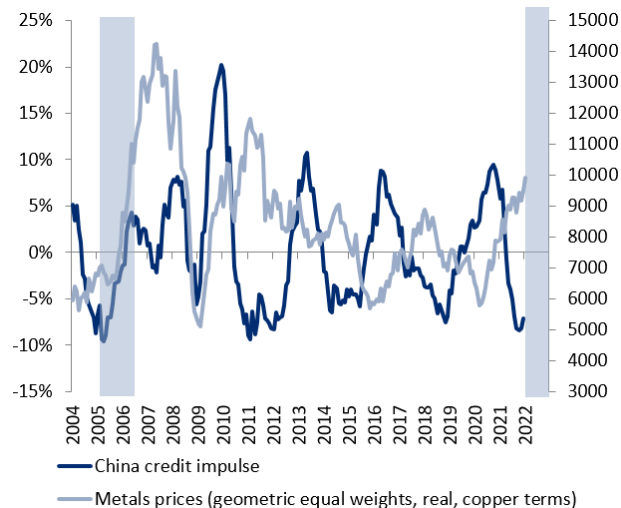
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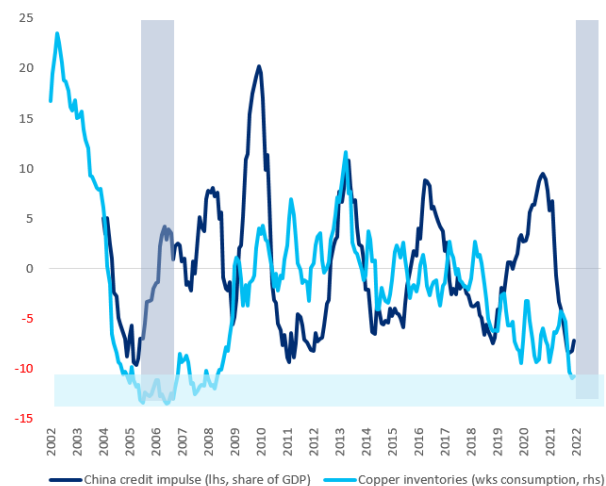
Copper - supercycle story to continue



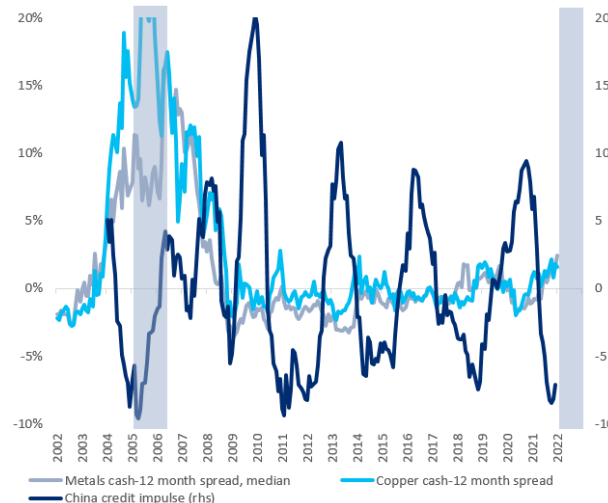
The last time China eased policy into high/rising metals price environment was 2005 – during the period when Cu prices doubled



China is easing into high and rising metals prices for the time since 2005



China is easing policy into the lowest available global inventory since the mid – 2000s



China is easing policy into the tightest metals and copper spreads in well over a decade

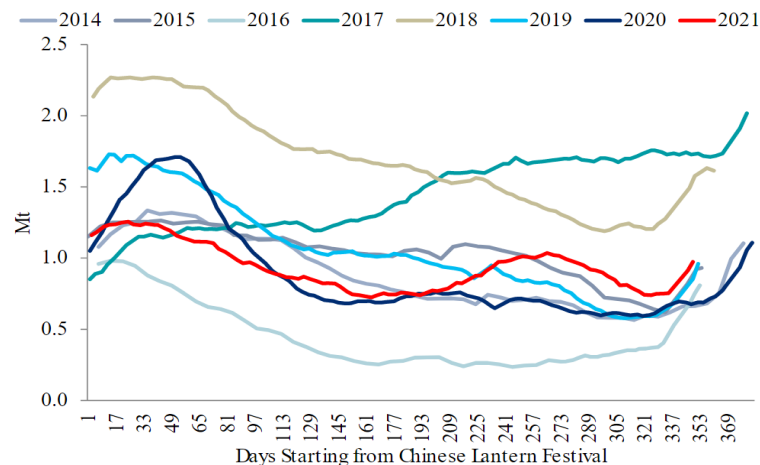
Source: Citi Research, Global Commodities - Supercycle sunlight – why copper's next move is to \$11k/t and to \$13k/t in our bull case, <https://www.citivelocity.com/t/r/eppublic/2N4wY>
9 Feb 2022, Maximilian J Layton^{AC}

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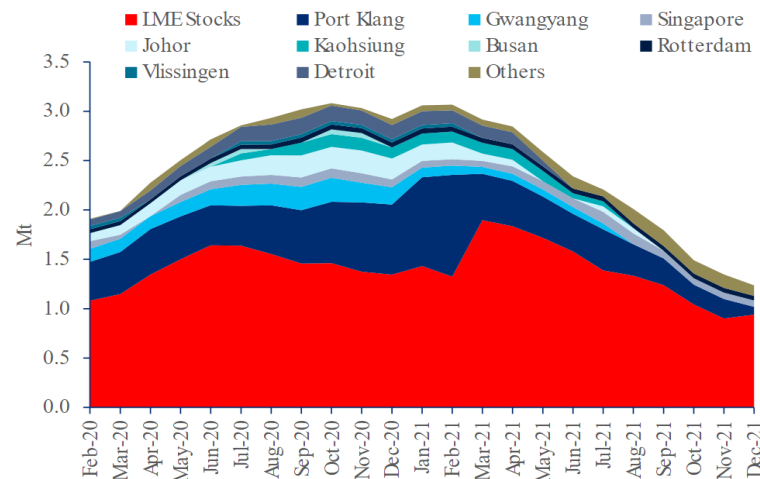
13* Subject to issuer credit risk.

Long Ali: rising producing costs in an environment of low inventories

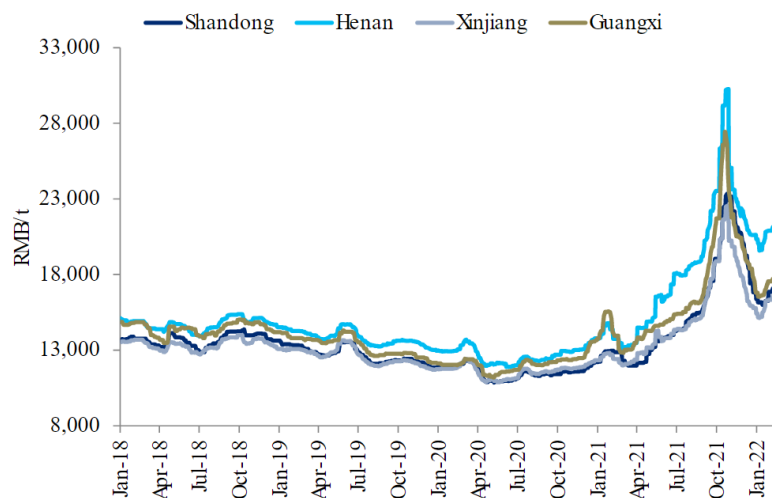
China aluminium inventories in key cities



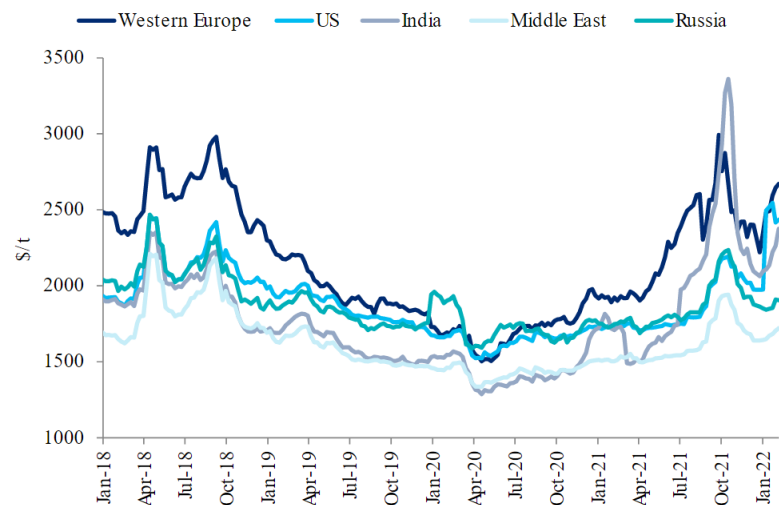
LME on and off warrant aluminium inventories



China aluminium cash cost tracker



Ex-China aluminium cash cost tracker



Source: Citi Research, Global Commodities - Aluminium enjoys all the tailwinds it needs, <https://www.citilocalcity.com/t/r/eppublic/2N4xu>, 14 Feb 2022, Tracy Xian Liao^{Ac}

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Call Spread on Basket of Ali and Copper

2Y note offers exposure to the average performance of Aluminium and Copper

The note payout is floored at 100% if held to maturity

Format	CGMFL / CGMHI Note
Issue Price	100%
Currency	USD
Tenor	2Y
Underlying	Equally weighted basket of Copper (LOCADY), Aluminium (LOAHDY)
Cap	120%
Basket Performance	Arithmetic average of underlying performance
Underlying performance	Final level divided by Initial level
Redemption at maturity	Notional amount x Basket Performance, capped at 120% and floored at 100%

Indicative price as of 6 May 2022

ESG Product Offering

Commodities

EU ETS Price History

- €0-15: A regulator's headache (EU ETS is cornerstone of EU climate policy)
- €15-30: Energy efficiency, coal-to-gas switching, increase of power prices => increase in PPA activity
- €30-40: Further deployment of renewables, grid modernisation, hydrogen, batteries
- €40-90+: High gas prices, speculative demand and upcoming reforms push price to record-high



Source: Bloomberg

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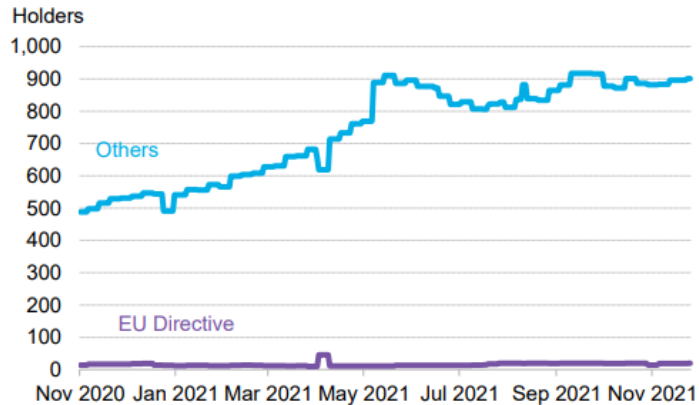
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Investor Interest in Carbon Market

Speculator go long on EUA

- The number of entities invested in EUA futures, which are not under the EU directive, has **risen 85%** to 901 holders from last November. The group reached a record high of 917 holders in September 2021, betting on the carbon price going up.
- During November 2021, investment funds reverted to growing their carbon positions. The build up contributed to EUAs breaking the psychological price threshold of 70 euros/t and reaching 75 euros/t on November 25, 2021.

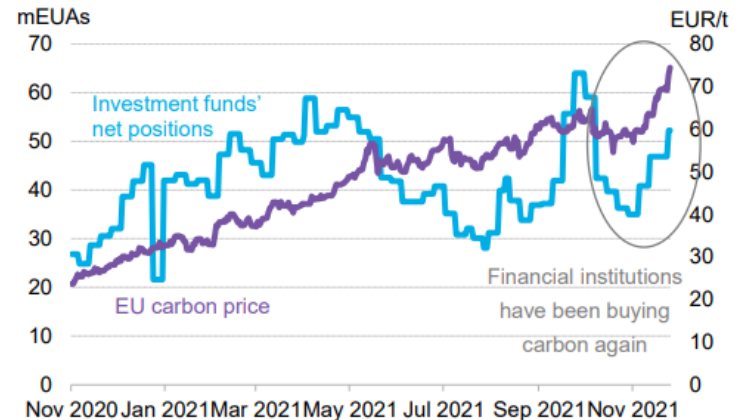
COT: Net position holders



Source: ICE, EEX, BloombergNEF. Note: Data is from Commitment of Traders (CoT) database.

Source: BloombergNEF

COT: Investment funds' positions



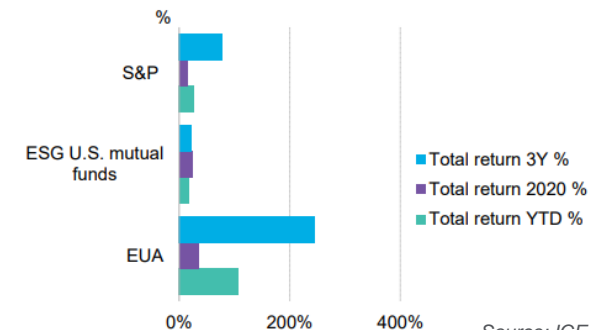
Source: ICE, EEX, BloombergNEF. Note: Data is from Commitment of Traders (CoT) database.

Source: BloombergNEF

Carbon attracts investors as a green asset

- EUAs have generated **higher returns** than S&P 500 or U.S. ESG mutual funds in the year-to-date and for the past three years
- EUAs have also performed better in the Covid-19 pandemic-ridden year

S&P, ESG mutual fund and EUA returns



Source: ICE, terminal, BloombergNEF

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Citi Research: EUA remains an attractive buy

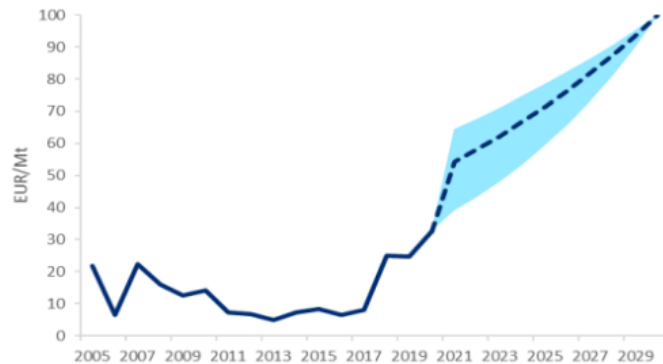
Bullish Factors:

- Fundamental balances deficit next year
- Ambitious “Fit for 55” environmental packages
- Economics of green hydrogen versus grey and blue hydrogen: Long way to go before green hydrogen becomes a commercially viable commodity
- Scarcity of allowances: our research team expect the total supply of carbon allowances to decrease by 5%

Potential risks

- A lower gas curve could put downside pressure on EUA prices from 2Q22 onwards
- EU regulators could be prompted to intervene due to high energy prices

Citi EUA price forecasts range to 2030



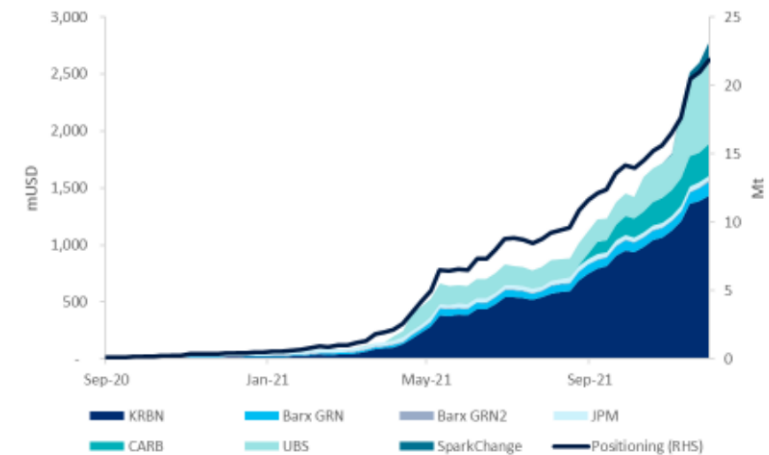
Source: Citi Research, *Global Commodities - After a Winter of Discontent for Energy*, <https://www.citivelocity.com/t/r/eppublic/2N4zv>, 10 December 2021, Edward L. Morse et al

The fundamental supply and demand balances are expected to remain in deficit over the next decade



Source: Citi Research

Capital is also piling into passive investment schemes, with ETFs AUM up



Source: Citi Research

Players in EU Allowance (EUA)

Physical and Futures Markets

Market Participants

- Operators with compliance obligations – utilities/industrial under EU ETS
- Investment firms or credit institutions – banks/dealers
- Other financial institutions – insurer/re-insurer
- Investment funds – HFs or asset managers
- Commercial undertakings – apart from above like trading houses

EU carbon market – recap and how to access it?

- EU carbon market cap is > €200bn
- EUA submission year end is end of March and operators must surrender their EUA by end of April
- Spot market for EUA
 - Each physical allowance entitles you to emit one tonne of CO₂. Can be surrendered by emitters in order to meet their CO₂ quota
 - You must have a registry setup at an authority, e.g. Dutch
 - Investment firms that have a registry setup and have an arrangement in place with the appropriate auction platform are able to participate via the primary market/auction
- Futures market for EUA (Exchanges – ICE and EEX)
 - Monthly contracts but most people trade December contracts and other contracts don't have many open interests. Dec-21 open interest is ~ €25bn
 - Daily average volumes of December 2021 contract on ICE ~ €1.5bn

EUA - Access Products

Physical Carbon Permits

Physical holding

- No maturity on permits
- Direct exposure
- Need an account at the Union Registry and buy/sell through this account
- Fully funding the exposure

Exchange Traded Commodities or Structured Notes

ETCs are being launched while Notes can be structured easily

- No major ETCs currently in the market
- Daily liquidity
- Indirect exposure such as a transferable security
- No physical delivery
- Structured notes wrapping futures or TRS exposure
- Fully funding the exposure

Futures Markets

ICE or EEX Exchanges

- EUR denominated
- December contracts are much more liquid
- Daily liquidity
- Physical delivery
- Roll costs
- Initial margin ~ 13% in EUR

Total Return Swap (TRS)

Total Return Swap (TRS) Linked to EUA Emissions Index

- Index CVICA0MO level is published daily on Bloomberg
- Index was launched in Sept 2019
- Daily liquidity – same liquidity as futures
- No physical delivery
- Rolling December contract every November before expiry
- 2 way daily margining with no initial margin (dependent on your CSA with Citi)

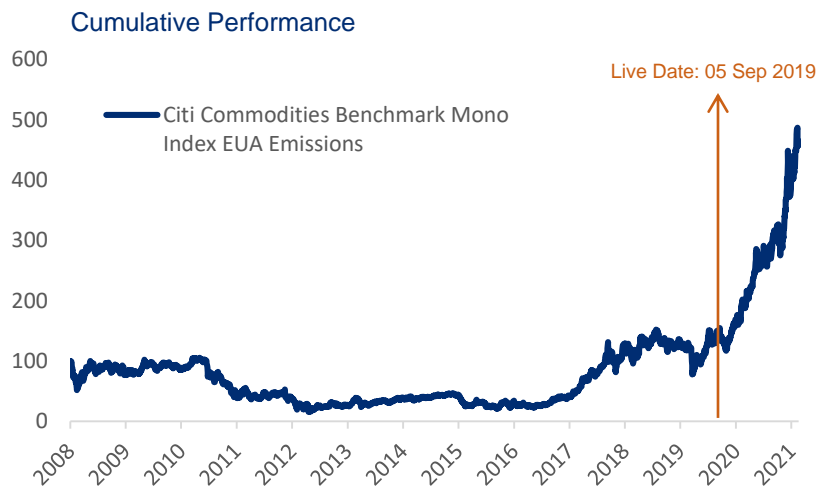
Citi EUA Emissions Index – Rolling December Futures Index

Citi EUA Emissions Index

Ticker: **CVICA0MO** – Live Since September 2019

- **Concept:** Long only index; tracks the December futures of the EUA Carbon Emission contracts.
- **Rolling mechanism:**
 - As Futures contracts have a set expiry date an index has to “roll” to avoid taking delivery.
 - This Index only holds December contracts, rolling from the front December contract to the next December over a 10 day period starting on the 5th business day of every November.
- The Index is described in full in the applicable Index Conditions which are available on request.

Additional Past Performance Information



Index Performance Statistics - as of 28 May 2021

	1 Year	3 Years	5 Years	Since Dec-08
Annualised Return	138.9%	45.6%	52.0%	7.9%
Volatility	43.7%	47.7%	48.1%	49.9%
Sharpe Ratio	3.2	1.0	1.1	0.2
Max Drawdown	-24.4%	-49.0%	-49.0%	-85.5%
Max Drawdown / Vol	-0.6	-1.0	-1.0	-1.7
Positive Months	75.0%	58.3%	63.3%	57.7%

Source: Citi.

Standardised Live and Simulated Past Performance

	31 May 16 to 31 May 17	31 May 17 to 31 May 18	31 May 18 to 31 May 19	31 May 19 to 29 May 20	29 May 20 to 28 May 21
CVICA0MO	-18.75%	198.09%	60.92%	-13.00%	137.25%

Monthly Performance

☐ Live performance

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann Ret	Ann Vol	Sharpe Ratio
2009	-25.5	-14.9	16.5	21.4	4.6	-11.1	3.4	8.9	-10.5	8.8	-10.1	-6.1	-22.8	49.0	-0.5
2010	2.6	1.1	-1.3	24.2	-5.2	1.0	-7.3	7.9	0.9	-5.1	0.7	-5.3	11.4	26.9	0.4
2011	5.2	3.6	11.3	-0.8	-0.9	-20.4	-9.6	5.9	-17.1	-5.3	-17.7	-16.2	-50.8	45.2	-1.1
2012	9.8	6.5	-16.8	6.7	-16.3	30.2	-16.3	16.6	-1.5	3.5	-24.6	3.1	-12.5	51.5	-0.2
2013	-48.7	43.3	-1.8	-35.1	26.6	6.6	3.1	5.3	10.3	-4.6	-9.7	10.2	-28.2	86.6	-0.3
2014	12.9	27.9	-34.3	16.2	-6.6	14.9	6.3	2.9	-8.9	8.7	10.8	2.7	45.9	46.2	1.0
2015	-2.6	0.0	-2.5	6.6	-0.9	1.4	5.6	2.5	0.9	6.0	-0.7	-4.2	12.0	25.7	0.5
2016	-26.8	-17.5	4.2	18.4	-1.3	-26.7	-0.9	0.9	11.0	19.0	-22.2	42.5	-21.1	55.0	-0.4
2017	-18.4	-2.2	-10.5	-2.6	9.0	1.0	4.0	13.6	19.0	4.2	2.1	8.2	24.0	47.7	0.5
2018	13.4	8.8	31.5	2.3	9.7	0.5	16.1	21.2	0.6	-22.9	25.0	20.0	199.9	48.6	4.1
2019	-10.8	-2.7	-0.7	22.1	-7.0	7.4	6.5	-5.9	-6.1	3.6	-1.5	-2.8	-2.0	41.7	0.0
2020	-3.1	-1.1	-25.1	10.7	9.4	26.0	-2.6	9.1	-6.0	-12.0	23.1	11.5	32.1	52.4	0.6
2021	0.7	13.1	14.1	14.8	4.5								56.0	38.8	

Source: Citi. Please refer to the disclaimer in the Performance Notice.

Investor Products – correlation with other asset classes

Correlations of EUA with traditional asset classes are very low and negative even under stressed events

Correlation to Other Assets – Overall Period (31-Dec-08 to 31-Jan-21) and Various Stressed Events

Start Date	End Date	Events	US Equities	World Govt	Global Agg	USTs	US TIPS	Gold
31-Dec-08	31-Jan-21	Overall	17.84%	-0.02%	1.95%	-9.22%	-3.42%	1.82%
15-Sep-08	09-Mar-09	Lehman Bankruptcy*	8.72%	-27.15%	-24.32%	-40.06%	-28.21%	-27.73%
01-Apr-10	30-Jun-10	EU Sovereign Crisis	9.01%	-9.44%	6.42%	0.16%	22.94%	21.78%
07-Jul-11	10-Aug-11	U.S. Debt Downgrade	32.49%	15.22%	16.36%	-1.54%	8.88%	10.54%
15-Jun-12	31-Jul-12	Summer Drought 2012	15.00%	-17.10%	-15.31%	-33.65%	-29.02%	12.89%
29-Jan-13	30-Dec-13	Taper Tantrum	1.13%	3.40%	4.45%	2.71%	1.57%	-5.32%
20-Jul-15	28-Sep-15	China Stock Market Crash	15.80%	-4.30%	-1.06%	-4.78%	5.44%	9.72%
02-Jun-18	28-Sep-18	First Tariff In Trade War	-6.72%	5.88%	1.29%	-4.98%	2.97%	9.19%
03-Oct-18	24-Dec-18	Q4 2018 Sell-off	-1.49%	-9.23%	-8.38%	-8.68%	1.18%	-6.31%
13-Sep-19	03-Oct-19	Saudi Refinery Attacks	-23.02%	-44.30%	-37.69%	1.39%	34.54%	8.37%
19-Feb-20	23-Mar-20	COVID-19	43.40%	29.84%	33.59%	21.56%	17.82%	21.09%
Average of Stressed Events			9.43%	-5.72%	-2.46%	-6.79%	3.81%	5.42%

Source: Bloomberg

*Our EUA index CVICA0MO starts on 31 Dec 2008 so correlation of daily returns between 31 Dec 2008 and 31 Jan 2021

- US Equities: S&P 500
- World Govt: Bloomberg Barclays Global Agg Treasuries Total Return Index
- Global Agg: Bloomberg Barclays Global Aggregate Total Return Index
- USTs: Bloomberg US Treasury Total Return USD
- US TIPS: Bloomberg US Treasury Inflation Notes Total Return Index USD
- Gold: Bloomberg Gold Subindex

Historical Returns During Various Stressed Events

Start Date	End Date	Events	EUA Index	US Equities	World Govt	Global Agg	USTs	US TIPS	Gold
15-Sep-08	09-Mar-09	Lehman Bankruptcy*	-26.73%	-43.28%	-0.49%	-2.48%	4.20%	-7.55%	16.14%
01-Apr-10	30-Jun-10	EU Sovereign Crisis	16.58%	-12.51%	0.33%	-0.05%	4.80%	3.97%	10.48%
07-Jul-11	10-Aug-11	U.S. Debt Downgrade	-10.77%	-17.18%	4.39%	3.51%	4.59%	7.19%	16.42%
15-Jun-12	31-Jul-12	Summer Drought 2012	-5.33%	2.72%	0.95%	1.19%	0.74%	0.95%	-1.12%
29-Jan-13	30-Dec-13	Taper Tantrum	21.67%	22.10%	-2.73%	-1.50%	-1.80%	-7.58%	-27.95%
20-Jul-15	28-Sep-15	China Stock Market Crash	-0.88%	-11.58%	2.50%	1.77%	1.71%	-0.95%	2.12%
02-Jun-18	28-Sep-18	First Tariff In Trade War	31.49%	6.08%	-1.98%	-1.05%	0.05%	0.07%	-8.61%
03-Oct-18	24-Dec-18	Q4 2018 Sell-off	16.62%	-19.63%	2.26%	1.40%	2.84%	-0.02%	5.21%
13-Sep-19	03-Oct-19	Saudi Refinery Attacks	-11.90%	-3.22%	1.36%	1.20%	2.46%	1.55%	0.95%
19-Feb-20	23-Mar-20	COVID-19	-39.56%	-33.92%	-0.82%	-3.11%	5.40%	-0.43%	-2.61%

Source: Bloomberg, sub-periods of daily returns from 14 Sep 2008 to 31 Jan 2021

*Our EUA index CVICA0MO starts on 31 Dec 2008 hence EUA Index return is calculated from this date to 09 Mar 2009. The other asset classes start on 15 Sep 2008

Citi does not offer legal, accounting, regulatory or taxation advice. Client institutions should undertake their own independent analysis in relation to any of the trade ideas or other proposals made herein, and should confirm the legal, accounting, regulatory and tax treatment with their own advisors before entering into any resulting transaction. The availability of the products are subject to respective jurisdiction's restrictions and may be subject to regulatory approval in each jurisdiction. This is neither an offer or recommendation to purchase or sell any investment product. Please contact your local Citi Sales Representative for further information.

* Subject to issuer credit risk.

Delta 1 tracker

1Y note offers exposure to the performance of underlying index, providing access to the EUA emission futures

The note payout is floored at zero

Format	CGMFL Certificate
Issue Price	100%
Currency	USD
Tenor	1Y
Underlying	Citi Emission Index – CVICU0MO <Index>
Fee	0.70%
Redemption at maturity	Notional amount x (Final Level / Initial Level – Fee)

Indicative price as of 6 May 2022

The CUBES-D Index “Enhanced Beta”

Citi CUBES-D Strategies

The CUBES-D Index and the BCOM

The CUBES-D Index and the BCOMSM track the performance of the same 22 commodities, weighted in a similar way. However they may track the performance of futures contracts for different maturities

Methodology

- The BCOMSM tracks the performance of 22 commodities in the following way.
 - *Monthly Futures Contract Selection:* Each month, the BCOMSM roll to new futures contracts for each commodity. The contracts that the BCOMSM rolls to each month is determined by a static schedule.
 - *Monthly Roll Period:* On a monthly basis, for each commodity, the BCOMSM progressively rolls to a new futures contract over the fifth to ninth business days of the month.
- The CUBES-D Index tracks the performance of the same 22 commodities in the following way.
 - *Monthly Futures Contract Selection:* Rather than a static roll schedule, the CUBES-D Index uses a rules-based algorithm to dynamically choose three futures contracts to track each month, for each commodity. Selected futures contracts are those which are anticipated by the algorithm to generate the highest positive yield, or least negative yield, relative to other futures contracts, for each commodity, which mature within one year.
 - *Monthly Roll Period:* On a monthly basis for each commodity, the CUBES-D Index progressively rolls to newly selected futures contracts over the first to third business days of the month.

Tracked Commodities

Energy
WTI Crude Oil
Brent Crude Oil
Natural Gas
Gasoline
Heating Oil

Precious Metals
Gold
Silver

Industrial Metals
Copper
Aluminium
Nickel
Zinc

Agriculture
Wheat (Chicago BOT)
Wheat (Kansas BOT)
Corn
Soybean
Soybean Oil
Soybean Meal
Coffee
Sugar
Cotton

Livestock
Lean Hogs
Live Cattle

Source: Citi

How does the CUBES-D Index attempt to outperform the BCOMSM?

The CUBES-D Index aims to outperform the BCOMSM in two ways

Monthly Futures Contract Selection	BCOM SM	CUBES-D Index
	<p>Passive Rolling Methodology</p> <ul style="list-style-type: none">• The BCOMSM uses a static roll schedule and typically tracks commodities which are near maturity, or near the front of each futures curve.• If the futures curve is in contango, this may result in negative yield.	<p>Dynamic Rolling Methodology</p> <ul style="list-style-type: none">• The CUBES-D Index uses a rules-based algorithm to choose three futures contracts to track each month, for each commodity.• Selected futures contracts are those which are anticipated by the algorithm to generate the highest positive yield, or least negative yield relative to other futures contracts, for each commodity, which mature within one year.• This dynamic contract selection does not eliminate the potential negative yield but attempts to minimize it.
Roll Period	BCOM SM Rolling Period	Pre-Rolling Period
	<ul style="list-style-type: none">• On a monthly basis, for each commodity, the BCOM progressively rolls to a new futures contract over the 5th to 9th business days of the month.• Owing to the large amount of investments tracking the BCOMSM, this process may influence futures contract prices.• For example, if the BCOMSM is rolling from the March WTI Crude Oil futures contract to the May WTI Crude Oil futures contract, the price of the March WTI Crude Oil futures contract may become depressed, impacting the roll yield.	<ul style="list-style-type: none">• To avoid the potential performance disadvantages of rolling during the crowded roll period of the BCOMSM over the 5th to 9th business days of each month, the CUBES-D Index progressively rolls to its newly selected futures contracts over the 1st to 3rd business days of each month.• Futures contract prices may be impacted by the CUBES-D Index rolling to newly selected futures contracts.

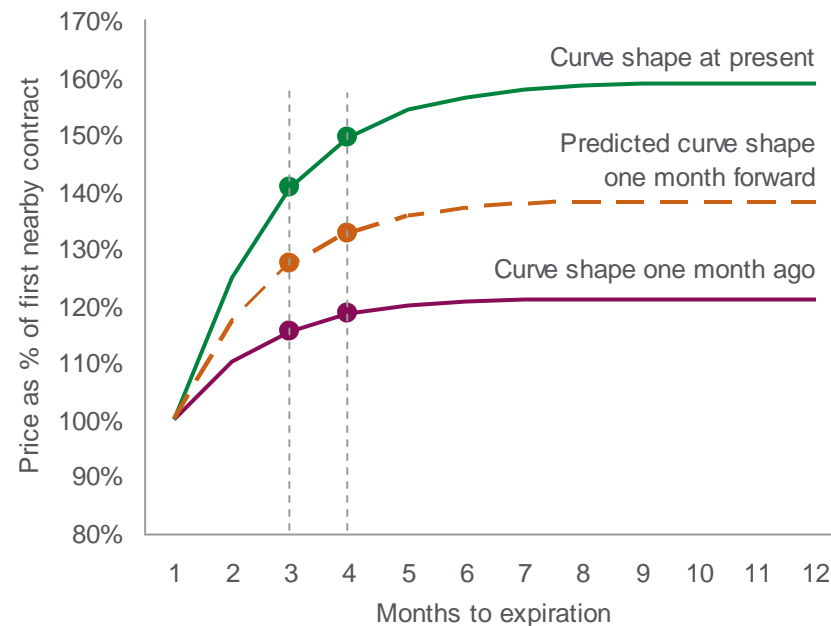
The CUBES-D Index contract selection methodology

The CUBES-D Index uses a rules-based algorithm to determine its monthly selection of futures contracts. The first step in this algorithm is predicting a shape for the futures curve, for each commodity, for the following month

Contract Selection Methodology

- The CUBES-D Index uses a rules-based algorithm to determine which futures contract to track, for each commodity, each month.
- The first step in this algorithm is predicting a shape for each commodities futures curve for the following month
 - Based on the assumption that the shape of the futures curve will remain stable, each month, for each commodity, the algorithm attempts to predict a shape for next month's futures curve by averaging today's futures curve with the futures curve from one month ago.
 - This approach is based on the assumption that significant moves in the futures curve are unsustainable and that the futures curve will revert to its historical average.
 - The realized shape of the futures curve may differ from the shape predicted by the algorithm. For example, it is possible for the realized shape of the futures curve to flip from upward sloping (contango) to downward sloping (backwardation) over the month.

Example Selection



Source: Citi

The CUBES-D Index contract selection methodology (continued)

Using the predicted shape of each futures curve in one month's time, the CUBES-D Index selects which futures contracts to track for the following month

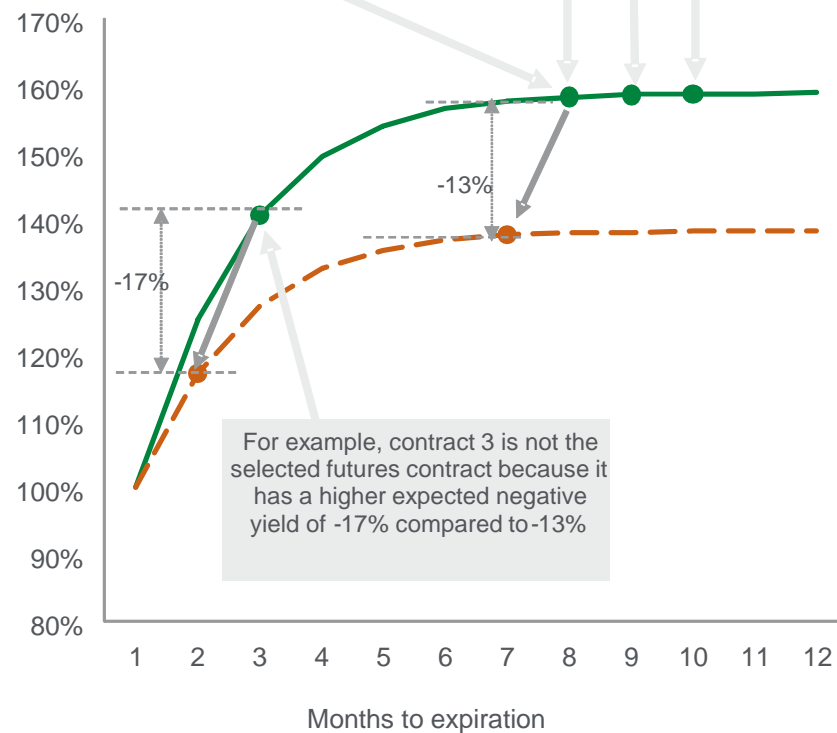
Contract Selection Methodology

- Each month, the CUBES-D Index tracks three futures contracts, for each commodity, selected in the following way:
 - Each commodity within the CUBES-D Index has a list of candidate futures contracts eligible for selection; candidate futures contracts are those futures contracts which mature within one year filtered for liquidity.
 - Using the predicted shape of the futures curve one month forward and the list of candidate futures contracts, the algorithm generates estimated forward-looking monthly yields for each commodity.
 - The CUBES-D Index then selects the three futures contracts anticipated to generate the highest positive or least negative yield, for each commodity, based on this list of potential forward-looking monthly yields.
 - The CUBES-D Index tracks the performance of the selected futures contracts on an equally-weighted basis, for each commodity, for the next month.

Example Selection

Contract 8 is one of the 3 selected futures contract as it provides one of the lowest expected negative yields of -13%

Futures Contracts 8, 9 and 10 are the 3 selected futures contracts as they have the least negative expected yields of the 12 futures contracts eligible for selection




Source: Citi

Citi Commodities Curve Beta Enhanced Distributed (BCOMSM Weighted) Index

Past Performance Information

Monthly Performance

 Live performance

*All figures reported in % except for Sharpe Ratio

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ret	Vol	SR
2011	2.6	2.4	2.2	3.7	-4.5	-4.6	3.2	1.1	-14.3	6.6	-2.0	-3.2	-8.1	17.3	-0.5
2012	3.0	2.7	-3.5	-1.0	-8.4	3.8	5.0	2.4	1.9	-3.5	0.5	-2.3	-0.2	12.7	0.0
2013	1.9	-4.2	0.4	-2.6	-1.7	-4.5	1.2	3.1	-1.9	-1.1	-0.6	0.9	-9.0	9.3	-1.0
2014	-0.7	6.2	0.5	2.5	-2.4	1.0	-4.2	-0.8	-6.1	-0.5	-4.3	-6.5	-14.8	9.3	-1.6
2015	-3.6	2.0	-4.7	4.8	-2.7	1.4	-9.8	-1.0	-3.2	0.3	-6.1	-2.4	-22.9	14.0	-1.6
2016	-1.5	-0.6	3.6	7.6	-0.3	3.9	-4.3	-1.5	3.1	0.1	1.5	1.6	13.6	13.2	1.0
2017	0.9	0.5	-2.5	-1.1	-1.2	0.0	2.9	0.7	-0.1	2.1	-0.2	2.8	4.8	8.6	0.6
2018	2.0	-1.6	-0.2	2.3	1.7	-3.5	-1.6	-1.8	1.3	-2.4	-3.4	-3.0	-10.0	10.1	-1.0
2019	4.8	1.2	-0.7	-0.8	-3.5	2.5	-0.8	-2.9	0.9	2.0	-2.2	5.1	5.4	9.5	0.6
2020	-6.5	-4.9	-11.3	0.3	3.9	2.9	6.3	5.2	-2.3	0.2	4.4	5.1	1.7	14.8	0.1
2021	1.9	6.2	-1.4	8.1	3.4	2.0	2.1	-0.1	3.6	3.0	-5.0	4.1	31.1	14.4	2.2
2022	7.9	5.1	9.8	4.3									29.9	21.6	6.3

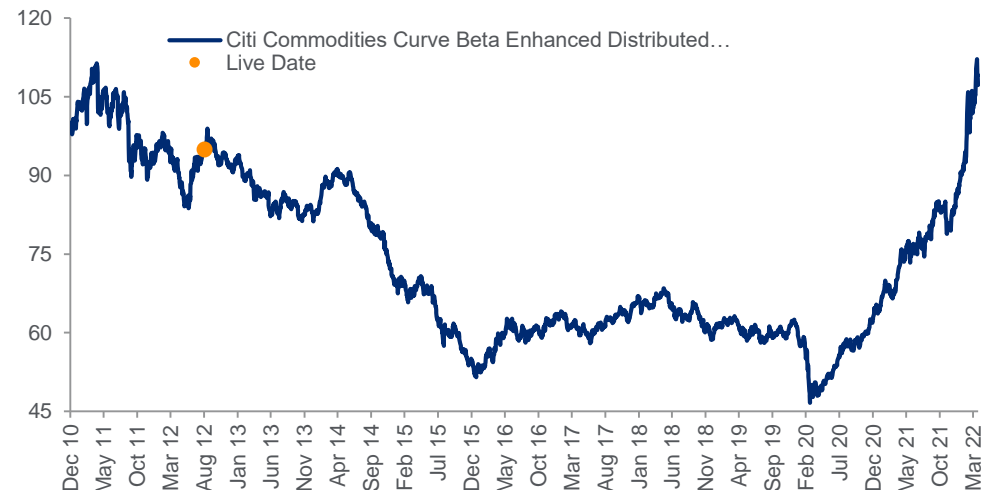
Data for all charts, graphs and tables are as of 22 Apr 2022. Data source for all charts, graphs and tables: Citi. Simulated past performance (back-tested) data from 04 Jan 1999 to 31 Aug 2012. Live past performance data from 31 Aug 2012. Simulated past performance data are provided for illustrative purposes only. Past performance data should not be regarded as an indication of future results. No fees or costs are embedded in the index. Please see the notice regarding past performance at the end of this communication. 2022 return is not annualised, but 2022 sharpe ratio uses an annualised return.

Standardised Past Performance Information (Last 5 Years)

	21 Apr 17 to 20 Apr 18	20 Apr 18 to 22 Apr 19	22 Apr 19 to 22 Apr 20	22 Apr 20 to 22 Apr 21	22 Apr 21 to 22 Apr 22
CCUDDJER	10.24%	-7.05%	-21.89%	45.91%	50.91%

Index Performance Statistics

	1 Years	3 Years	5 Years	Long Term (31 Dec 2010)
Annualised Return	51.0%	19.8%	12.0%	0.6%
Volatility	17.2%	14.7%	12.8%	12.8%
Sharpe	3.0	1.4	0.9	0.0
Positive Months	81.8%	68.6%	57.6%	51.9%
Best Month	9.8%	9.8%	9.8%	9.8%
Worst Month	-5.0%	-11.3%	-11.3%	-14.3%



Citi Commodities CUBES-D (BCOM Weighted) Spread Alpha 2.5% Vol Target Index

The Index tracks the performance of a “long” exposure to CUBES-D and a “short” exposure to the BCOM for each of the 23 commodities in the BCOM benchmark universe.

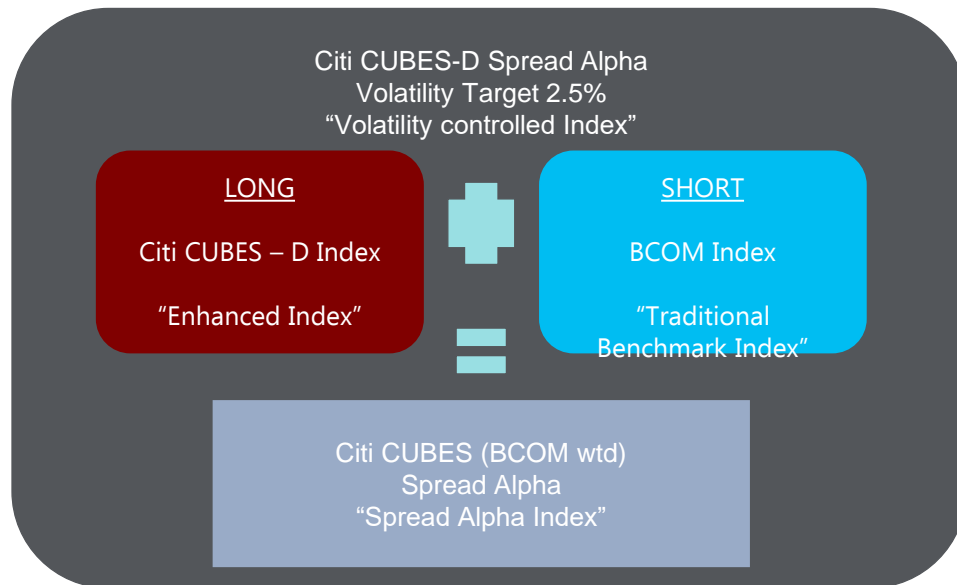
Citi Commodities CUBES-D (BCOM Weighted) Spread Alpha 2.5% Vol Target

1/ Construct a Long-Short spread alpha index

Aiming to extract the potential outperformance of the Enhanced Beta Index over the benchmark index via long the Enhanced index and short the benchmark index

2/ Apply Vol Target Mechanism

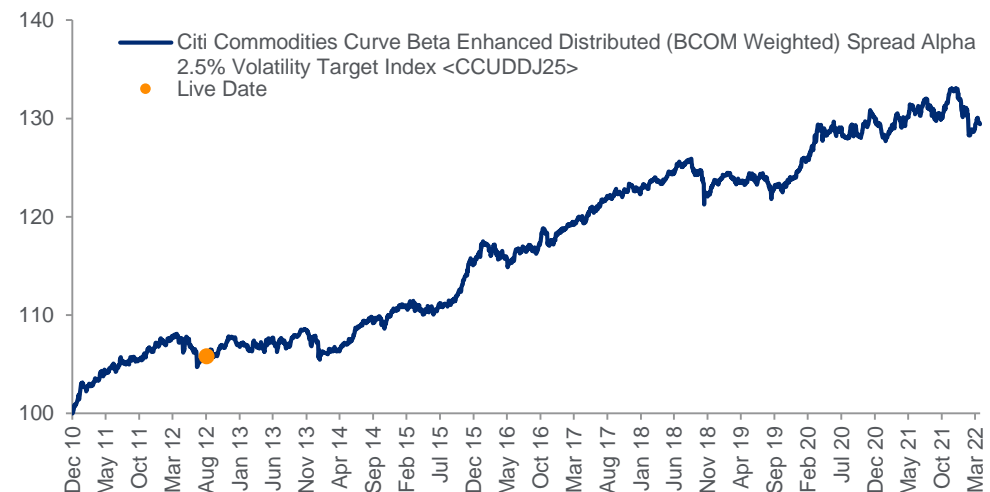
Using the spread alpha index, the spread alpha 2.5% vol target index adjusts exposure to target a volatility of 2.5%, subject to a maximum of 1.25x leverage



Data for all charts, graphs and tables are as of 22 Apr 2022. Data source for all charts, graphs and tables: Citi. Simulated past performance (back-tested) data from 03 Feb 1999 to 31 Aug 2012. Live past performance data from 31 Aug 2012. Simulated past performance data are provided for illustrative purposes only. Past performance data should not be regarded as an indication of future results. No fees or costs are embedded in the index. Please see the notice regarding past performance at the end of this communication. 2022 return is not annualised, but 2022 sharpe ratio uses an annualised return.

Index Performance Statistics

	1 Years	3 Years	5 Years	Long Term (31 Dec 2010)
Annualised Return	-0.3%	1.6%	1.5%	2.3%
Volatility	2.8%	2.6%	2.4%	2.4%
Sharpe	-0.1	0.6	0.6	1.0
Positive Months	63.6%	65.7%	67.8%	68.9%
Best Month	1.6%	1.6%	1.6%	1.6%
Worst Month	-1.8%	-1.8%	-2.1%	-2.1%



Call on Spread Alpha 2.5% VT Index

*2Y note can offer 2.7x leveraged exposure to the performance of underlying index.
The note payout is floored at 100% if held to maturity*

Format	CGMFL / CGMHI Note
Issue Price	100%
Currency	USD
Tenor	2Y
Underlying	Citi Commodities CUBES-D (BCOM Weighted) Spread Alpha 2.5% Vol Target (CCUDDJ25 Index)
Participate Rate (PR)	270%
Redemption at maturity	Notional amount x (100% + PR x max(0, Final/Initial-1))

Indicative price as of 6 May 2022

Important Information & Disclaimers

Past Performance

PAST PERFORMANCE

Past performance data should not be regarded as an indication of future results. Any upward or downward trend in past performance should not be regarded as an indication of future performance. Future performance may be positive or negative. Any transaction or instrument linked to an index (including an index which implements any hypothetical strategy referred to in this communication) would bear additional fees which would reduce overall returns compared with the performance illustrated here, and the return of any transaction or instrument linked to an index may increase or decrease as a result of currency fluctuations.

SIMULATED PAST PERFORMANCE

Past performance data shown in this communication include performance data derived from back-testing simulations. Simulated past performance data are provided for illustrative purposes only. Simulated past performance of an index has been derived from a back-testing simulation, by applying the index methodology to published historical levels of the index constituents, and based on certain assumptions, including the assumption that (during the period of back-testing simulation) no disruption events occurred and no modifications were made to the index methodology. Details of the index methodology are available on request. The actual performance information on which the back-testing simulation is based is available on request.

SIMULATED PAST PERFORMANCE (BACK-TESTED) - HYPOTHETICAL STRATEGIES

All past performance data relating to each hypothetical strategy shown in this communication are derived from back-testing simulations. Simulated past performance data are provided for illustrative purposes only. Simulated past performance of a hypothetical strategy has been derived from a back-testing simulation, by applying the strategy methodology to published historical levels of the strategy constituents, and based on certain assumptions, including the assumption that (during the period of back-testing simulation) no disruption events occurred and no modifications were made to the strategy methodology. Details of the strategy methodology are available on request. The actual performance information on which the back-testing simulation is based is available on request. The simulated past performance of a hypothetical strategy should not be regarded as an indication of the performance of any index which implements it. Please see the risk factor regarding hypothetical strategies.

Risk Factors (1/3)

For the purposes of this discussion, “**Index**” means each index described or referred to in this communication [and each index that is developed to implement each hypothetical strategy referred to in this communication].

SPECIFIC RISKS

Specific risks include the following:

For the purposes of these specific risk factors, “**Index**” means the Citi Commodities Momentum Index.

- **THE INDEX IS BACKWARD LOOKING.** The weighting methodology of the Index operates with reference to historical market data and is therefore said to be “backward-looking”. There can be no assurance that commodities that are selected as being bullish on a daily rebalancing will remain bullish over the period to the next day rebalancing, and there can also be no assurance that the commodities that are selected as being bullish will generate positive returns, or outperform other commodities the Backwardation Measure of which are lower.
- **COMPONENT INDICES.** The performance of the Index is dependent on the performance of the component indices. There can be no assurance that a component index will generate positive returns or that a combination of component indices that the Index determines on a rebalancing date will generate positive returns.
- **MOMENTUM COMMODITIES.** The Index is premised on the insight that positive day returns of commodities are followed by positive day returns (and conversely). There is no guarantee that a positive day return will be followed by a positive day returns and there is no guarantee that a negative day return will be followed by a negative day return.
- **SIGNALS.** The Index measures the degree of momentum for each commodity from the calculation of signals and indicators based on historical data. A 150 days moving average, a 5days moving average, a 252d realised volatility and an indicator of range bound market based on the number of time a price crossed a specific level historically. There is no guarantee that applying such signals or indicators may result in selecting momentum commodities and no guarantees that commodities deemed to be subject to momentum from such signal and indicator will have returns on days with performance similar to the previous day(s).
- **WINDOW.** The Index uses signals that are calculated a specific window. There is no guarantee that such window of historical data will provide a consistent and fair representation of how subject to Momentum a commodity is.
- **OTHER COMMODITIES MAY GENERATE HIGHER RETURNS.** There can be no assurance that for a selected commodity a long position in the relevant BCOM mono-index will generate higher returns than such a position for another commodity that was not selected.
- **OVERALL NEGATIVE PERFORMANCE NOTWITHSTANDING SOME POSITIVE PERFORMANCE.** If some of the component indices of the Index (each, a “Component Index”), i.e. the BCOM mono-indices, to which the Index is exposed generate negative returns, and the other Component Indices to which the Index is exposed positive returns, then the positive returns generated may not be sufficient to outweigh the negative returns generated, and therefore the performance of the Index may be negative notwithstanding the positive returns that have been generated.

THIS LIST OF RISKS IS NOT EXHAUSTIVE. ANY EVALUATION OF INDEX LINKED PRODUCTS SHOULD BE MADE AFTER SEEKING ADVICE FROM INDEPENDENT PROFESSIONAL LEGAL, TAX, ACCOUNTING AND OTHER ADVISORS.

Risk Factors (2/3)

GENERAL RISKS

General risks include the following:

THE INDEX IS NOTIONAL.

The Index is purely notional and reflects the performance of notional positions in its constituents. There is no actual portfolio of assets to which any person has any ownership interest. The Index is not a substitute for any actual asset or combination of assets.

THE INDEX IS EXPOSED TO MARKET RISK.

The Index is subject to the risks which arise in the markets for the assets whose performance it reflects, including the risk of market disruption.

PERFORMANCE RISK.

The Index level may go down as well as up and may not be correlated with the value of any or all of its constituents. The Index may be adversely affected by any change in the correlation between its constituents and by fluctuations in any currency exchange rate used to determine its level. The Index has limited performance history and there can be no assurance that it will meet any investment objective or achieve any particular performance. The Index is not directly comparable with any benchmark and may underperform a benchmark.

LIMITATIONS IN THE DESIGN OF THE INDEX.

In common with all algorithmic strategies, the Index uses a rules-based methodology with fixed processes and parameters that are assumed to be reasonable. However, an alternative index using other processes and parameters may outperform the Index.

GOVERNANCE AND OPERATION OF THE INDEX.

Citigroup Global Markets Limited acts as administrator of the Index (the “**Index Administrator**”, which may also be referred to as the “**Index Sponsor**”). [Citigroup Global Markets Limited also] [●] acts as calculation agent for the Index (the “**Index Calculation Agent**”). Although the Index is rules-based, the Index Calculation Agent (using expert judgement) may make certain determinations or suspend publication of the Index on the occurrence of certain events (including market disruptions), and the Index Administrator (using expert judgement) may modify the Index to resolve any error, ambiguity or omission. The Index Administrator may also cancel and discontinue the Index.

CONFLICTS OF INTEREST AND NO DUTY.

The Index Calculation Agent and the Index Administrator, and their affiliates, (1) may engage in other activity (including trading the assets represented in the Index) which may give rise to conflicts of interest and which may adversely affect the Index level; and (2) do not act as adviser to, or owe any duty to, any person, including any investor in any transaction or instrument linked to the Index.

THIS LIST OF RISKS IS NOT EXHAUSTIVE. ANY EVALUATION OF INDEX LINKED PRODUCTS SHOULD BE MADE AFTER SEEKING ADVICE FROM INDEPENDENT PROFESSIONAL LEGAL, TAX, ACCOUNTING AND OTHER ADVISORS.

Risk Factors (3/3)

HYPOTHETICAL STRATEGY.

The Index which will implement any hypothetical strategy referred to in this communication will be a rules-based quantitative index, and is currently under development by Citi. The Index methodology remains subject to change and the fully developed Index methodology may be substantially different to the methodology which is outlined in this communication. Citi may ultimately determine not to launch this Index or any similar index.

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Risk Factors – CUBES-D Spread Alpha (1/2)

For the purposes of these specific risk factors, “**Index**” means the Citi Commodities CUBES-D Spread Alpha Index and the Citi Commodities CUBES-D Spread Alpha Seasonality-Adjusted Index.

- **OVERVIEW.** The performance of the Index is dependent on the performance of the Component Indices. There can be no assurance that a Component Index will generate positive returns. Knowledge of the methodology of the Component Indices is essential to evaluate the Index. The risks which exist in respect of an exposure to the Component Indices also exist in respect of an exposure to the Index. Consequently investors should read and understand the index conditions of the Component Indices, including the disclosure and the discussion of the risks which arise in respect of an exposure to the Component Indices. The combination of these risks may create additional particular risks which may substantially increase the effect of adverse market movements. In addition to the risks which exist in respect of an exposure to the Component Indices, the following are certain specific risks which exist in respect of an exposure to the Index.
- **EXPECTED PERFORMANCE.** The Index does not track commodities generally. The level of the Index will increase only if the Citi Index Group (“CUBES-D Index”) has better returns than the Benchmark Group. For example, commodity prices may be generally rising as measured by either the Citi Index Group or the Benchmark Group individually, but the index may be declining because the Citi Index Group is underperforming the Benchmark Group. The performance of the Index is based on a mathematical calculation of the extent to which the Citi Index Group outperforms or underperforms the Benchmark Group. In order to evaluate the Index you should fully understand the methodology, assumptions and risks of the Citi Commodities Curve Beta Enhanced Distributed Mono Indices (Excess Return) (each, a “CUBES-D Index”).
- **ROLL DAY DIFFERENTIAL.** The level of the Index may be adversely affected because the CUBES-D Indices and the benchmark indices have different roll days and times. As a result, the CUBES-D Indices and the benchmark indices may roll into new futures contracts during different market conditions in terms of liquidity, volatility or other factors, which would adversely affect the level of the Index.
- **ROLL METHODOLOGY.** The performance of the Index is dependent on the performance of the CUBES-D roll methodology, by which the constituent futures contracts of the Citi Index Group are selected on the basis of an estimated futures curve. The CUBES-D roll methodology may not be successful if the actual realized futures curve differs from the estimated futures curve that is used. The particular way in which the CUBES-D Index determine the predicted shape of the futures curve is only one of many potential ways, each no less valid than any other, that this could be done. The particular method of determining the predicted shape of the futures curve used by the CUBES-D Index may be less predictive of the actual shape of the futures curve one month later than other methods that could have been used, or may not be predictive at all.
- **COMMODITY EXPOSURE.** Although the Index is intended to have neutral exposure to commodities, the Index will nevertheless be subject to certain risks associated with an investment in commodity futures contracts. The Index is rebalanced monthly to match a notional long position in the Citi Index Group (“CUBES-D Index”) against a notional short position in the Benchmark Group but between monthly rebalancing dates, the weights of the Citi Index Group and the Benchmark Group will fluctuate as a result of the performance of the Component Indices, such that their weighted values will no longer exactly offset each other. The Index will have exposure to the value of the underlying futures contracts and their underlying commodities to the extent of that difference.

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Risk Factors – CUBES-D Spread Alpha (2/2)

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- **CHANGES TO BENCHMARK.** Changes to the Benchmark Index methodology may adversely affect the Index. The sponsors of the Benchmark Index may change the methodology pursuant to which it selects futures contracts at any time. If any such change is made, the performance of the Benchmark Group may improve, which would have a negative effect on the performance of the Index.
- **PERFORMANCE IDIOSYNCRANCIES.** The returns of the Citi Index Group (“CUBES-D Index”) may differ from those of the Benchmark Group for reasons other than the CUBES-D roll methodology; for example, fluctuations in commodity prices may have a different effect on futures contracts for immediate delivery compared to longer dated futures contracts. In bullish commodity markets near-term futures contracts may rally more sharply than longer-dated. The Index may generate negative performance when the shape of the underlying commodity futures curve that is realized is different from the shape premised on the CUBES-D roll methodology. Sudden and unexpected changes in the shape of the futures curve may adversely affect the Index.
- **CURVE SHAPE CHANGE.** The accuracy of the CUBES-D roll methodology, as well as the performance of Citi Index Group relative to the Benchmark Group may be negatively impacted if a commodity futures curve flips from a contango (upward-sloping futures curve) market to a backwardation (downward-sloping futures curve) market, or vice versa, during the month. This may negatively impact the performance of the Index.

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