US Chemicals

Year Ahead 2024: Turning more bullish cyclicals, 5 rating changes

Price Objective Change

16 January 2024

Equity
United States
Chemicals

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Top six themes for 2024

As we look into 2024, our top six themes are: (1) We are constructive on companies that we expect will have a relatively-easier path to significant growth over the next couple of years, given their respective end-markets, lapse of destocking headwinds, and recovery from rock-bottom margins; (2) we are turning more positive on commodity chemical stocks (see below), but we remain selective given a tough recovery, and lean this way with lithium as well; (3) the ag markets are entering normalized earnings at a lower part of the cycle, with farmer margins likely flat y/y in 2024 yet still above pre-2021 levels; (4) the Q4 rally in chems ex-ag/lithium (+13% vs +12% for the S&P 500) has resulting in more stretched valuations in some cases, prompting us to downgrade three stocks and upgrade two; (5) our view of tougher housing fundamentals informs our coatings ratings at U/P for those more exposed; and (6) litigation risks are likely under-appreciated.

Shifting more + in commodity chems, but still selective

Across our seven petchem/diversified names (DOW, LYB, WLK, OLN, CE EMN, HUN) we are raising our POs by an average of 5%, despite a modest trimming in recovery expectations (2024-25E EBITDA -2%). We are warming up to the group given our petchem sentiment indicator and our view that estimate revisions have largely troughed after an abysmal 2023. Moreover, we increasingly expect an earnings recovery for those companies that saw massive destocking headwinds in 2023, such as Buy-rated EMN and HUN. However, the path is not fully clear, and with PMIs suggesting still sluggish demand and some chemistries poised to see margin pressures, in part due to supply growth. We upgrade DOW to Buy from Hold with a $60 PO (from $57) as we are increasingly confident on a ~50% EBITDA growth by 2025 (vs 2023). We downgrade CE to Underperform from Neutral with a $135 PO (from $124) as, following a 56% return in 2023, shares more than fully discount the expected earnings recovery.

Ag markets consolidating at a lower level, Buys on fertilizers

Based on crop prices, farmer economics, and stocks/use ratios, we are approaching a point of stability in the ag markets after a tough 2023. Fundamentals have deteriorated but remain OK. The outlook for crop chems remains cloudy, and we downgrade FMC to U/P from Neutral with a PO of $57 (from $60). We stay Buy-rated on fertilizers tactically and see significant upside for BG in part due to the Viterra acquisition.

Geography and end markets key among Specialty Chems

While EU and Chinese economies remain sluggish, the US outlook has improved, with our economists expecting 1.0% GPD saar growth in 1H24, and 1.5% growth in 2H. Residential and non-resi investments could remain soft (cautious on RPM and SHW), with more resilience in aero and auto, and continued focus on decarbonization and water management (ECL upgraded to Neutral). Modest improvement in electronics/housing end markets and PFAS exposure have led us to downgrade DD to Underperform.

Exhibit 1: PO Change Table

We raise POs on 12 names, lower on 10

Ticker	New PO	Old PO
ADM	$85	$90
ALB	$147	$149
APD	$292	$295
BG	$140	$135
CE	$135	$124
CF	$95	$100
DD	$80	$78
DOW	$60	$57
ECL	$216	$185
EMN	$104	$95
ESI	$26	$24
FMC	$57	$60
GPRE	$32	$36
HUN	$28	$27
IFF	$83	$81
LIN	$455	$440
LYB	$103	$107
NTR	$79	$82
OLN	$63	$58
PPG	$161	$162
SGML	$33	$37
SHW	$286	$275

Source: BofA Global Research

Tickers referenced: APD - Air Products; ALB - Albemarle; ADM - Archer Daniels; AXTA - Axalta Coating Syst; BG - Bunge; CE - Celanese; CF - CF Industries; CTVA - Corteva; DOW - Dow; DD - DuPont; EMN - Eastman Chemical; ECL - Ecolab Inc; ESI - Element Solutions; GPRE - Green Plains; HUN - Huntsman Corp; IFF - Int Flav; LIN - Linde; LYB - LyondellBasell; NTR - Nutrien; OLN - Olin Corp; ORGN - Origin Materials; PPG - PPG Industries; RPM - RPM Intl; SHW - Sherwin-Williams; SGML - Sigma Lithium; MOS - The Mosaic Company; WLKP - Westlake Chemical; WLK - Westlake Corp.

Refer to important disclosures on page 53 to 56. Analyst Certification on page 51. Price Objective Basis/Risk on page 45. 12646400

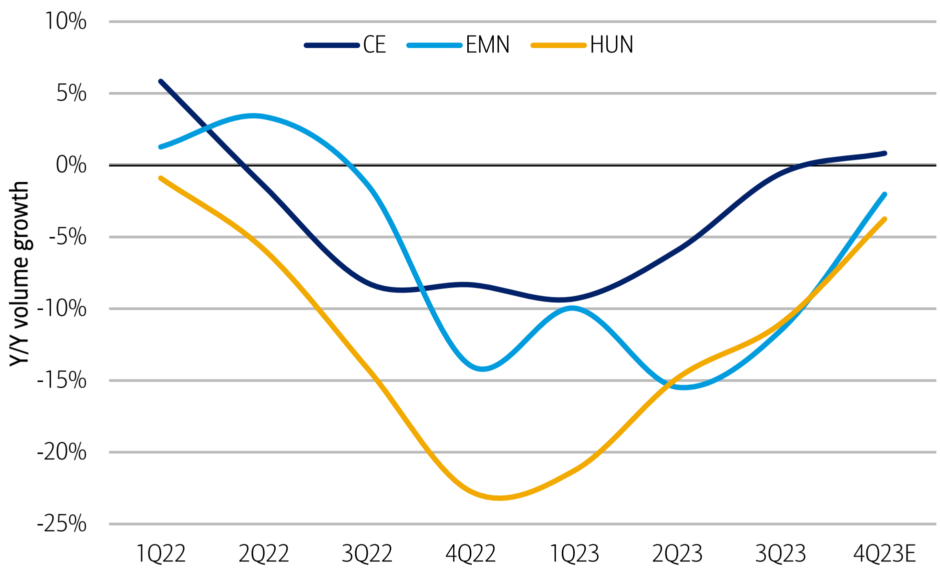
Timestamp: 16 January 2024 06:24AM EST

Top six themes for 2024

Focus on companies with relatively-easier path to growth

We are constructive on companies that we expect will have a relatively-easier path to significant growth over the next couple of years, given their respective end-markets, lapse of destocking headwinds, and recovery from rock-bottom margins. 2023 was tough for topline for most of our coverage, yet there were certain companies that suffered extraordinary from destocking and as such we see an easier path for their earnings to bounce back. Exhibit 2 shows the y/y volume growth for CE, EMN, and HUN. CE faced modest headwinds, with volumes down 4.4% on a two year-stack (2022-23), as autos were an end-market that outperformed in 2023. On the other hand, EMN and HUN are more reliant on construction and durables markets, and saw volumes drop by 12.6% and 33.2%, respectively, over two years. Yet demand for durables and construction didn't drop at such a vast rate. Clearly the volume construction was largely on significant destocking, which we believe sets EMN and HUN for a rebound in volumes/earnings even if their end-markets remain sluggish.

Exhibit 2: Celanese/Eastman/Huntsman y/y volume growth
Huntsman faced the worst volume headwinds while CE fared better



Source: Company Reports, BofA Global Research

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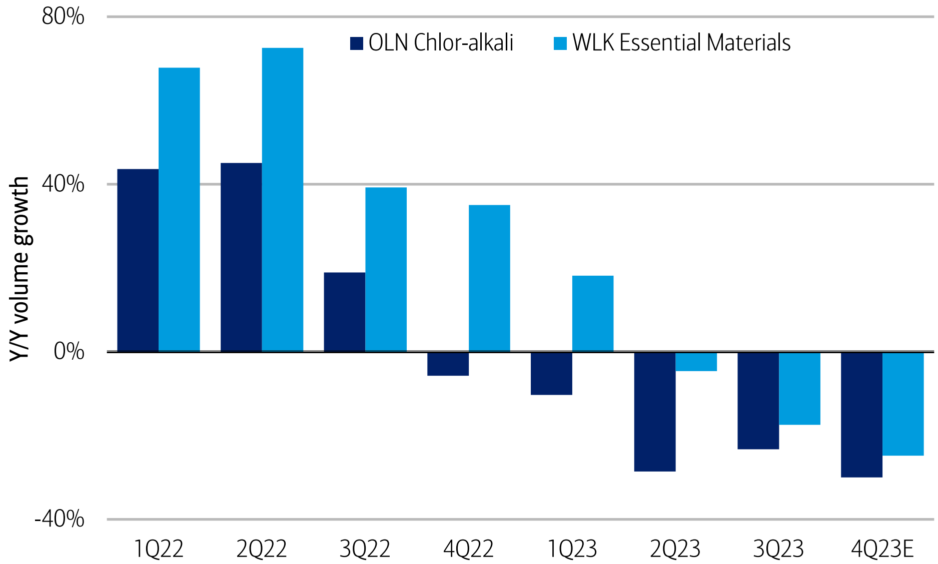
While chlor-alkali markets have been in a downtrend for the past year, OLN's earnings have suffered even more due to its steep operating rate cutbacks. This is evident when we compare the revenues of OLN's Chlor-alkali segment with WLK's Essential Materials business. Looking ahead, we believe that OLN's earnings can rebound strongly even if caustic/chlorine margins do not expand – solely by raising operating rates/increasing volumes. While it's hard to quantify the impact of OLN's steep curtailments, we note that the Q4 cutbacks were expected to impact profitability by $100mn according to management. Given that OLN had already cut production by at least a similar amount prior to Q4 (especially if we include their epoxy actions), we believe that a return to normal production levels could add ~$800mn to the company's annual EBITDA.

Exhibit 3: Olin Chlor-alkali vs Westlake Essential Materials y/y revenue change

Olin has been the swing supplier in global chlor-alkali markets



Source: Company Reports, BofA Global Research

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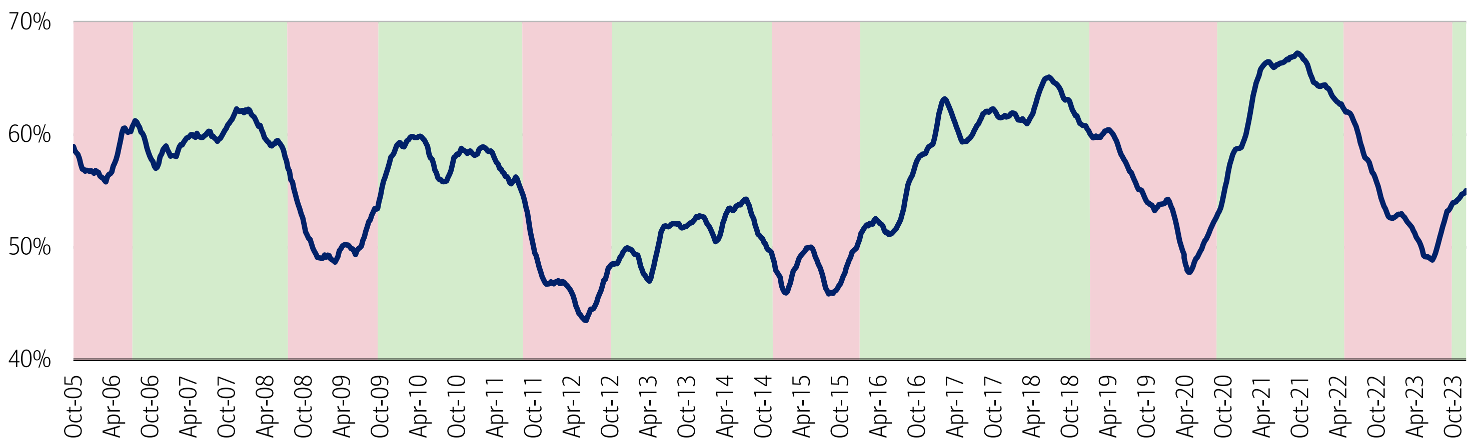
Turning more positive on commodity chemicals

Our petrochemical sentiment indicator bottomed in July, and has now flipped into an upcycle territory (see the appendix for indicator background). This trend has been historically correlated with positive performance for commodity chemical stocks such as EMN, DOW, and LYB (see the appendix for more details on correlations/backtesting). Given this bullish signal, we are turning incrementally more positive on petrochemical and diversified stocks, and are raising our valuations for all but one of the stocks (LYB, due to deteriorating I&D earnings).

Exhibit 4: BofA Petrochemical Sentiment Indicator

Our petchem sentiment indicator has flipped into an upcycle



Source: BofA Global Research

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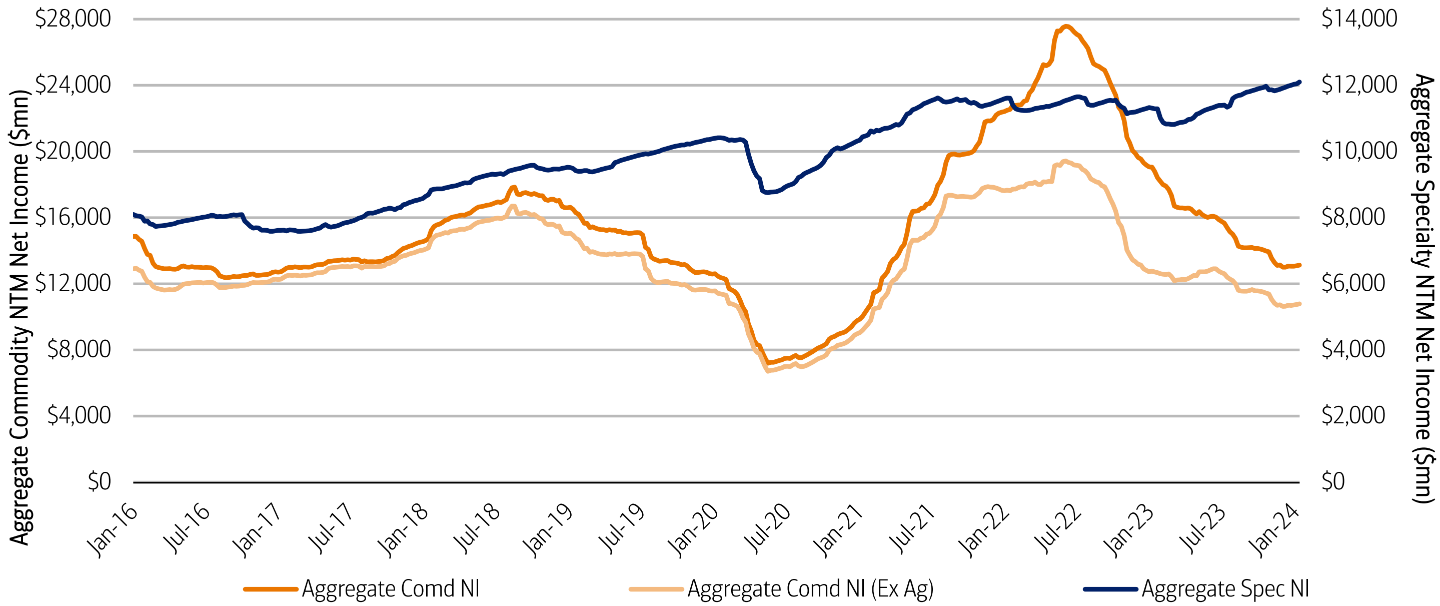
Moreover, we believe that the cycle of downgrade earnings revisions for commodity chemicals is now approaching an end. 2023 was a very tough year for commodity companies' profitability, with many seeing their 2023 earnings revised lower by ~15-30 % vs a year ago. However, we have confidence that earnings are troughing and are likely to increase next year due to volume growth, feedstock deflation, and likely higher prices.

Exhibit 5: Forward net income forecasts for specialty and commodity chemicals

We believe commodity chemical earnings have troughed



Source: Bloomberg, BofA Global Research. *Aggregate Specialty group includes data from APD, ASH, AXTA, ECL, ESI (replacing GRA), FMC, FUL, GRA, PPG, RPM, and SHW. Aggregate Commodity group includes AVNT, BASF, CE, CF, EMN, HUN, LYB, MOS, OLN, and WLK*

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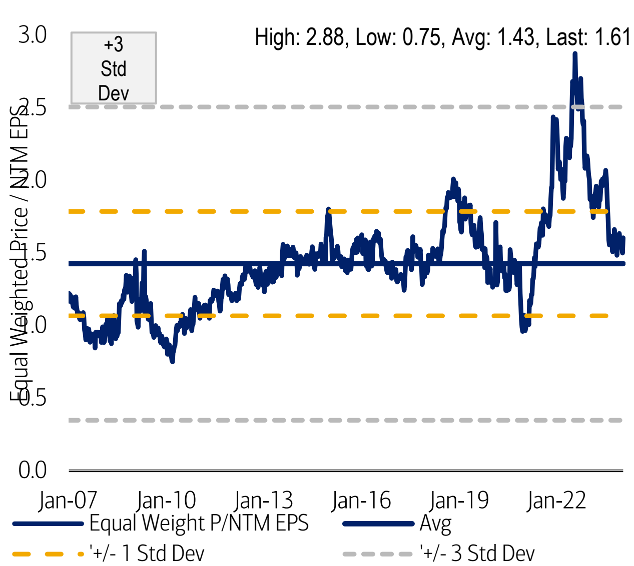
Given our view on troughing commodity earnings, we view our analysis of specialty vs commodity valuation multiples as a contrarian indicator. The premium of specialty stocks vs commodity ones has now largely reverted to normalized levels; this is especially true when looking at the five-year average valuation premium. This is largely because earnings estimates for commodity stocks have declined substantially, as shown in the above chart, while stock prices have somewhat held up. As we move towards an earnings growth phase for commodity stocks we expect multiples to decline, or, in order to maintain their historical relationship to specialties, stock prices to move higher.

Exhibit 6: P/E multiple comparison Specialty vs Commodity, long-term

Specialty valuation premium is now near the long-term average



Source: Bloomberg, BofA Global Research

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Exhibit 7: P/E multiple comparison Specialty vs Commodity, 5 yrs

Specialty valuation premium is now below the 5-yr average

Source: Bloomberg, BofA Global Research

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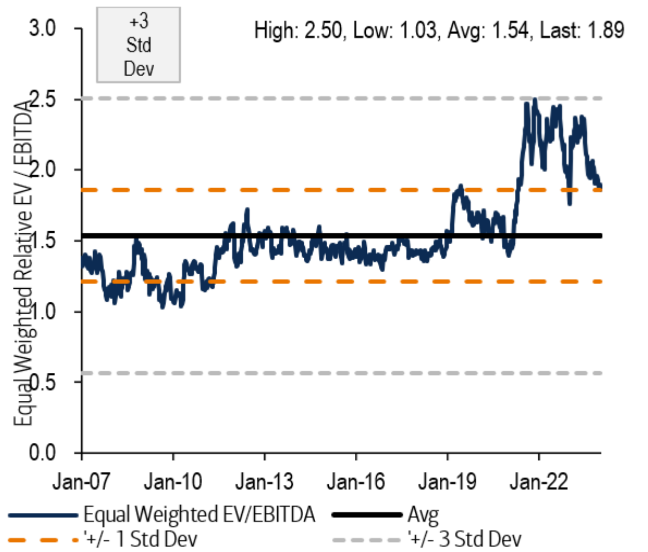
Exhibit 8: EV/EBITDA multiple comparison Specialty vs Commodity, LT
Specialty valuation premium is now near the long-term average



Source: Bloomberg, BofA Global Research

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Exhibit 9: EV/EBITDA multiple comparison Specialty vs Commodity 5 yrs
Specialty valuation premium is now below the 5-yr average

Source: Bloomberg, BofA Global Research

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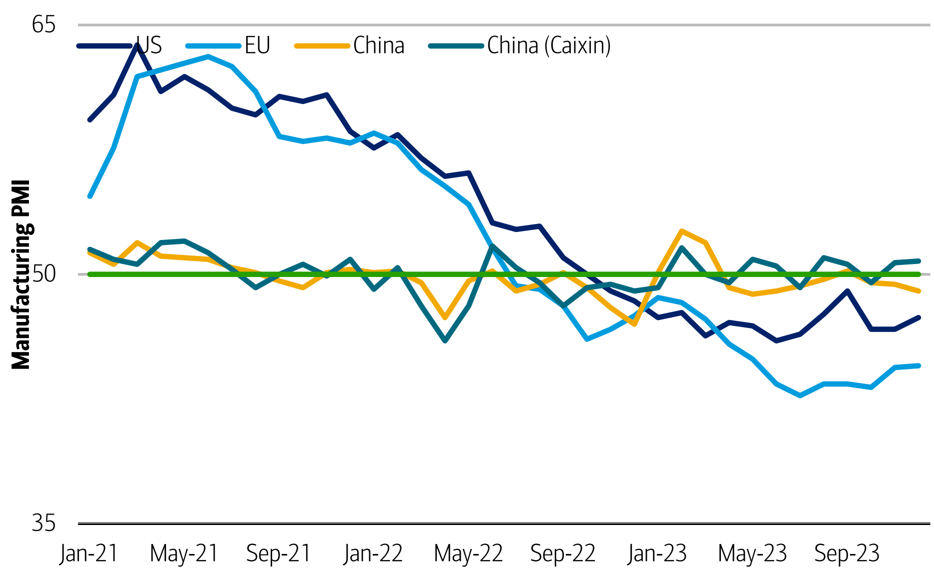
However, we remain selective in our ratings and are refraining on going "all-in" on commodity stocks as demand remains lackluster. Manufacturing activity remains challenged, with PMIs in the US and Europe still in contraction territory. Chinese Manufacturing PMIs have been hovering around 50 for the entirety of 2023.

Exhibit 10: Manufacturing PMIs
US and EU manufacturing PMIs remain in contraction territory



Source: ISM, S&P Global, China Federation of Logistics & Purchasing, Bloomberg

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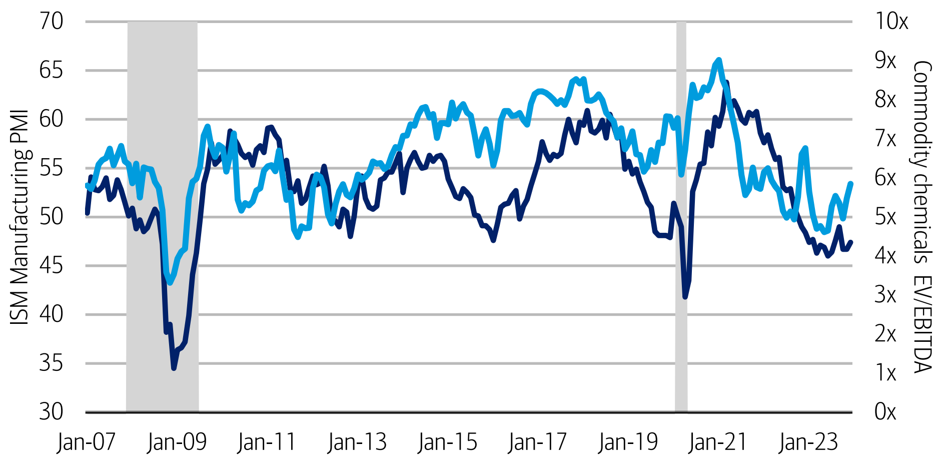
We observe a reasonable correlation between commodity chemical multiples and the US ISM Manufacturing PMI (see exhibit below). This metric is even stronger when comparing current valuation multiples to last month's PMI reading – i.e., multiples tend to be a leading indicator of PMI. With valuations now ~1x above their year-ago levels, we believe the market is discounting a manufacturing recovery; if this doesn't materialize, multiples are likely to come back under pressure, in our view.

Exhibit 11: BofA Industrial Momentum Indicator vs Global Manufacturing PMI
Bottoms in the BofA Industrial Momentum Indicator lead bottoms in Global PMI



Source: Bloomberg, ISM, BofA Global Research

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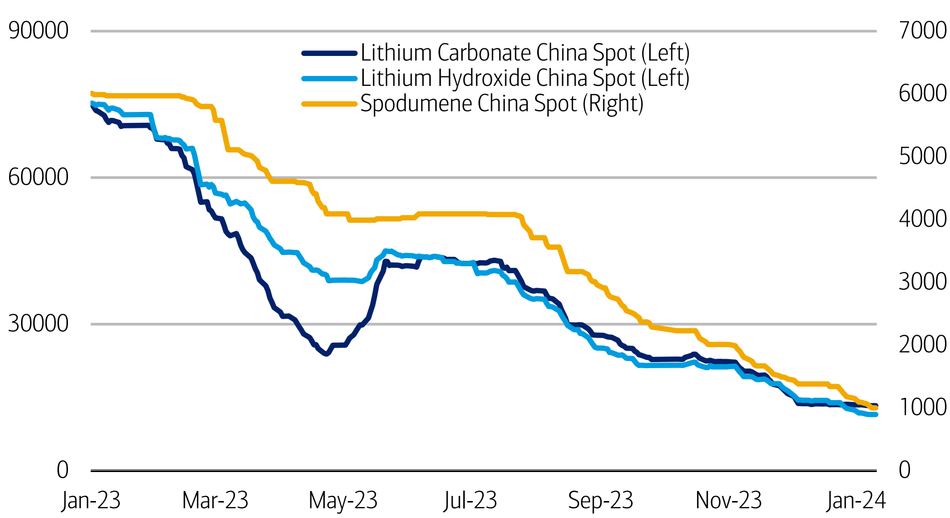
Lithium trough deeper than expected

Spot prices for Lithium hydroxide were \$75/kg a year ago and are now sub-\$15/kg, which has been driven by the slowdown in global EV production and a significant buildup of feedstock inventory by Chinese converters. While hydroxide prices two years ago were closer to \$10/kg, we believe we are near the bottom, as the top quartile of the cost curve, the non-integrated converters in China, is now loss-making. The cost curve is steeper now than it was 2 years ago, as the lofty year-ago prices, while unsustainable, have enabled China to back integrate into lepidolite, which is plentiful in China but with low lithium content (~0.1% vs most spodumene ores have >1.0% lithium). Benchmark Minerals indicated that many of these converters are now pushing back on further price declines, reflecting a lack of profitability. With the pain of price declines not over, we retain our Neutral rating on Albemarle, and have a Buy on Sigma Lithium due to its low cost spodumene operations in Brazil. See our Lithium Conference Takeaways from last month for the outlook from 10 companies.

Exhibit 12: Lithium Spot Prices
All three spot prices fell 80-83% over the course of 2023



Source: Asian Metals

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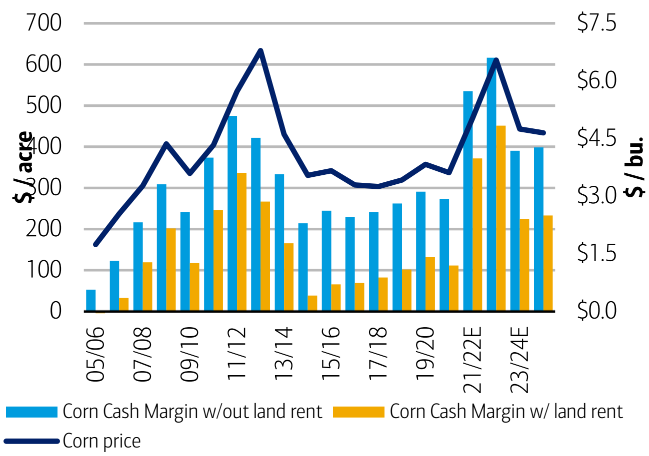
Ag markets entering normalized earnings

2023 was a tough year for ag markets, and certainly played out much worse than we expected a year ago: Crop prices declined much more than we expected, and with them farmers' profitability; fertilizer prices were weaker than excepted despite good demand; and the crop chemical market unraveled as supply chains were overstuffed and higher interest rates led to massive destocking.

Crop prices have dropped even more since early-December, especially for soybean prices. However, we believe markets are plateauing. Corn is in contango (2024-25 pricing is expected to be higher than Dec 2023) and we believe soybean demand will be strong enough to put upward pressure to prices. We now see corn profitability at ~$400/acre for both the 2023/24 and the upcoming 2024/25 marketing season.

While the set-up for ag is not great, stabilization at current levels would be positive in our view, given that crop prices and farmers' profits would remain well-above historical levels. This should translate to healthy demand for crop inputs, and margins for traders.

Exhibit 13: Farmer profitability per acre of corn
Corn margins in 2024 likely flat with 2023



Source: USDA and BofA Global Research Estimates

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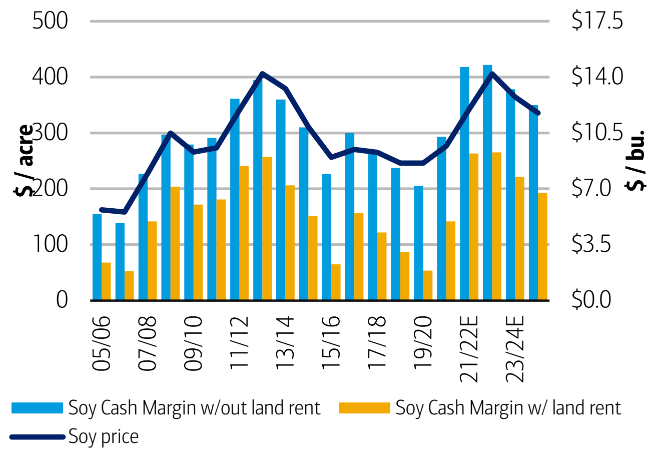
Exhibit 14: Farmer profitability per acre of soybeans
Soybean margin expectations for 2024 have fallen recently



Source: USDA and BofA Global Research Estimates

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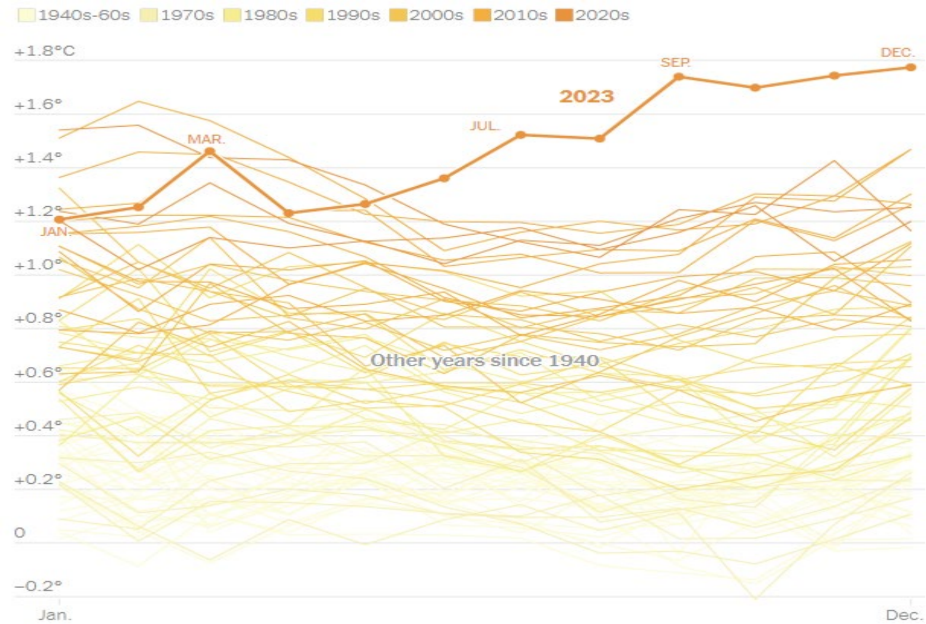
Ag Cycle has been driven by droughts

The Ag cycle started in late 2020 when droughts in South America resulted in smaller crops. Droughts continued in South America for 3 years, consistent with La Nina weather patterns. We are currently in a severe El Nino climatic condition, driven by Pacific equatorial waters that are above normal, which has contributed to the record level temperatures worldwide since June, 2023 (see the exhibit below). Predicting near-term climatic conditions is challenging, but we view the upward trend in global temperatures as bullish for Agricultural input suppliers.

Exhibit 15: Global temperatures over the last 85 years
Global temperatures have been at record levels for the 7 months



Source: New York Times, Copernicus, ECMWF

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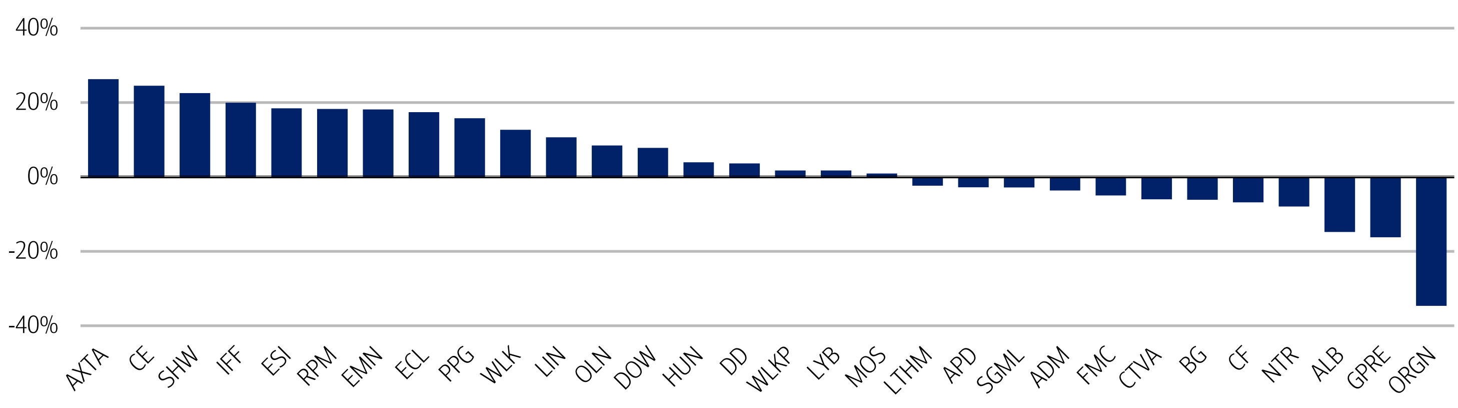
4Q23 rally ex-ag/lithium makes us more selective

Our 30-stock coverage (as of year-end 2023) delivered just a 2% total return in 2023 vs 26% for the S&P 500. However, three items weighed heavily on performance: Agriculture (-18%), lithium (-10%), and Origin Materials (-82%). Excluding these categories/stocks, our coverage's total return was 18%.

What is more notable is that the vast majority of chemical returns were generated in 4Q23. During that period our entire coverage's return was +4% and ex-ag/lithium/ORGN +13% vs 12% for the S&P 500. That year-end rally has led to many specialty and petchem/diversified stocks running ahead of themselves and weighed on our ratings decisions. For example, CE delivered a 56% return in 2023, including 25% in Q4, despite 2023-25 earnings expectations declining substantially. We see valuation as stretched after this rally and challenges in the acetyls chain ahead, and as such we downgraded the shares to U/P from Neutral. Underperform rated SHW and RPM also delivered strong returns in Q4 of 23% (vs +33% for 2023) and 18% (vs +17% for 2023), respectively.

Exhibit 16: 2023 stock performance for US Chemical sector
The fertilizers, lithium stocks, and grain handlers had a rough 2023



Source: Bloomberg

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Coatings have several benefits, but varies by end market

As discussed on page 26, we expect raw material deflation benefits in 2024 across the coatings companies. This sub-sector within Chemicals has significant pricing power, driven by brand loyalty and services provided directly to customers. The primary differentiating factor in our view is end market exposure, as highlighted in Exhibit 17. Of all these end markets, we see the most risk in construction and residential remodeling activity (see LIRA index in Exhibit 47), which have an improved outlook vs a few months ago from lower interest rate expectations, but we stick to our Underperform ratings as the shares have recovered too soon, in our opinion. We see modest gains in mobility, particularly in aerospace, and thus we retain our Buy ratings on Axalta and PPG, owing to more attractive valuations.

Exhibit 17: BofA End Market Heatmap for the Coatings Companies

We see the most risk in construction and general industrial markets, and the most opportunity in transports, aero, and healthcare

Ticker	Agriculture	Construction	Consumer	Energy	Healthcare	Aerospace	Autos & Mobility	General Industrial	Materials	Tech	Other
AXTA	0%	16%	0%	2%	0%	0%	72%	10%	0%	0%	0%
PPG	0%	33%	0%	0%	0%	7%	31%	24%	5%	0%	0%
RPM	0%	94%	6%	0%	0%	0%	0%	0%	0%	0%	0%
SHW	0%	64%	0%	1%	0%	0%	4%	23%	7%	0%	0%

Source: Company Reports and BofA Global Research Estimates

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Litigation risks are likely underappreciated

We have heard from many investors a belief that DuPont's PFAS liabilities are behind them and that glyphosate was the only toxic crop chemical used in agriculture. Our reaction to these comments could be too conservative, but we believe the focus on exposures to synthetic chemicals by the general public and regulators is on the rise. The US Center for Disease Control has been collecting >1,000 blood samples from the US population each year since the late-1990s with analyses for an extensive number of contaminants. The onset of COVID caused this initiative to slow, resulting in an enormous backlog of samples to be analyzed. The last data released were from 2018, but we note that these samples had more than 60% with detectable levels of glyphosate, and over 99% contained PFOA. Note these samples were randomly collected across the US, and not from farming communities or near manufacturing facilities.

When the CDC reports updated analyses from more recently collected samples, we believe it could potentially drive litigation activity. We note that recently collected urine samples from pregnant women in the Midwest by the Heartland Study found 100% with detectable levels of the herbicide 2'4-D and 65% had detectable levels of dicamba, another broadly used herbicide. Any correlations with the health of the offspring could readily drive litigation. These data could drive more questions about the source of these pesticides in American blood. Several recent publications have implicated significant relationships with crop chemical exposures and adverse health effects, as summarized here and also here.

PFAS litigation is not over

We view the $1.2bn AFFF MDL settlement that DuPont/Chemours/Corteva negotiated as quite favorable, which was reinforced by 95+% of the 14k US public water suppliers to opt in. This fund represents a small fraction of the $50bn of capital costs estimated by Black & Veatch to comply with EPA's proposed PFAS MCLs. The treatment system for the town of Fayetteville, NC (0.05% of US) will require nearly $100mn. We hear a broadly held view that PFAS liabilities have been addressed, which ignores the potential for significant personal injury litigation based on our due diligence in crop chemical litigation. DuPont produced PFOA in Fayetteville prior to switching to GenX in 2009, and PFOA was recently reassessed as carcinogenic by a working group at IARC, and has been detected in more than 99% of ~1000 randomly selected US blood samples every year from 1999-2018 (more recent samples not analyzed yet by CDC). There is a class action lawsuit with 100,000 plaintiffs from residents downstream from Fayetteville.

Key Estimate/Rating Changes

Rating changes:

CE: Valuation, acetyls challenges, tough recovery; downgrade to U/P

We are downgrading Celanese to Underperform from Neutral, with a PO of $135 (up from $124). The shares have had a great run in 2023 (+56%) and 4Q23 (+25%), which we believe overly discounts expectations of a 2024-25 recovery. In fact since the start of 2023, consensus EPS forecasts for 2024 and 2025 have declined by 20% and 15%, respectively, causing the stock to be overvalued in our view. Additionally, the acetyls environment remains challenging, with significant capacity growth in both acetic acid and VAM (vinyl acetate monomer) in 2024, and tough comps as margins in 2023 were boosted by supply disruptions. Lastly, beyond the near-term “low-hanging fruit” of synergies, lack of inventory adjustments, and the new Clear Lake capacity, we see limited growth drivers – unlike many peers which saw severe volume declines/destocking in 2022-23 – and thus a more uncertain path to our 2025 estimates. See here for our CE downgrade note and more details on acetyl capacity.

DD: modest growth and PFAS – downgrade to U/P

We are downgrading the shares of DuPont from Buy to Underperform based on relative valuation, modest earnings recovery in 2024, and under-appreciated PFAS liabilities. EPS growth for DuPont has been supported by aggressive share repo, with EBITDA more flattish. Our 2024 EPS increases to $3.85 from $3.76, reflecting more recovery in Water & Protection from an improvement in US housing starts, combined with modest gains in Electronics & Industrial. We see more earnings growth with other specialty chem names like ESI and ECL. Our fair value of $80 has modest upside to current shares, which combined with the potential for negative PFAS news leads to our downgrade. See here for our DD downgrade note with more details on PFAS.

DOW: upcycle ahead – upgrading to Buy

After turning more constructive on the stock and moving to a Neutral in October 2023, we are now raising our rating to Buy, with a PO of $60 (from $57). Our upgrade is predicated on (1) our petrochemical sentiment indicator moving into positive territory in late-2023, which has historically had a high correlation to Dow’s stock outperformance, (2) our view that petrochemical margins and volumes have largely troughed in 2H23, and (3) our projection of a 50% EBITDA growth by 2025 (over 2023) as the supply/demand balance of many chemical chains improves and destocking reverses. See here for our DOW upgrade note.

ECL: robust earnings outlook – upgrade to Neutral

ECL has been able to drive double-digit earnings growth over the past few quarters due to aggressive pricing, business wins, cost deflation which started in Q3, and a more recent focus on productivity (SG&A/sales has been down sequentially for the past two quarters). We expect these trends to continue due to Ecolab’s service model that drives loyalty and pricing power. We also see potential acceleration in ECL’s water business as there is significant demand from companies striving to reduce water usage. With water demand up 40% over the past 40 years and estimated to go up another 25% by 2050, and supply more than halved since 1970, the global water scarcity issue is increasingly severe (See Thematic Investing primer on Water here). Additionally, we see increasing regulatory and legal scrutiny on contaminants discharged in wastewater as a positive for ECL as it will require more treatment and monitoring. For example, the EPA has been active in setting a variety of new rules regarding PFAS drinking water standards with a focus on industrial discharges. See here for our ECL upgrade note.

FMC: cautious earnings recovery – downgrade to U/P

We are downgrading FMC to Underperform due to a lack of conviction about a near-term earnings recovery. We estimate FMC’s volume contraction in 2023 at 20%, more than offsetting the prior 2-yr volume gain of 18%, assuming global inventory levels of crop chemicals are now approaching normal levels, which suggests flattish underlying demand. The lack of visibility about monitoring and managing channel inventory levels will need to be improved. We also have concerns that the relatively undisciplined global crop chemical industry (vs. seed producers) could lead to aggressive price actions in 2024 in response to cautious inventory rebuilds. Our $57 PO is based on a 10x EV/EBITDA, below the 12-13x range we have used in prior years as the robust sales volumes from 2021-2022 were not sustainable. See here for our FMC downgrade note.

Aggregate EPS and EBITDA estimate changes:

We have somewhat reduced our earnings estimates, with EPS cut by an average of 3% for 4Q23 and 6% for 2024. However, as the table below shows, our POs have increased by an average of 1%, in part due to higher multiples applied to commodity stocks in line with our more constructive outlook.

Exhibit 18: BofA's EPS estimate revisions for US Chemicals

We have slightly more EPS increases than decreases, but on average our forecasts have been revised lower

	BofA New					BofA Old					% Delta				
	4Q23	2023	2024	2025	PO	4Q23	2023	2024	2025	PO	4Q23	2023	2024	2025	PO
ADM	1.67	7.29	6.05	6.20	$85	1.73	7.35	6.20	6.30	$90	-4%	-1%	-2%	-2%	-6%
ALB	0.75	21.15	3.94	14.05	$147	1.27	21.66	6.55	13.94	$149	-41%	-2%	-40%	1%	-1%
APD	2.97	11.51	13.15	14.45	$292	2.99	11.51	13.10	14.41	$295	-1%	0%	0%	0%	-1%
AXTA	0.44	1.59	1.80	2.00	$38	0.45	1.60	1.80	2.02	$38	-2%	-1%	0%	-1%	0%
BG	2.85	12.85	11.20	11.60	$140	2.85	12.85	11.65	11.95	$135	0%	0%	-4%	-3%	4%
CE	2.31	9.00	12.20	15.10	$135	2.29	8.98	12.05	15.20	$124	1%	0%	1%	-1%	9%
CF	1.68	8.18	6.65	6.60	$95	1.72	8.22	7.00	6.60	$100	-3%	-1%	-5%	0%	-5%
CTVA	0.07	2.62	3.10	3.85	$52	0.09	2.63	3.10	3.80	$52	-19%	0%	0%	1%	0%
DD	0.86	3.46	3.85	4.29	$80	0.86	3.46	3.76	4.16	$78	0%	0%	3%	3%	3%
DOW	0.40	2.23	3.55	5.30	$60	0.37	2.20	3.70	5.45	$57	8%	1%	-4%	-3%	5%
ECL	1.57	5.23	6.15	7.22	$216	1.57	5.23	6.00	6.99	$185	0%	0%	2%	3%	17%
EMN	1.24	6.34	8.10	10.15	$104	1.24	6.34	8.10	10.00	$95	0%	0%	0%	1%	9%
ESI	0.31	1.28	1.40	1.54	$26	0.30	1.26	1.47	1.61	$24	2%	1%	-5%	-4%	8%
FMC	1.13	3.84	4.20	5.15	$57	1.13	3.84	4.30	5.30	$60	0%	0%	-2%	-3%	-5%
GPRE	0.15	-1.69	0.57	1.21	$32	0.25	-1.90	0.95	1.65	$36	-40%	-11%	-40%	-27%	-11%
HUN	0.02	0.59	1.45	2.70	$28	0.01	0.58	1.45	2.50	$27	86%	2%	0%	8%	4%
IFF	0.85	3.44	4.20	4.65	$83	0.85	3.44	4.15	4.60	$81	0%	0%	1%	1%	2%
LIN	3.51	14.12	15.85	17.59	$455	3.54	14.15	16.14	17.92	$440	-1%	0%	-2%	-2%	3%
LYB	1.27	8.43	9.25	9.85	$103	1.65	8.80	10.10	10.00	$107	-23%	-4%	-8%	-1%	-4%
MOS	0.74	3.61	3.10	2.70	$49	0.77	3.64	3.15	2.85	$49	-4%	-1%	-2%	-5%	0%
NTR	0.67	4.67	4.50	4.70	$79	0.67	4.66	4.75	4.75	$82	0%	0%	-5%	-1%	-4%
OLN	0.36	3.83	3.25	8.75	$63	0.35	3.83	3.45	9.15	$58	2%	0%	-6%	-4%	9%
PPG	1.55	7.70	8.50	9.44	$161	1.55	7.70	8.50	9.40	$162	0%	0%	0%	0%	-1%
RPM	0.45	NM	4.98	5.55	$99	0.45	NM	4.98	5.55	$99	-1%	NM	0%	0%	0%
SGML	0.23	0.07	0.73	4.05	$33	0.46	0.30	1.06	4.07	$37	-50%	-75%	-31%	-1%	-11%
SHW	1.77	10.30	11.25	12.23	$286	1.72	10.25	10.95	11.92	$275	3%	0%	3%	3%	4%
WLK	0.66	8.42	6.60	10.40	$129	0.67	8.43	7.00	13.15	$129	-1%	0%	-6%	-21%	0%

Source: BofA Global Research Estimates

Note: APD shows F1Q24 data for 4Q23. Annual data is for FYE 9/30. RPM shows F3Q24 (3ME 2/29) for 4Q23. Annual Data is for FYE 5/31.

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The changes to our EBITDA forecasts are of similar magnitude, with revisions of -4% for 4Q23 and -3% for 2024. These downward revisions are largely led by steep earnings cuts for three companies – ALB, SGML, and GPRE. We have also somewhat lowered our EBITDA estimates for commodity and ag chemicals, with specialties seeing minor upward revisions.

Exhibit 19: BofA's EBITDA estimate revisions for US Chemicals

Our EBITDA estimates have been revised lower, led by ALB, SGML, and GPRE

	BofA New				BofA Old				% Delta			
	4Q23	2023	2024	2025	4Q23	2023	2024	2025	4Q23	2023	2024	2025
ADM	1,464	6,324	5,514	5,566	1,503	6,363	5,627	5,647	-3%	-1%	-2%	-1%
ALB	161	3,243	1,136	2,852	241	3,323	1,433	2,852	-33%	-2%	-21%	0%
APD	1,086	4,098	5,288	5,836	1,242	4,702	5,276	5,825	-13%	-13%	0%	0%
AXTA	254	954	1,026	1,078	256	956	1,022	1,079	-1%	0%	0%	0%
BG	748	3,259	2,805	2,839	748	3,259	2,871	2,887	0%	0%	-2%	-2%
CE	609	2,445	2,849	3,146	606	2,442	2,830	3,159	0%	0%	1%	0%
CF	631	2,799	2,484	2,337	643	2,811	2,578	2,340	-2%	0%	-4%	0%
CTVA	312	3,307	3,701	4,245	326	3,321	3,716	4,241	-4%	0%	0%	0%
DD	738	2,965	3,285	3,499	738	2,965	3,216	3,396	0%	0%	2%	3%
DOW	1,268	5,441	6,541	8,210	1,235	5,408	6,679	8,328	3%	1%	-2%	-1%
ECL	889	3,126	3,440	3,691	889	3,126	3,373	3,620	0%	0%	2%	2%
EMN	349	1,604	1,858	2,128	349	1,604	1,858	2,109	0%	0%	0%	1%
ESI	128	490	540	576	127	490	557	595	1%	0%	-3%	-3%
FMC	277	1,001	1,060	1,190	277	1,001	1,060	1,191	0%	0%	0%	0%
GPRE	52	52	191	191	57	58	237	315	-9%	-11%	-19%	-39%
HUN	87	515	668	940	84	512	670	901	4%	1%	0%	4%
IFF	451	1,970	2,144	2,308	451	1,970	2,148	2,312	0%	0%	0%	0%
LIN	3,254	13,101	13,284	14,164	3,275	13,122	13,456	14,358	-1%	0%	-1%	-1%
LYB	960	5,272	5,427	5,590	1,112	5,424	5,792	5,717	-14%	-3%	-6%	-2%
MOS	587	2,702	2,423	2,205	599	2,714	2,451	2,282	-2%	0%	-1%	-3%
NTR	1,188	6,171	5,992	6,026	1,186	6,169	6,098	6,020	0%	0%	-2%	0%
OLN	235	1,336	1,229	1,951	234	1,334	1,248	1,983	1%	0%	-2%	-2%
PPG	620	2,908	3,154	3,412	618	2,906	3,150	3,394	0%	0%	0%	1%
RPM	148	997	1,136	1,240	148	997	1,136	1,240	0%	0%	0%	0%
SGML	42	35	138	570	63	57	166	559	-34%	-38%	-17%	2%
SHW	789	4,200	4,454	4,692	773	4,184	4,353	4,590	2%	0%	2%	2%
WLK	461	2,684	2,399	2,995	463	2,686	2,469	3,460	0%	0%	-3%	-13%

Source: BofA Global Research Estimates

Note: APD shows F1Q24 data for 4Q23. Annual data is for FYE 9/30. RPM shows F3Q24 (3ME 2/29) for 4Q23. Annual Data is for FYE 5/31.

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Exhibit 20: BofA's EPS estimates for US Chemicals vs consensus

Our 2024 EPS estimates are on average 8% below consensus

	4Q23			2024			2025		
	BofA	Cons.	%	BofA	Cons.	%	BofA	Cons.	%
ADM	1.67	1.67	0%	6.05	6.47	-7%	6.20	6.67	-7%
ALB	0.75	1.37	-45%	3.94	12.21	-68%	14.05	17.02	-17%
APD	2.97	3.02	-2%	13.15	12.98	1%	14.45	14.21	2%
AXTA	0.44	0.45	-1%	1.80	1.94	-7%	2.00	2.21	-9%
BG	2.85	2.86	0%	11.20	11.24	0%	11.60	11.58	0%
CE	2.31	2.33	-1%	12.20	11.99	2%	15.10	14.77	2%
CF	1.68	1.64	2%	6.65	6.71	-1%	6.60	5.94	11%
CTVA	0.07	0.06	16%	3.10	3.00	3%	3.85	3.50	10%
DD	0.86	0.85	1%	3.85	3.95	-3%	4.29	4.60	-7%
DOW	0.40	0.40	0%	3.55	3.22	10%	5.30	4.40	20%
ECL	1.57	1.54	2%	6.15	6.13	0%	7.22	7.02	3%
EMN	1.24	1.30	-4%	8.10	7.84	3%	10.15	9.13	11%
ESI	0.31	0.33	-6%	1.40	1.47	-4%	1.54	1.68	-8%
FMC	1.13	1.09	4%	4.20	4.42	-5%	5.15	5.45	-6%
GPRE	0.15	0.23	-34%	0.57	1.53	-63%	1.21	3.15	-62%
HUN	0.02	-0.04	-143%	1.45	1.15	26%	2.70	1.99	36%
IFF	0.85	0.75	13%	4.20	4.04	4%	4.65	4.70	-1%
LIN	3.51	3.46	1%	15.85	15.43	3%	17.59	16.94	4%
LYB	1.27	1.32	-4%	9.25	9.40	-2%	9.85	10.97	-10%
MOS	0.74	0.86	-14%	3.10	3.36	-8%	2.70	3.41	-21%
NTR	0.67	0.72	-6%	4.50	4.74	-5%	4.70	4.68	0%
OLN	0.36	0.19	86%	3.25	3.84	-16%	8.75	6.45	36%
PPG	1.55	1.49	4%	8.50	8.44	1%	9.44	9.32	1%
RPM	0.45	0.47	-5%	4.98	4.96	0%	5.55	5.57	0%
SGML	0.23	0.49	-53%	0.73	1.93	-62%	4.05	5.07	-20%
SHW	1.77	1.79	-1%	11.25	11.31	-1%	12.23	12.60	-3%
WLK	0.66	0.87	-24%	6.60	8.13	-19%	10.40	9.81	6%

Source: BofA Global Research Estimates

Note: APD shows F1Q24 data for 4Q23. Annual data is for FYE 9/30. RPM shows F3Q24 (3ME 2/29) for 4Q23. Annual Data is for FYE 5/31.

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Exhibit 21: BofA's EBITDA estimates for US Chemicals vs consensus

Our 2024 EBITDA estimates are on average 5% below consensus

	4Q23			2024			2025		
	BofA	Cons.	%	BofA	Cons.	%	BofA	Cons.	%
ADM	1,464	1,444	1%	5,514	5,590	-1%	5,566	5,604	-1%
ALB	161	238	-32%	1,136	2,089	-46%	2,852	2,899	-2%
APD	1,086	1,243	-13%	5,288	5,221	1%	5,836	5,713	2%
AXTA	254	253	1%	1,026	1,033	-1%	1,078	1,093	-1%
BG	748	750	0%	2,805	2,954	-5%	2,839	2,826	0%
CE	609	616	-1%	2,849	2,799	2%	3,146	3,147	0%
CF	631	622	2%	2,484	2,550	-3%	2,337	2,328	0%
CTVA	312	313	0%	3,701	3,570	4%	4,245	3,956	7%
DD	738	745	-1%	3,285	3,208	2%	3,499	3,488	0%
DOW	1,268	1,251	1%	6,541	6,361	3%	8,210	7,514	9%
ECL	889	849	5%	3,440	3,398	1%	3,691	3,727	-1%
EMN	349	355	-2%	1,858	1,805	3%	2,128	1,967	8%
ESI	128	124	3%	540	543	-1%	576	589	-2%
FMC	277	268	3%	1,060	1,078	-2%	1,190	1,215	-2%
GPRE	52	52	-1%	191	269	-29%	191	392	-51%
HUN	87	77	13%	668	608	10%	940	775	21%
IFF	451	450	0%	2,144	2,155	-1%	2,308	2,369	-3%
LIN	3,254	3,014	8%	13,284	12,908	3%	14,164	13,728	3%
LYB	960	1,020	-6%	5,427	5,578	-3%	5,590	5,953	-6%
MOS	587	611	-4%	2,423	2,470	-2%	2,205	2,441	-10%
NTR	1,188	1,167	2%	5,992	5,999	0%	6,026	6,055	0%
OLN	235	206	14%	1,229	1,295	-5%	1,951	1,671	17%
PPG	620	594	4%	3,154	3,147	0%	3,412	3,362	1%
RPM	148	149	-1%	1,136	1,128	1%	1,240	1,231	1%
SGML	42	87	-52%	138	376	-63%	NM	NM	NM
SHW	789	801	-2%	4,454	4,523	-2%	4,692	4,861	-3%
WLK	461	457	1%	2,399	2,618	-8%	2,995	2,890	4%

Source: BofA Global Research Estimates

Note: APD shows F1Q24 data for 4Q23. Annual data is for FYE 9/30. RPM shows F3Q24 (3ME 2/29) for 4Q23. Annual Data is for FYE 5/31.

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Exhibit 22: BofA End Market Heatmap

We see the most risk in construction and general industrial markets, and the most opportunity in transports, aero, and healthcare

Ticker	Agriculture	Construction	Consumer	Energy	Healthcare	Aerospace	Autos & Mobility	General Industrial	Materials	Tech	Other
ADM	92%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%
ALB	5%	6%	6%	2%	6%	0%	49%	12%	0%	15%	0%
APD	0%	0%	5%	26%	4%	0%	0%	10%	37%	14%	4%
AXTA	0%	16%	0%	2%	0%	0%	72%	10%	0%	0%	0%
BG	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
CC	0%	33%	13%	2%	1%	0%	22%	12%	11%	6%	1%
CE	0%	28%	23%	0%	2%	0%	28%	11%	0%	7%	2%
CF	85%	0%	0%	0%	0%	0%	0%	15%	0%	0%	0%
CTVA	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
DD	0%	14%	12%	1%	8%	0%	13%	20%	0%	20%	12%
DOW	1%	15%	43%	8%	2%	0%	4%	17%	8%	1%	1%
ECL	0%	6%	43%	5%	11%	0%	1%	0%	21%	2%	9%
EMN	4%	12%	25%	3%	7%	0%	15%	6%	22%	6%	0%
ESI	0%	0%	12%	3%	11%	8%	27%	8%	6%	25%	0%
FMC	97%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
HUN	2%	45%	6%	5%	0%	3%	12%	7%	8%	1%	10%
IFF	0%	0%	91%	0%	9%	0%	0%	0%	0%	0%	0%
LIN	0%	0%	10%	25%	16%	0%	0%	19%	14%	9%	7%
LTHM	0%	0%	0%	0%	6%	0%	52%	26%	11%	0%	6%
LYB	1%	7%	42%	26%	4%	0%	7%	7%	2%	2%	2%
MOS	95%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%
NTR	87%	0%	0%	0%	0%	0%	0%	13%	0%	0%	0%
OLN	4%	19%	12%	4%	1%	0%	6%	22%	25%	3%	4%
PPG	0%	33%	0%	0%	0%	7%	31%	24%	5%	0%	0%
RPM	0%	94%	6%	0%	0%	0%	0%	0%	0%	0%	0%
SHW	0%	64%	0%	1%	0%	0%	4%	23%	7%	0%	0%
TROX	0%	41%	9%	0%	0%	1%	7%	22%	20%	0%	0%
WLK	2%	40%	21%	4%	1%	0%	5%	7%	13%	0%	7%

Source: Company Reports and BofA Global Research Estimates

BofA GLOBAL RESEARCH

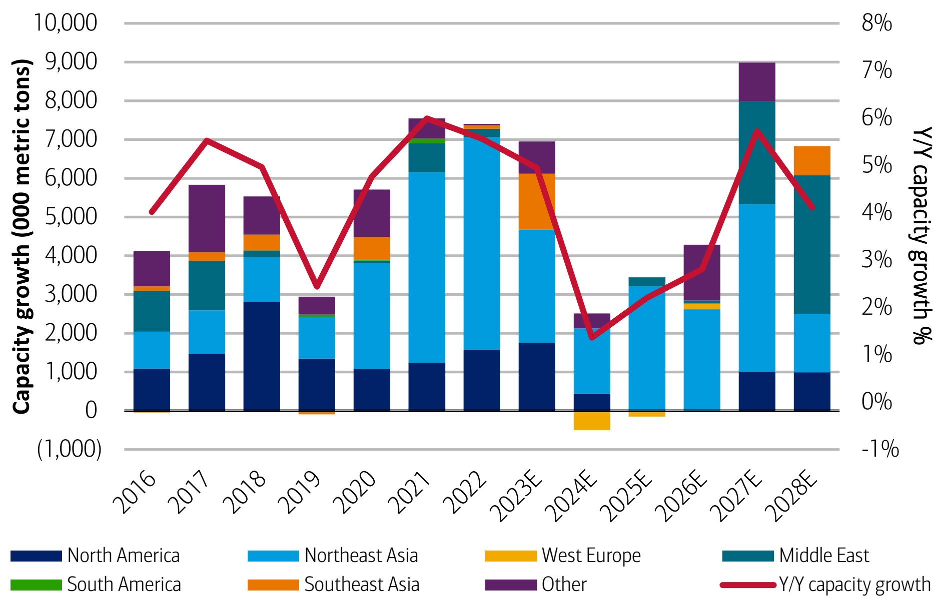
End Market Outlooks

Petrochemicals

Polyethylene faces tough recovery, but still in an upcycle

We believe that polyethylene is entering a recovery phase in the next 2-3 years, albeit at a slow rate. Near-term, there are still risks especially in the US with the 4Q23 start of Bayport Polymers and the expected restart of one of Shell's three units in Monaca, PA in early 2024. However, after that there will be no new supply in the US till sometime in 2027-28. Global supply additions are also poised to slow, as shown in the chart below. We expect another large wave of capacity additions, anchored by several large projects in the US, Middle East, and China, in 2027-28.

Exhibit 23: Polyethylene capacity expansions
We expect another large wave of capacity additions in 2027-28



Source: OPIS and BofA Global Research

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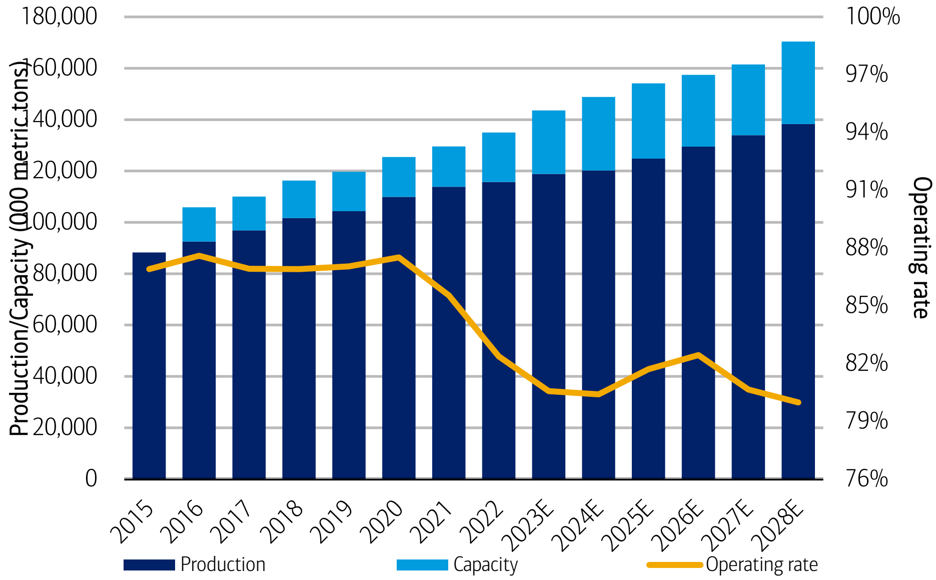
Despite the expected reduction in new supply, global polyethylene rates are expected to recover very modestly over the next few years, by only ~200bps according to OPIS; that would be off an expected 2024 trough operating rate of 80.4% – a decades-low level. We find OPIS' forecast somewhat conservative, and wouldn't be surprised if production surprises to the upside. However, the clear message is that the recovery will be slow.

Exhibit 24: Global polyethylene capacity additions and operating rates
Operating rates have likely troughed



Source: OPIS and BofA Global Research

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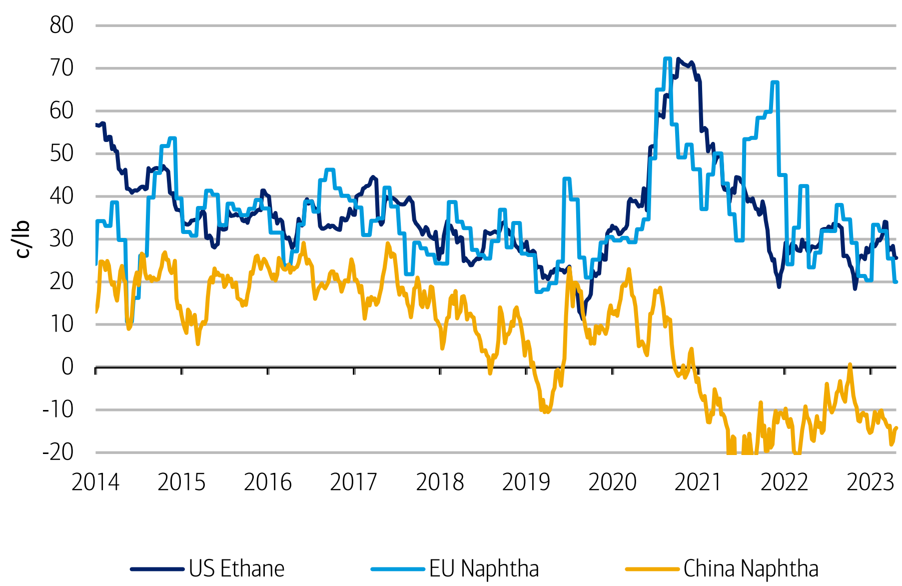
Meanwhile polyethylene margins are now retesting their COVID lows. In the US oversupply has damped prices, and even a 6cpp (cents per pound) price increase shown by trade publications in August and September has now been followed by a 5cpp non-market adjustment. We believe that the gradual absorption in new capacity in the USS should allow for gradually improved PE margins. Moreover, in Europe producers have been also grappling with high energy costs and rock-bottom demand. As we look ahead, improved demand along with a gradual deflation in feedstock costs should lead to materially higher margins.

Exhibit 25: Polyethylene margins based on feedstock
China's naphtha-based polyethylene margins have been negative for 3 years



Source: OPIS and BofA Global Research

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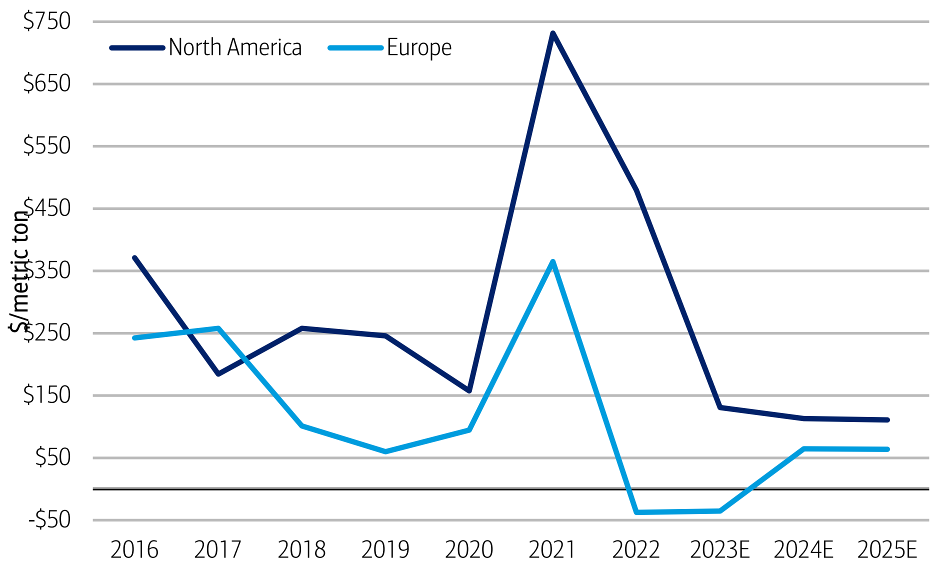
Polypropylene margins to remain depressed on new supply

We are much more concerned about the outlook for polypropylene, due to significant supply growth mainly in China. According to OPIS data, capacity growth has been ~6-7% annually since 2020 and through 2024 (expected), bringing the total capacity additions over this five-year period to 36%. Operating rates globally are expected to trough in 2024 at 76% and stay below 80% through at least 2028 as supply continues to creep in the low-to-mid single digit percentage basis.

The chart below highlights OPIS' historical data and forecasts for North American and Western European polypropylene margins. In North America PP margins are expected to remain at depressed levels vs history through 2025. In Europe, margins are likely to move into positive territory in 2024-25 after two years in the red, but even so would be at depressed levels. This metric is particularly relevant for LyondellBasell. The company is the world's second largest producer of PP, with capacity of ~9mtpa (~2.2mn in North America and ~6.8mn internationally, mainly Europe).

Exhibit 26: Polypropylene margins in NA and Europe
Polypropylene margins are expected to remain under pressure



Source: OPIS and BofA Global Research

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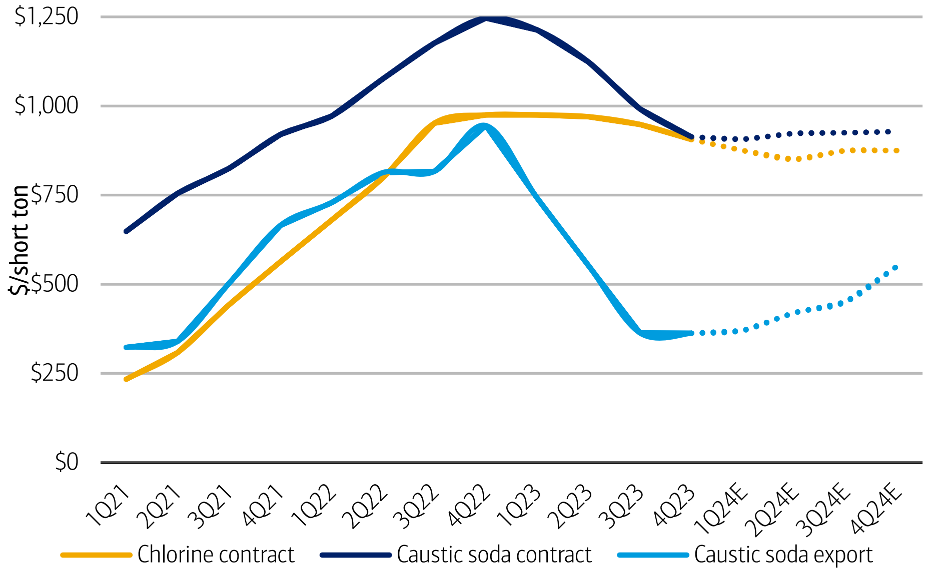
Chlor-alkali looks to be bottoming despite some near-term risks

Caustic soda prices appear to be stabilizing after roughly four quarters of precipitous declines. Export levels have already seen some modest rebound in 4Q23, and given the widespread to US contract prices we expect additional upward movement. Market commentary also points to a bottoming in the US caustic contract price, which is in line with our prior expectations. However, a recovery may be a bit muted near-term. S/D fundamentals could be negatively impacted by several factors including (1) the closure of a large alumina refinery in Australia by Alco this year, which per Argus should cut caustic demand by 220k dry metric tons, or ~0.3.% and (2) ~500k dry metric tons of additional US supply in 2024-25 from new integrated PVC capacity. Longer-term, the outlook remains favorable, with very limited capacity growth.

We are a bit less certain about the chlorine outlook, noting that our 2024 price estimates shown in the chart below are above OPIS' forecast. However, we believe that Olin's decisive actions in 4Q23 should successfully put a floor on prices. Additionally, the demand outlook for chlorine should improve significantly as many key end markets lapse a period of severe destocking (TiO2, MDI, crop chemicals).

Exhibit 27: US Caustic soda and chlorine price forecasts
We believe that caustic soda prices have bottomed



Source: OPIS and BofA Global Research

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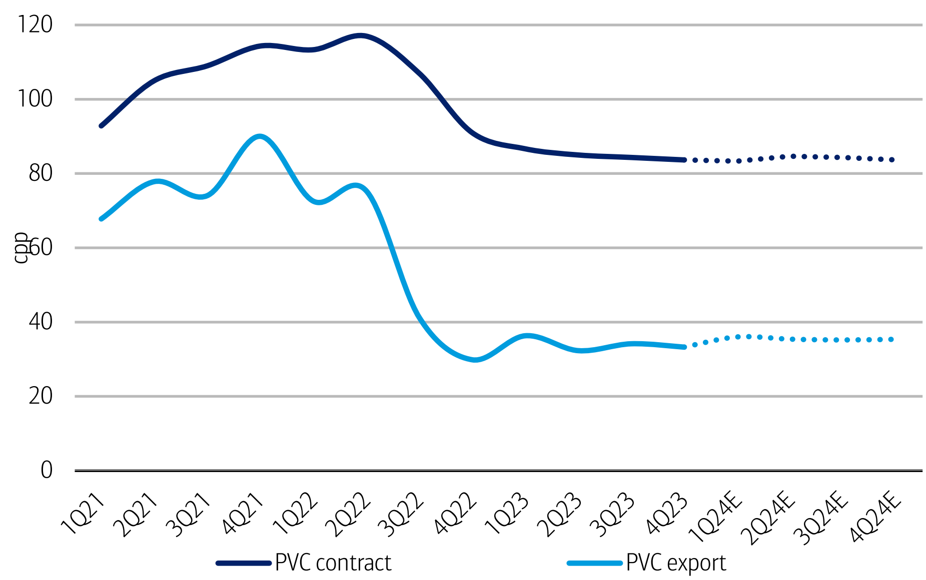
PVC bottoming but no recovery in sight

We believe that US domestic and export PVC prices are near a bottom. However, we struggle to see a recovery in the PVC market, which has been greatly affected by sluggish construction activity in China. Near-term, the US market will also face a ~5% supply growth from two new capacity adds, including from Shin-Etsu. These projects have been delayed multiple times, but as of now are poised to start production in 1H24. With soft demand conditions. OPIS expects both the US contract and export benchmarks to remain near current levels in 2024.

Exhibit 28: US PVC price forecasts
PVC prices could struggle to bounce back



Source: OPIS and BofA Global Research

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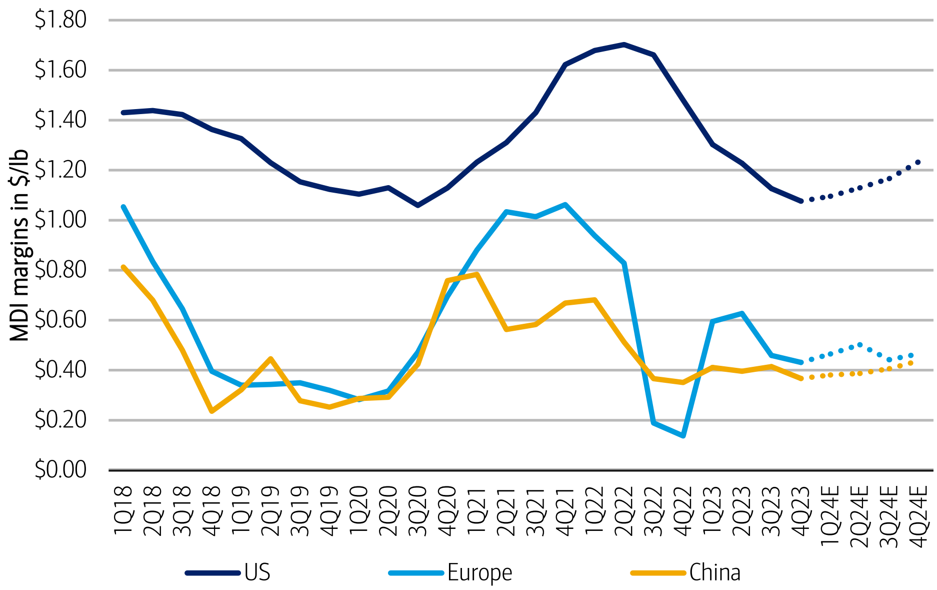
Limited traction in MDI prices/margins in 2024, lower energy costs a tailwind

Given tough construction demand, as well as a new capacity by Wanhua, we believe MDI (methylene diphenyl diisocyanate) prices will see limited improvement from current levels in 2024. In fact, on a y/y basis, 2024 average prices/margins may decline. However, we broadly see feedstocks as a tailwind to margins. Benzene prices have been softening since 4Q23. In the US, the benefits of lower chlorine prices should also accrue in 2024. Lastly, while not captured in our margin analysis, we expected MDI products to benefit from reduced energy costs, particularly in Europe. Note that energy is the largest single cost of MDI product (in our understanding ahead of benzene).

Exhibit 29: US, Europe, and China MDI margins
We see limited traction in MDI prices in 2024



Source: OPIS, ICIS, BofA Global Research

BofA GLOBAL RESEARCH

Acetyls facing significant capacity growth, tough comps

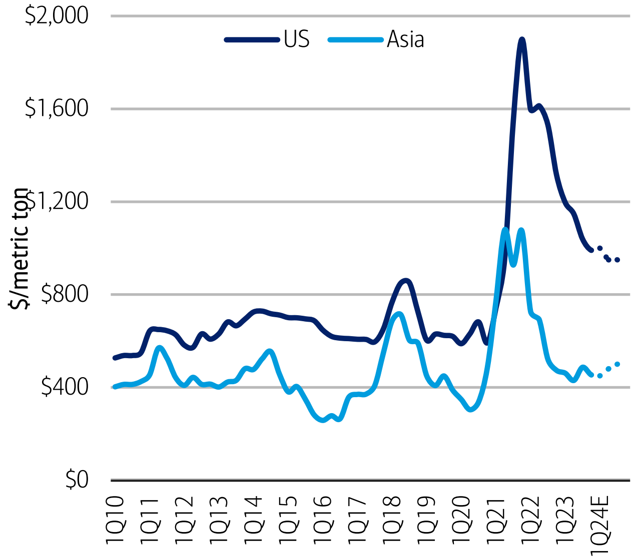
US acetic acid prices have come down a lot in 2023, but in our view should face some additional pressure in 2024 as (1) US and global pricing continued to be buoyed by continued supply disruptions (the latest one being LYB's force majeure that was lifted just a few weeks ago); (2) China is adding ~10% to global acid capacity this year (that is assuming CE's Clear Lake capacity expansion is supply neutral); and (3) the US premium over Chinese prices remains well-above historical levels (~$540/mt in 4Q23 vs ~$300 since 2010). In China we expect a modest recovery of acid prices to ~$500/mt, more in line with historical averages, from ~$450/mt currently, as the increased supply largely offset the impact of increasing demand.

The downstream VAM (vinyl acetate monomer) market is also expected to struggle to rebound in light of a similar ~10% capacity growth in China from 4Q23 through the end of 2024. Ironically, in China we expect a rebound in VAM pricing given current levels of ~$870/mt are well-below a long-term average of almost $1,200. Moreover, there is significant capacity growth further downstream, boosting VAM demand. Here a key issue is Europe, where prices are now back to historical levels of ~$1,500/mt after entering 2023 at over $2,000.

With Europe comprising ~20% of CE's VAM capacity, we expect the company's VAM margins to decline by over 5% in 2024 vs 2023. We also forecast flat acid margins y/y. All-in, this translates into our calculated CE acetyls chain margin of $647/mt in 2024 vs $667 in 2023.

Exhibit 30: Acetic acid prices

US acetic acid prices remain at a substantial premium to export prices



Source: Bloomberg, BofA Global Research

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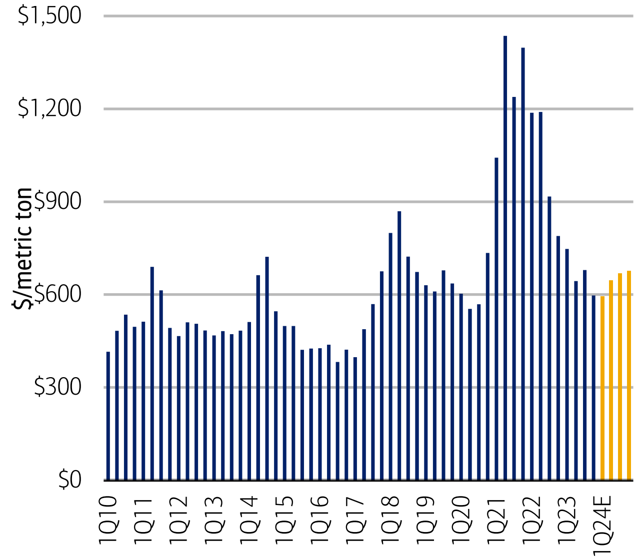
Exhibit 31: CE acetyl margins

We expect CE's acetyl margin to decline in 2024 vs 2023



Source: Bloomberg, BofA Global Research

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Agriculture/Fertilizers

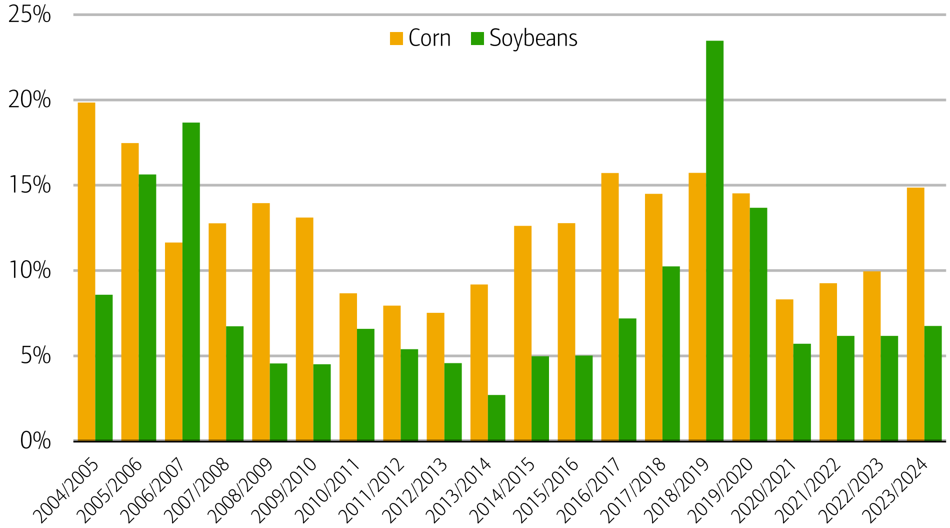
Crop prices under pressure, but S/D balances still OK

As we discussed in theme #4, US crop prices have come under considerable pressure in 2023, with a sell-off intensifying during the last month of the year. Farmer profitability is now settling at a lower level, with corn farmers expected to earn ~$400/acre during the current marketing year (i.e., the crop that was harvested in Nov/Dec) and a similar amount in 2024/25.

However, we don't believe the ag markets are all doom and gloom. In the US, the corn ending stocks/use ratio has jumped significantly this year, to ~15% driven by a massive 94.6mn acres planted and an unexpectedly-high yield (after poor June weather) of 177.3 bushels/acre. However, as shown in the charts below, globally the stocks/use ratio is much more balanced. Excluding China, the global stocks/use ratio this year is expected to be 12.2%, in-line with its 20-year average. Besides this, expectations for the Brazilian corn crop have come down significantly since the start of the season, as delays in soybean planting (pushing back the timeline for the country's Safrinha corn crop) and poor corn economics have curtailed Brazilian acreage estimates. Reflecting these developments, the US corn futures curve is in contango, with the Dec 2024 (harvest month) contract now being ~30c/bu above the active contract.

Exhibit 32: Ending stocks to use for US corn and soybeans

US corn ending stocks have rebounded



Source: USDA and BofA Global Research

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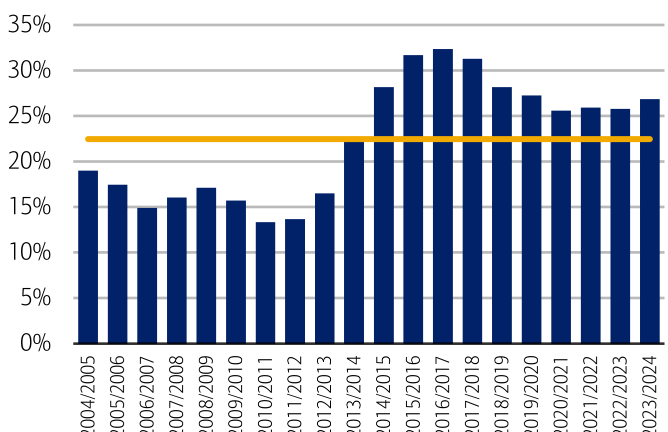
US soybean prices have held up better than corn for the better part of 2023, but have experienced a big decline in the past month or so, with the forward curve also moving substantially higher. The US soybean S/D balance remains extremely tight despite a big pullback in exports; note that if the US exported the same volume of soybeans in 2023/24 as it did last year, ending stocks would approach zero. We believe that markets are worried of a big soybean crop in 2024 as many indicators favor this crop over corn for the upcoming season. Moreover, here we observe a reverse situation vs corn: The global stocks/use ratio (ex-China) is expected to be 21.4% this year, up over 200bps and in line with its 20-year average – that is, despite the significant US tightness. Demand for oilseeds elsewhere is simply not as strong as in the US where demand is buoyed by biofuels. That being said, in our view soybean prices don't properly discount our expected strong domestic demand growth as we enter a period of new soybean crushing capacity additions. We estimate that domestic demand from soybean crushing could add ~15% to US soybean demand over the next three years or so, and as such see soybean prices coming ahead of the current curve.

Exhibit 33: Global corn stocks/use ratio

The stocks to use ratio is moving higher this year



Source: USDA, BofA Global Research

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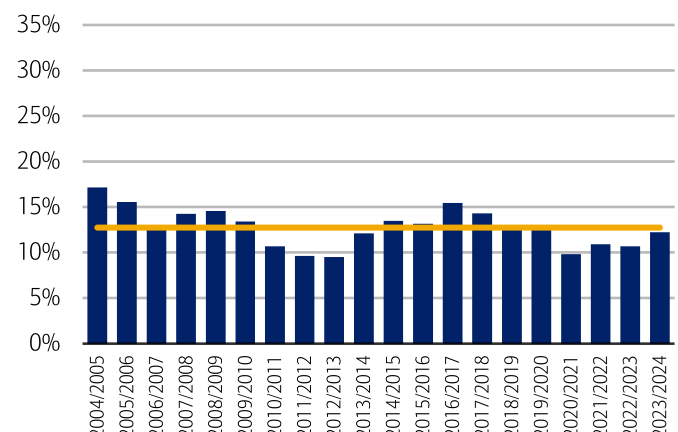
Exhibit 34: Global ex-China corn stocks/use ratio

The stocks/use ratio is near its historical average



Source: USDA, BofA Global Research

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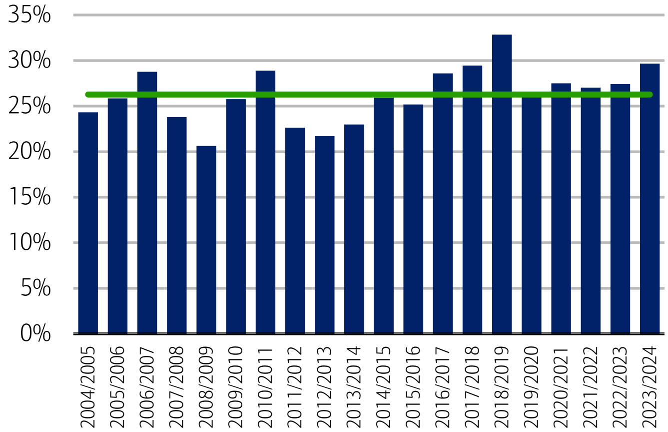
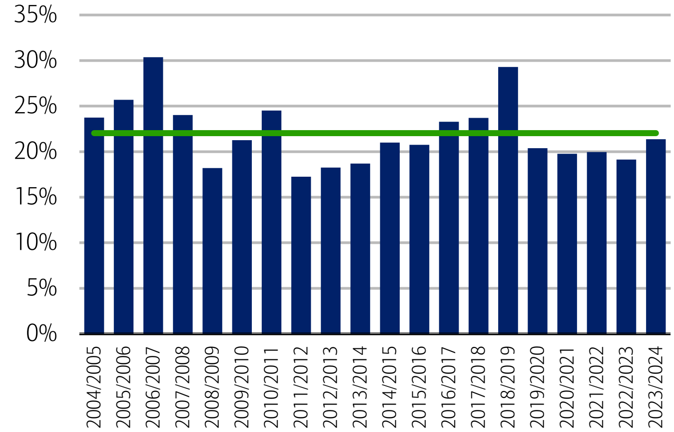
Exhibit 35: Global soybean stocks/use ratio
The global stocks/use ratio is rebounding strongly



Source: USDA, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 36: Global ex-China soybean stocks/use ratio
The stocks/use ratio is near its historical average



Source: USDA, BofA Global Research

BofA GLOBAL RESEARCH

Updating fertilizer price expectations – N/K down, P up

The volatility in fertilizer prices continued in 4Q23, although price swings have moderated vs the prior two years. Ammonia prices surprised to the upside driven by a strong fall season in the US and a sharp increase in European natural gas costs in the second half of the year (which has since largely reversed). Urea, on the other hand, faced a much steeper decline than we expected as winter crop conditions in Europe were poor and buyers stayed on the sidelines.

Looking ahead, we have made few changes to our ammonia price deck, but have trimmed our urea forecasts by a mid/high single digit percentage for 2024. Ammonia prices have softened globally at the start of the year, which was expected given seasonality, but we expect higher prices as the spring season approaches and some industrial end markets recover. We expect urea prices to increase modestly in 1Q24 from their current levels (e.g., our NOLA urea 1Q24E forecast is $320/st vs $304 as of last Friday), and more substantial leg up in Q2. The key drivers of our constructive view are (1) India's tender that appears to have put a floor on the market, (2) the return of China's export restrictions which should bite in 1H24 when Western markets need these volumes the most, and (3) continued tightness in the US as net imports have declined significantly vs pre-2023 levels.

The potash markets have stabilized in 4Q23, with US prices in fact topping our estimates. If there was one soft spot – and a cause of concern for us – that is Brazil. Potash pricing in Q4 was below our estimate by $10/mt, and came in at just $335. That is despite a massive amount of imports in 2H23 which brought the full-year level at 135.mn tons, +14.3% y/y. We expect potash prices to trade at a relatively narrow range in 2024 as China has its contract in place and the incremental supply (from Belarus and Laos mainly) should be countered by another leg up in demand towards trend levels. Still, potash pricing should be quite softer in 2024 vs 2023 when considering the elevated price at the start of 2024.

The phosphate market was the only one to surprise to the upside – and by a material extent (MAP/DAP benchmarks up mid/high single digit % vs our 4Q23 estimates). We struggle to fully-explain the strength in phosphates given S/D dynamics, although we surmise that supply discipline from Moroccan OCP and operational mishaps by Mosaic contributed to the tightness. Looking ahead, we expect prices to trend lower from the current elevated levels, yet remain solid – largely due to Chinese export curtailments and the increasing pull of phosphate in the EV battery market. A key risk here remains OCP's massive capacity expansion program, although it is our view that the company will bring online its new production only as needed.

Exhibit 37: Quarterly fertilizer price forecasts
We expect fertilizer prices to remain firm in 2024

				4Q23A			1Q24E	2Q24E	3Q24E	4Q24E
				Estimate	Actual	%	New	New	New	New
Nitrogen	Ammonia	Cornbelt	USD/st	600	703	17%	550	575	550	575
	Ammonia	Tampa	USD/st	530	543	2%	475	450	475	525
	Urea	Cornbelt	USD/st	440	422	-4%	390	430	415	430
	Urea	NOLA	USD/st	370	334	-10%	320	370	355	370
	UAN	Cornbelt	USD/st	280	294	5%	285	290	265	285
	UAN	NOLA	USD/st	250	261	4%	250	260	240	260
Potash	Granular	Cornbelt	USD/mt	420	439	5%	445	440	440	455
	Standard	Southeast Asia	USD/mt	320	318	-1%	325	330	330	330
	Granular	Brazil	USD/mt	345	335	-3%	320	325	360	360
Phosphate	DAP	NOLA	USD/mt	560	603	8%	600	560	580	540
	DAP	US Gulf/Tampa	USD/mt	525	550	5%	540	520	520	505
	MAP	Brazil	USD/mt	525	558	6%	550	520	520	495

Source: CRU, BofA Global Research

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Exhibit 38: Annual fertilizer price forecasts
We've raised our near-term price forecasts for phosphate

				2021A	2022A	2023A			2024E			2025E		
						Estimate	Actual	%	Prior	New	%	Prior	New	%
Nitrogen	Ammonia	Cornbelt	USD/st	759	1276	604	630	4%	563	563	0%	538	538	0%
	Ammonia	Tampa	USD/st	556	1053	463	466	1%	481	481	0%	500	500	0%
	Urea	Cornbelt	USD/st	535	667	439	434	-1%	440	416	-5%	408	398	-2%
	Urea	NOLA	USD/st	492	601	363	354	-2%	390	354	-9%	358	348	-3%
	UAN	Cornbelt	USD/st	372	561	296	300	1%	278	281	1%	275	271	-1%
	UAN	NOLA	USD/st	341	543	263	266	1%	253	253	0%	250	246	-2%
Potash	Granular	Cornbelt	USD/mt	569	799	461	466	1%	446	445	0%	418	418	0%
	Standard	Southeast Asia	USD/mt	393	781	380	380	0%	330	329	0%	330	330	0%
	Granular	Brazil	USD/mt	539	850	393	391	-1%	366	341	-7%	380	361	-5%
Phosphate	DAP	NOLA	USD/mt	668	846	595	606	2%	545	570	5%	515	515	0%
	DAP	US Gulf/Tampa	USD/mt	644	894	554	560	1%	500	521	4%	483	483	0%
	MAP	Brazil	USD/mt	694	906	549	557	1%	493	521	6%	483	483	0%

Source: CRU, BofA Global Research

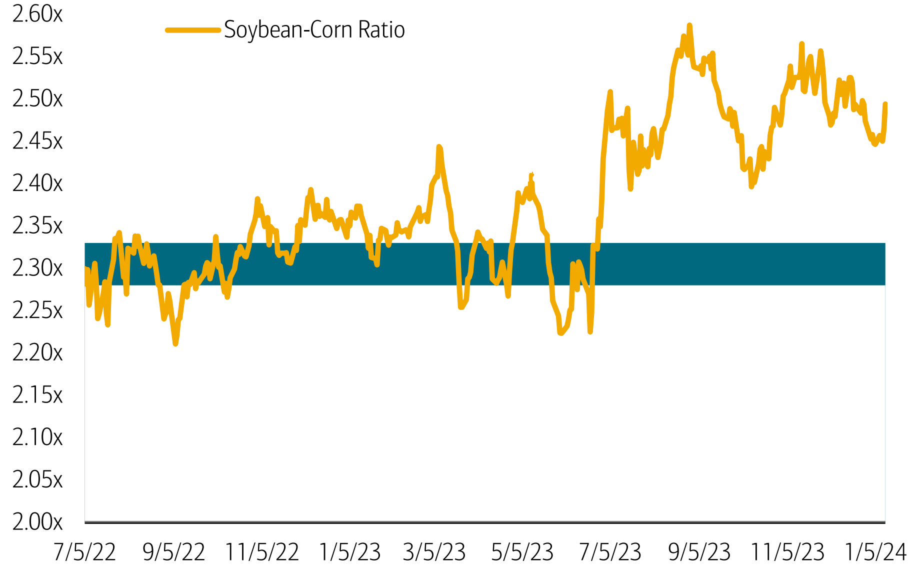
BofA GLOBAL RESEARCH

Based on our updated price deck, we have lowered our POs for all three fertilizer companies, primarily CF and NTR. Certainly, any upside has been curtailed, but in light of the 4Q23 stock sell-off we still believe the stocks warrant a Buy rating at this juncture. For CF, and to a lesser extent NTR, we are also positive tactically, as we anticipate a rally in urea prices from the current oversold levels during the first half of of 2024.

Seed/crop chems outlook positive but with near-term challenges

We maintain a positive view of the seed market in the medium/long term, driven by barriers to entry and innovation. However, near-term we do see risks, one of the reasons we reiterate our Neutral rating for Corteva. The primary risk in 1H24 is a potential big shift towards soybeans and away from corn in the US. Several indicators, including the chart below, support this outcome. Given corn seeds are much more expensive than soybean seeds, CTVA has disclosed that each one million acre shift has a $10mn impact on its EBITDA. We are also concerned about the Safrinha corn acreage in Brazil. Lastly, more modest economics could put lid on seed price increases broadly; and specifically in US soybeans, our discussions with market participants point to a more competitive environment with pricing likely down y/y in 2024.

Exhibit 39: Historical soybean/corn price ratio
Soybean prices have fallen but are still attractive vs corn prices



Source: Bloomberg, BofA Global Research

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The outlook for crop chemicals is challenging for 2024 although the global inventory reset should lead to stronger growth in 2025. Based on discussions with market participants, it appears that the inventory destocking in North America has largely run its course, with stocks likely below-normal levels. That being said, we believe retailers are not eager to restock and we may be in a "new normal" for crop chem inventories. There is still tremendous uncertainty regarding the destocking in South America in 4Q23 and the expected soft demand from Europe in 1H24. Beyond the destocking trend, increased competition as producers fight for a more limited number of sales has already led to some price declines, which is in our view the biggest risk for CTVA' and FMC's business in 2024.

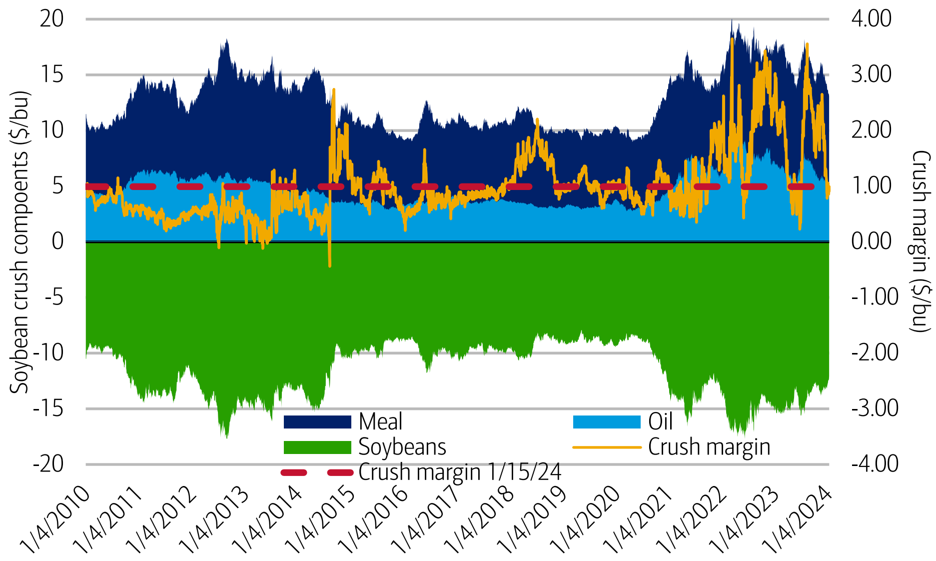
Crush margins off peak but expected to remain elevated

US Soybean crush margins have come under pressure this winter, and are now under $1/bushel. This has in turn put pressure on the shares of ADM and primarily BG. In our view, the crush environment in the US remains strong, with continued demand growth from new renewable diesel plants, but as new crushing capacity enters the market, margins are poised to settle at a lower level vs the boon years of 2022-23. We estimate that US crushing capacity will increase by roughly one-third from late-2023 (when ADM commenced operations at its Spiritwood, ND plant) through 2026.

That being said, we are not concerned about the recent pullback in margins; after all we saw two similar troughs in 2022-23 (see chart below) that were subsequently followed by a significant expansion. Additionally, even the current crush margin of $0.99/bu (by our estimates) is above the 2010-2021 average of $0.84. We also expect margins to expand from current levels, and average $1.26/bu in 2024 and $1.36 in 2025.

Exhibit 40: US soybean crush margin components

Despite the recent steep drop in crush margins, they remain in line with LT averages



Source: Bloomberg, BofA Global Research

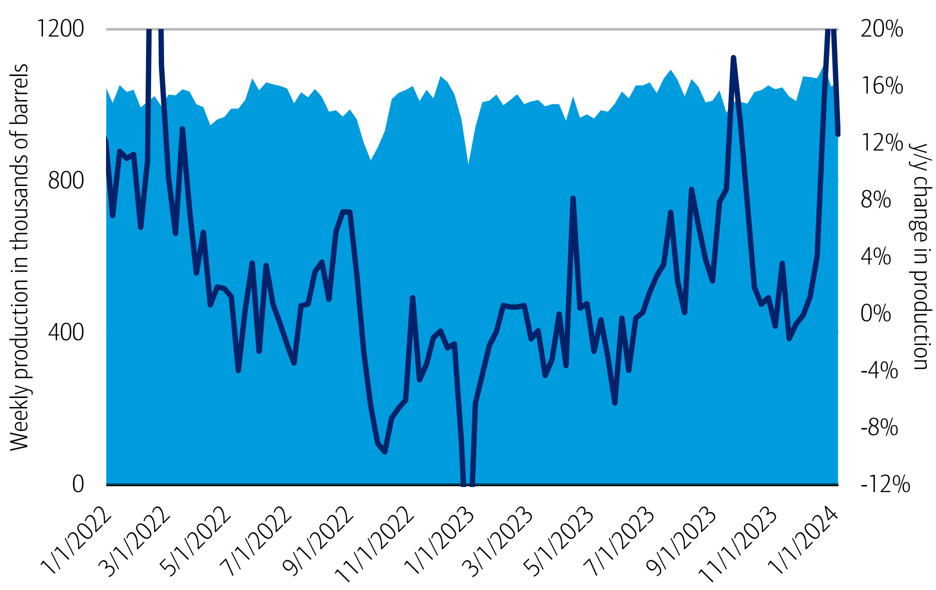
BofA GLOBAL RESEARCH

Ethanol under pressure but US corn supplies provide relief

Ethanol margins and stocks have come under pressure since the fall of 2023. US production of ethanol has skyrocketed during this period, with weekly figures by the DOE often showing y/y growth of 10-20% during that period.

Exhibit 41: Weekly US ethanol production

Ethanol production has increased significantly since September



Source: DOE, Bloomberg, BofA Global Research

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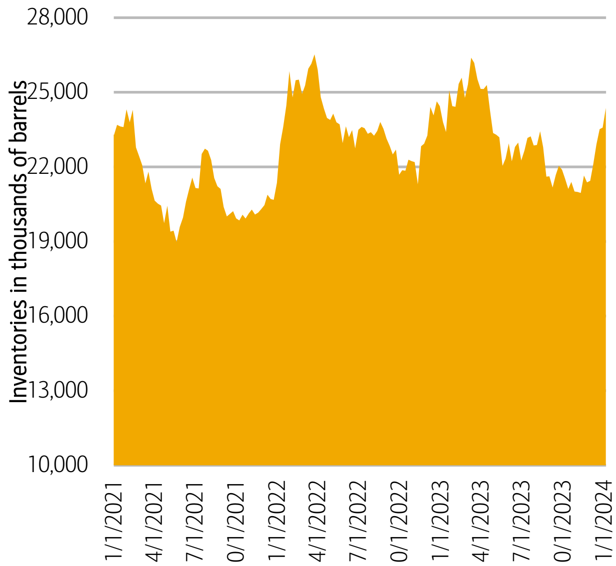
The production growth led to a rapid rise in inventories, which as of early-January are now up on a y/y basis. Ethanol prices have declined significantly, and we now expect margins to be well-below 2021-23 levels. That being said, we believe producers such as Green Plains can still generate positive profitability due to more abundant corn supplies. Of course lower corn prices are already baked into our margin estimates – but a lower corn basis is not. Recall that in 2022 and a portion of 2023 GPRE was paying a basis of

$1/bu or more above benchmark prices due to corn scarcity. With this past season's abundant crop, we expect the basis to become a material tailwind to profitability.

Exhibit 42: US ethanol inventories

The increase in ethanol production has led to a steep inventory buildup



Source: DOE, Bloomberg, BofA Global Research

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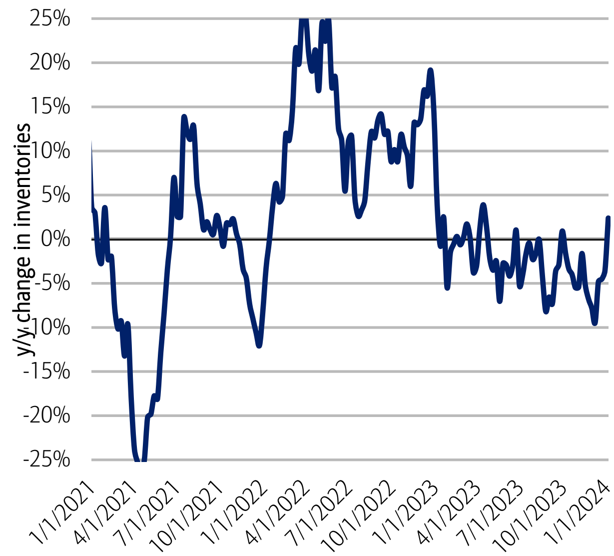
Exhibit 43: Y/Y change in US ethanol inventories

Starting in January, inventories are now higher on a y/y basis



Source: DOE, Bloomberg, BofA Global Research

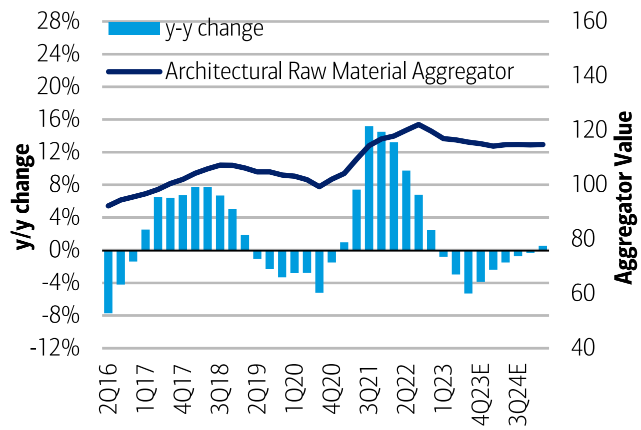
BofA GLOBAL RESEARCH

Coatings aggregator suggests minimal deflation in 2024

We updated our coatings raw material aggregator, based on OPIS forecasts, the crude forward curve, and our own estimates, reflecting low level deflation turning into reinflation by 1Q25. This moderating deflation trend throughout 2024 is driven primarily by higher Epoxy, TiO2, and Tin pricing, all of which we expect to increase throughout 2024 based on rising BPA price expectations, internal estimates in all regions, and internal can sheet body price estimates from our packaging team. This decreasing deflation/reinflation is slowed down by Acrylic, MMA, and HDPE which we expect to be a bit more stagnant throughout the year, partially due to falling crude oil futures. All in, coatings companies will likely see mid-single-digit raw material cost deflation in 4Q23, slowly moderating to a flat 4Q24 (<1% y/y deflation), implying 1-2% deflation for 2024. This flatness in 4Q24 could turn into reinflation by 1Q25. We note that inflation for coatings companies has outpaced our coatings cost aggregator forecasts (Exhibits 44-45), because of spot buying, and logistics/labor inflation. Some of this may "come back" to companies as supply chains normalize, though other "non-raw material" costs remain sticky.

Exhibit 44: Architectural Coatings Raw Material Aggregator

Raw material prices are expected to deflate 1.2% y/y in 2024, inflecting to slight reinflation in 1Q25



Source: OPIS, ICIS, Bloomberg, BofA Global Research estimates

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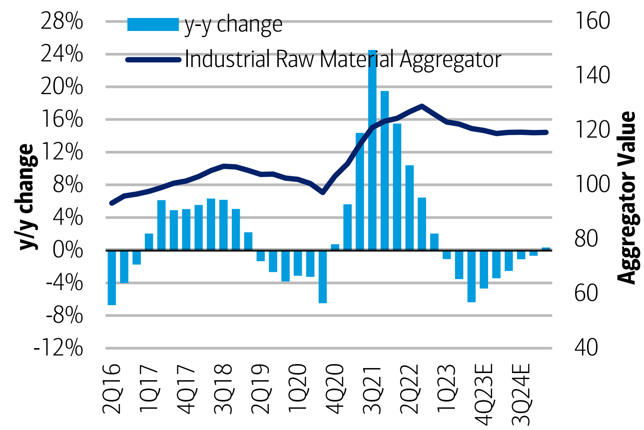
Exhibit 45: Industrial Coatings Raw Material Aggregator

Raw material prices are expected to deflate 2.0% y/y in 2024, inflecting to slight reinflation in 1Q25



Source: OPIS, ICIS, Bloomberg, BofA Global Research

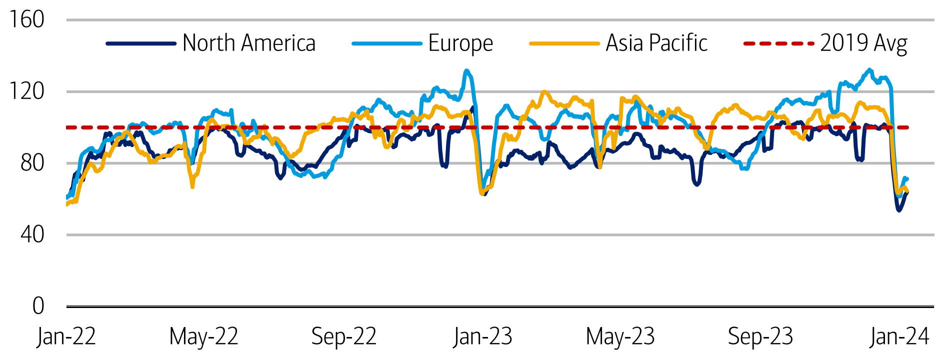
BofA GLOBAL RESEARCH

Pre-holiday congestion data is steadily improving, a tailwind for refinish

For automotive refinish coatings (PPG and AXTA), we look to traffic congestion data as an indicator of volumes as traffic often means collisions. Said data points to a potentially sharper 1Q recovery, and then normalized growth through 2024. Exhibit 46 shows that before late December, congestion was at or above 2019 levels in all regions (Asia, Europe, and North America). However, it is worth noting that the holiday congestion lull has brought the localized trough lower than the previous year's (December 2022), suggesting a stronger recovery will be needed in 1Q24 to get to pre-holiday congestion levels. After 1Q24, the rest of the year will likely still see growth in congestion, but at a lower, more normalized rate. This steady normalized growth in congestion should cause steady growth in collisions, bolstering 2024 refinish demand.

Exhibit 46: TomTom Congestion Index

All three regions were at or above 2019 levels before the December holidays



Source: TomTom Congestion Index, Bloomberg

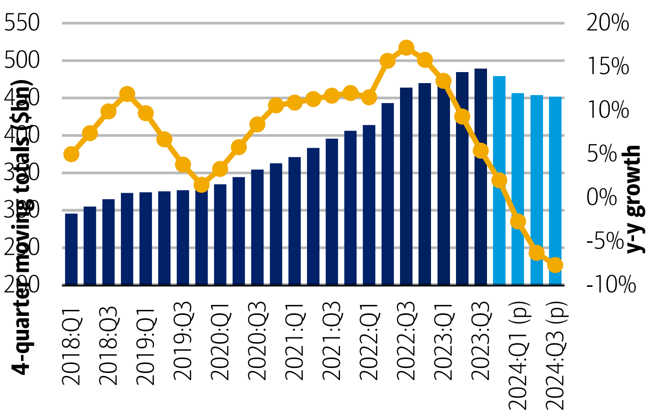
BofA GLOBAL RESEARCH

Remodeling market growth will continue to decline throughout 2024

Besides new housing we see headwinds in repair & remodeling (R&R) – the largest residential coatings end-market – as inflation dents homeowners' spending power and access to home equity remains limited. Several data points we track, including existing home sales which are down by almost 40% vs early-2022, as well as R&R indexes all support this view.

Exhibit 47: Harvard LIRA Index

Gains in improvement and maintenance expenditures to owner-occupied homes are expected to continue to steeply decline throughout 2024



Source: Harvard University

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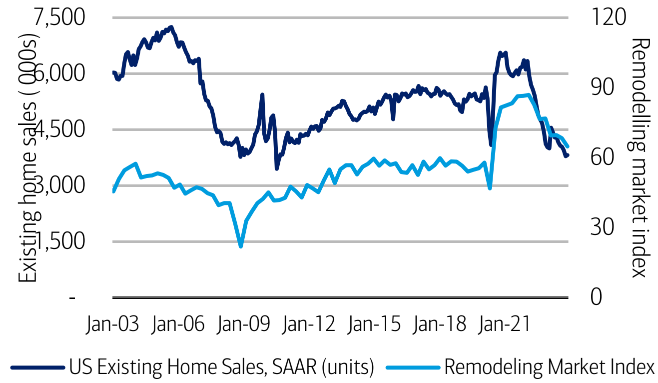
Exhibit 48: Existing home sales vs Remodeling Market Index

Existing home sales and remodeling expectations are both in decline



Source: US Census Bureau, NAHB, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Weakening Lithium spot, yet potential oversupply in 2024

Lithium price sinks, threatening the marginal producer

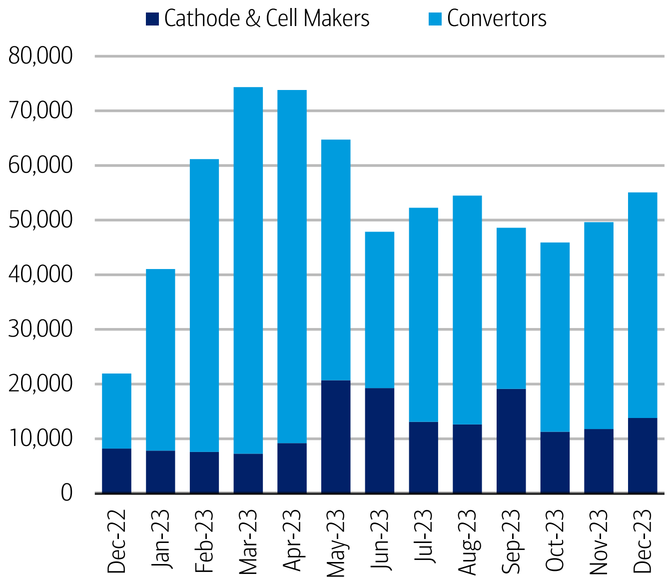
While lithium prices should be seasonally stronger in 4Q and 1Q, we have been seeing continuous declines in the Chinese spot market throughout 2H23 with 4Q being no exception. Given this consistent decline, we are hesitant to exclusively apply our global outlook on price, at least in the near term, so now we apply a spot and global outlook average to infer the near term price, assuming a walk toward our house view by the end of 2024. We still believe that price could bottom toward the end of 2024, but we note that this bottom could occur sooner given the recent price movements and the slowdown in production rates as noted in our recent lithium conference. See takeaways from our 6th annual Lithium & Battery Storage Conference here. Interestingly, Benchmark views the long-term incentive price of Lithium Carbonate to be $29k/mt, but this number likely will not be reached for another decade.

New supply is coming, improving balance

2023 saw solid global lithium market supply response with several brown and greenfield mines commissioning, in addition to the ongoing ramp of SQM and ALB 2022 growth initiatives. In 2024, we expect close to 40% y/y growth (or ~330 kt LCE) in supply reaching ~1.19mn mt LCE total, although we note some of these ramps could be delayed given the unfavorable current pricing. This is more supply than we expect in y-y demand growth, which fuels our view of expected price declines and project delays. Further, we note that the recent slowdown in production rates for lithium operations could potentially drive this near-term supply to be lower.

Recent SMM data highlights inventories being at the highest level since May 23 in a month when output of refined product was flat (= weak end demand) (see Exhibit 49). Current output rates of total lithium carbonate in China has remained between 40-45kt per month implying total inventory is currently >1Mo of stocks heading into a period where demand for new vehicles in China has been historically subdued. We expect operating rates at Chinese converters to slow incoming months due to elevated inventories and below breakeven profit margins. While China's government has subsidized loss-making industries in the past (e.g. nitrogen), we expect near-term operating rates to slow.

Exhibit 49: Total China Inventory Lithium Carbonate (mt)
Inventories are at the highest level since May 2023



Source: SMM

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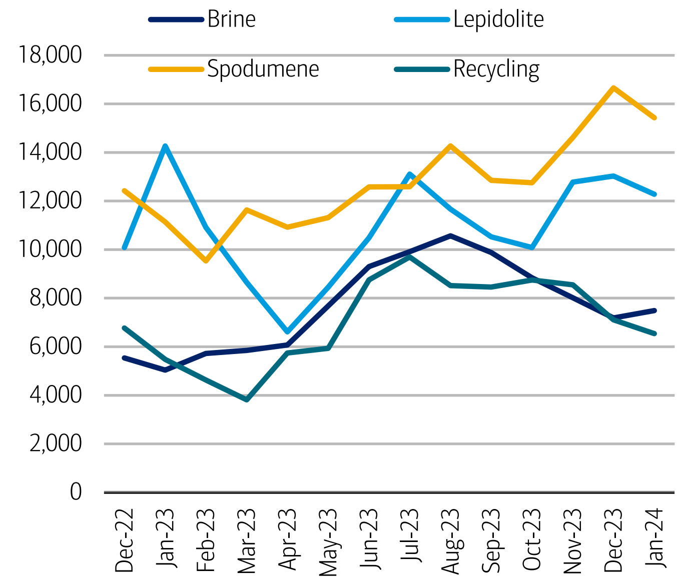
Exhibit 50: Monthly Output of Lithium Carbonate by Feedstock Source (mt)
Current output rates of total lithium carbonate in China has remained between 40-45kt / month



Source: SMM

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Demand driven by BEVs and IRA

Lithium demand in 2024 is bolstered by 45% demand growth in lithium for Battery Electric Vehicles (BEVs), driving aggregate demand growth to be up 30% y/y (or ~289 kt LCE) causing total demand to reach ~1.21mn mt LCE. In the US, specifically this is driven by the IRA which incentivizes domestic lithium production and operations. This trend of Global EV sales driving demand for key battery metals (lithium, cobalt, and manganese) is expected to continue in the medium to long term as Global EV sales increase from ~14mn in 2023 to ~59mn in 2033 (Benchmark Minerals). Similar to Benchmark's view, we also believe that a supply gap will emerge in the next few years (we have 2027, Benchmark has 2028) driven by rapidly increasing demand and not enough new projects coming online.

Exhibit 51: Lithium demand by segment and global supply balances
In 2024, we expect the lithium supply balance to be improved to -19.3 kt LCE

	18	19	20	21	22E	23E	24E	25E	26E	27E	28E	29E	30E
(LCE)	2018	2019	2020	2021	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
SUPPLY													
Base case													
Brine	117,168	120,412	206,322	241,300	333,384	408,204	508,549	594,323	673,377	695,642	697,967	698,034	698,192
Hard Rock	123,515	180,948	211,840	266,745	294,307	434,274	640,995	900,535	1,072,937	1,104,677	1,133,637	1,105,764	1,094,607
Sub-total	240,683	301,360	418,162	508,045	627,691	842,479	1,149,545	1,494,858	1,746,315	1,800,319	1,831,605	1,803,798	1,792,799
Projects													
Brine							7,800	57,390	91,897	152,423	198,799	198,799	197,699
Hard Rock							2,087	7,457	24,982	68,318	125,994	187,471	187,865
Sub-total							9,887	64,847	116,879	220,741	324,794	386,270	385,564
Secondary		220	1,633	3,886	9,425	19,881	35,681	59,498	92,544	135,836	212,516	310,837	430,917
Total Supply	240,683	301,581	419,795	511,931	637,116	862,360	1,192,640	1,602,992	1,926,518	2,101,711	2,287,716	2,404,338	2,512,889
Growth	*21.8%*	*25.3%*	*39.2%*	*21.9%*	*24.5%*	*35.4%*	*38.3%*	*34.4%*	*20.2%*	*9.1%*	*8.9%*	*5.1%*	*4.5%*
DEMAND													
BEVs	56,338	72,718	91,007	178,478	335,488	497,840	719,552	975,339	1,228,094	1,465,807	1,738,265	1,999,833	2,215,033

Exhibit 51: Lithium demand by segment and global supply balances
In 2024, we expect the lithium supply balance to be improved to -19.3 kt LCE

	18	19	20	21	22E	23E	24E	25E	26E	27E	28E	29E	30E
PHEVs and HEVs	5,504	8,043	14,692	23,786	40,054	59,015	80,073	92,114	98,343	97,007	96,961	96,152	94,243
Other eMobility	13,821	13,606	13,766	18,057	22,405	25,486	27,969	30,269	32,644	34,133	35,690	37,319	39,024
Inventory build, supply chain	9,978	4,676	6,275	80,294	88,813	8,474	12,039	63,253	62,449	63,528	65,331	58,634	49,672
Energy Storage	1,277	1,755	2,411	4,700	6,129	8,900	12,923	18,765	27,247	39,564	57,448	83,416	121,122
Other rechargeable	34,870	38,929	57,391	64,667	83,421	92,098	99,612	107,129	117,459	128,510	138,942	149,992	161,605
Salts & electrolytes	0	0	22,027	36,976	50,472	65,438	81,471	95,554	111,407	126,946	143,653	161,344	178,784
Glass-ceramics	63,747	65,423	26,605	28,202	29,077	29,779	30,603	31,466	32,307	33,155	34,019	34,890	35,771
Lubricating Greases	20,923	21,153	14,413	14,941	15,486	16,012	16,557	17,015	17,435	17,812	18,185	18,566	18,936
Continuous Casting	8,104	8,298	11,757	12,073	12,374	12,481	12,477	12,517	12,422	12,442	12,457	12,489	12,516
Air Conditioning	9,319	9,422	9,557	10,131	10,445	10,697	10,993	11,303	11,605	11,910	12,220	12,533	12,850
Polymer Production	7,218	6,795	7,442	7,497	7,844	8,266	8,617	8,862	9,086	9,286	9,480	9,679	9,863
Aluminium Smelting	1,999	1,977	1,931	1,914	1,895	1,912	1,923	1,923	1,923	1,923	1,923	1,923	1,923
Medical	0	0	5,406	5,419	5,441	5,462	5,472	5,483	5,496	5,508	5,520	5,533	5,544
Primary Batteries	0	0	4,664	4,974	5,060	5,115	5,279	5,424	5,559	5,681	5,806	5,933	6,062
Other	24,418	55,015	8,185	8,676	8,946	9,162	9,415	9,680	9,939	10,200	10,466	10,734	11,005
Total Demand	263,258	313,904	335,955	543,461	778,867	922,946	1,211,971	1,571,506	1,874,573	2,156,493	2,475,820	2,776,724	3,028,280
Growth	*10.6%*	*19.2%*	*7.0%*	*61.8%*	*43.3%*	*18.5%*	*31.3%*	*29.7%*	*19.3%*	*15.0%*	*14.8%*	*12.2%*	*9.1%*
Balance	-22,575	-12,323	83,840	-31,529	-141,751	-60,586	-19,330	31,486	51,945	-54,782	-188,104	-372,386	-515,391
Balance, of supply	-9.4%	-4.1%	20.0%	-6.2%	-22.2%	-7.0%	-1.6%	2.0%	2.7%	-2.6%	-8.2%	-15.5%	-20.5%
Utilization Rate	109.4%	104.1%	80.0%	106.2%	122.2%	107.0%	101.6%	98.0%	97.3%	102.6%	108.2%	115.5%	120.5%

Source: BofA Global Research estimates

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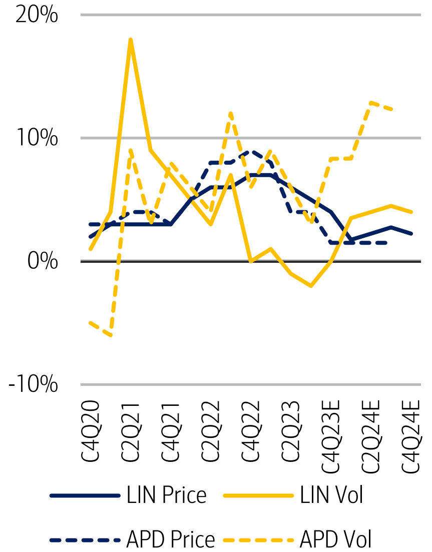
Industrial Gases – pricing power expected to continue

We remain constructive on the global industrial gases industry due to largely non-discretionary demand and significant discipline within the consolidated industry structure. Merchant pricing has been robust in all regions (see Exhibits 52-54), particularly in Europe, which has more than offset higher energy prices. Roughly a third of sales are via long-term take-or-pay contracts for on-site and pipeline delivery of gases. Volumes in merchant and packaged gases can be variable, but has remained relatively stable in recent years.

Exhibit 52: Americas Quarterly Price & Volume Y/Y Growth

We expect strong price/volume trends in US



Source: Company Filings, BofA Global Research estimates

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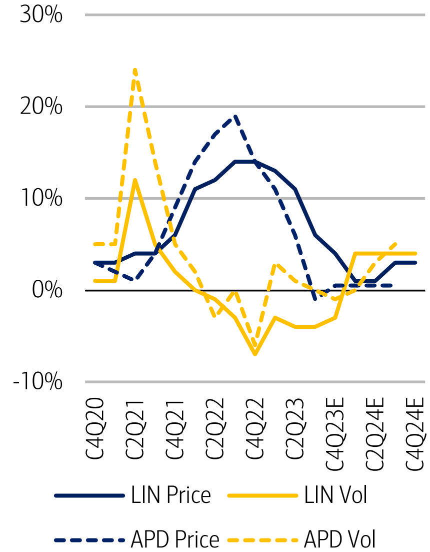
Exhibit 53: Europe Quarterly Price & Volume Y/Y Growth

Merchant pricing in Europe has been significant



Source: Company Filings, BofA Global Research estimates

Note: LIN data reflects EMEA segment. First four quarters of APD data reflects EMEA segment (prior to resegmentation)

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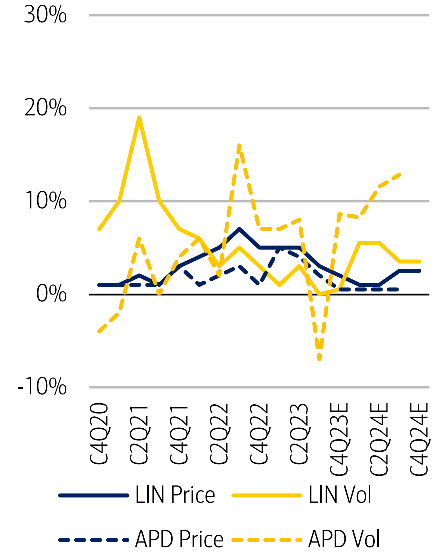
Exhibit 54: Asia Quarterly Price & Volume Y/Y Growth

Asian pricing trends remain positive



Source: Company Filings, BofA Global Research estimates

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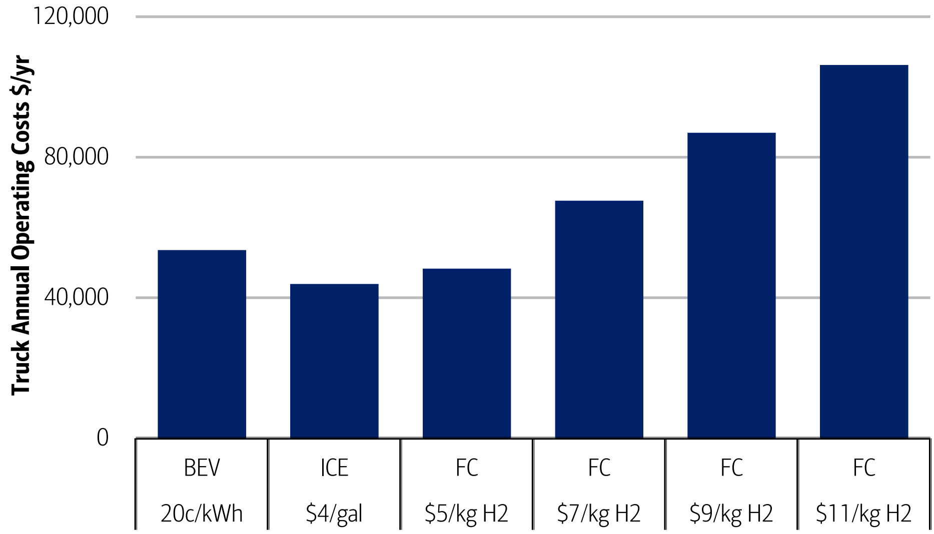
More potential for blue vs green H2

We have had a more constructive view on the potential shift from gray hydrogen to blue hydrogen than for the shift to green. We have had this view for several reasons. First is economics, as the additional operating and capital cost to implement carbon capture for steam methane reformers, combined with a pipeline installation to a Class VI injection well is relatively modest, and likely more than offset by the $85/t tax credit from 45Q. We also see significant demand for blue hydrogen in industrial end markets such as refining and renewable fuel production, given pipeline delivery, whereas mobility will require the additional costs of tank truck delivery and potentially also liquefaction. Our cautious view on the shift to green has been primarily due to mobility as the only credible end market, which does not look compelling due to significantly higher costs than fossil fuels and battery electric, as illustrated in Exhibit 55. We recently hosted our 6th Hydrogen Conference and the broadly held view as that hour matching of renewable power with green hydrogen production as required to attain the 45V tax credit will be very restrictive.

Exhibit 55: Operating costs for trucks
Diesel is a lower cost option for trucks vs green hydrogen



Source: BofA Global Research estimates

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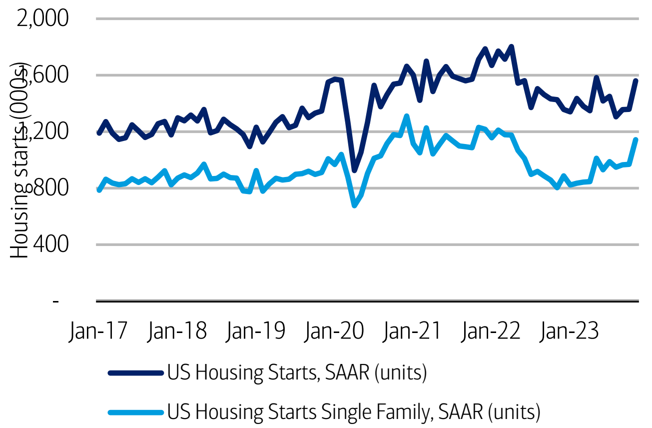
Decarbonization is a growth driver for the gases companies
Reflecting its large engineering division, Linde's approach to decarbonization projects is the most diversified, ranging from carbon capture of industrial emission sources, to converting combustion sources from fossil fuel to hydrogen. Nearly all these Linde projects involve long-term take-or-pay contracts. Air Products' strategy heavily involves very large hydrogen projects, some blue and some green, but largely without contracts. The target end market for the green hydrogen projects is mobility (FC cars, buses, and trucks), which is in very early stages of development. We would characterize the strategies for Matheson (Nippon Sanso) and Air Liquide to be closer to Linde than Air Products.

Housing Outlook is Challenging

While weakening existing home sales and remodeling indices infer continued weakness in R&R in the housing market, there are some indicators of a resilient new construction market, with US housing starts up 9% y/y in November 2023 (single family housing starts up 42% y/y) and US building permits up 5% y/y in November (single family building permits up 23% y/y). (See Exhibits 56-57). Note that single-family homes consume significantly higher amounts of raw materials such as coatings, insulation, and PVC, than multi-family units, so more strength in single family housing could be constructive for producers of said materials. Although it is fair to note that this trend of y/y growth has a short track record of only a few months. Some of the less constructive housing market indicators include the Homebuyer Affordability Index (Exhibit 58) which reached its lowest levels in October 2023, even lower than the Great Financial Crisis. Additionally, the Mortgage Bankers Association (MBA) purchase index which measures mortgage loan application volume is down 7% y/y and generally fallen throughout 2023. This index is a leading indicator of home sales by four to six weeks, so it can be a reasonable read in to a weaker 1Q24 (Exhibit 59). Weakness in the housing market has wide-ranging implications, and reverberates through the entire coatings chain: Coatings manufacturers (SHW, PPG, RPM); the entire coatings chain, including titanium dioxide pigments, acetic acid (CE), and epoxies (OLN, WLK), as well as other chemistries such as polyurethanes used in insulation and as an adhesive for wood products (HUN).

Exhibit 56: US housing starts
US housing starts have been in the ~1.3-1.6mn units range over the last year, while single family housing starts have shown more consistent growth over the past year, now at ~1.1mn units



Source: US Census Bureau, Bloomberg, BofA Global Research

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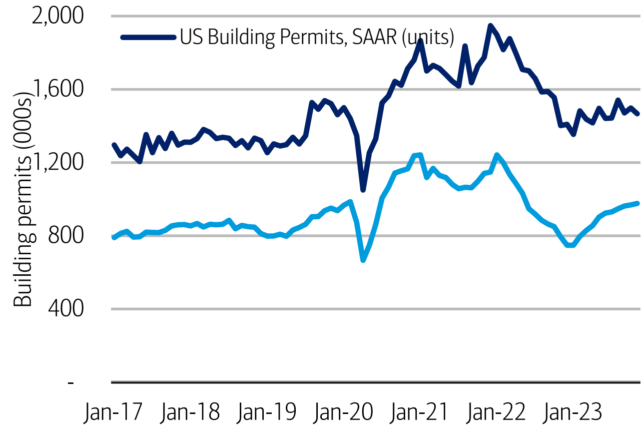
Exhibit 57: US building permits
Permits for single-family homes peaked in late-2020, but has seen modest recovery since January 2023



Source: US Census Bureau, Bloomberg, BofA Global Research

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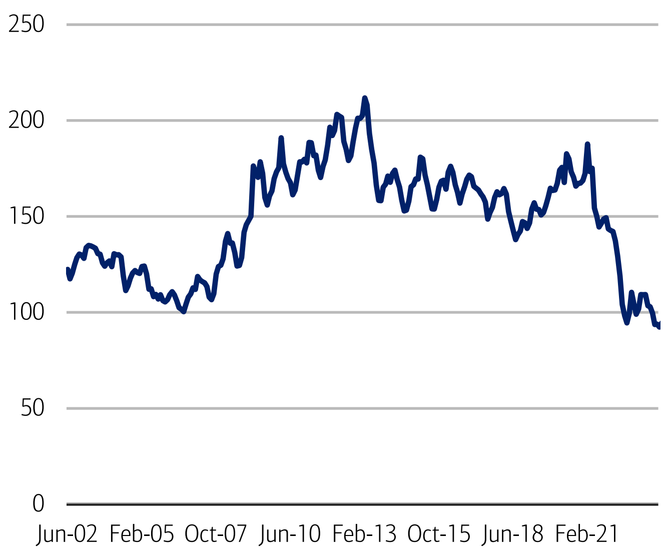
Exhibit 58: Homebuyer Affordability Index
The NAR Affordability Index is at its lowest level



Source: National Association of Realtors, Bloomberg, BofA Global Research

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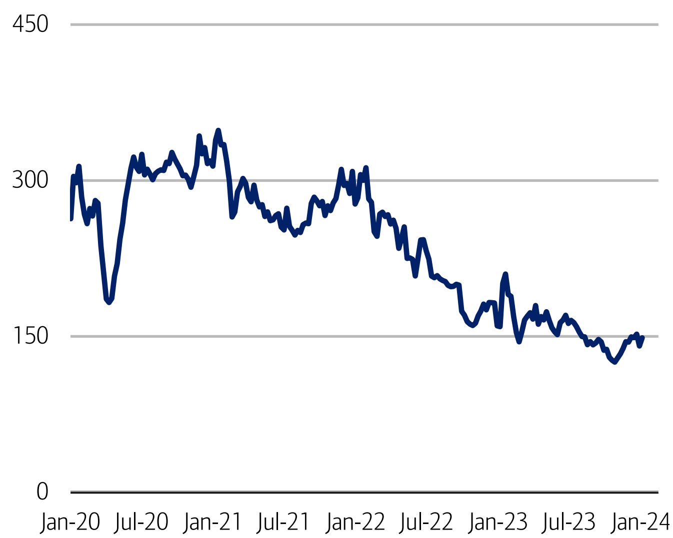
Exhibit 59: Mortgage Bankers Association Purchase Index
MBA Purchase down (6.8%) YoY



Source: Bloomberg, BofA Global Research

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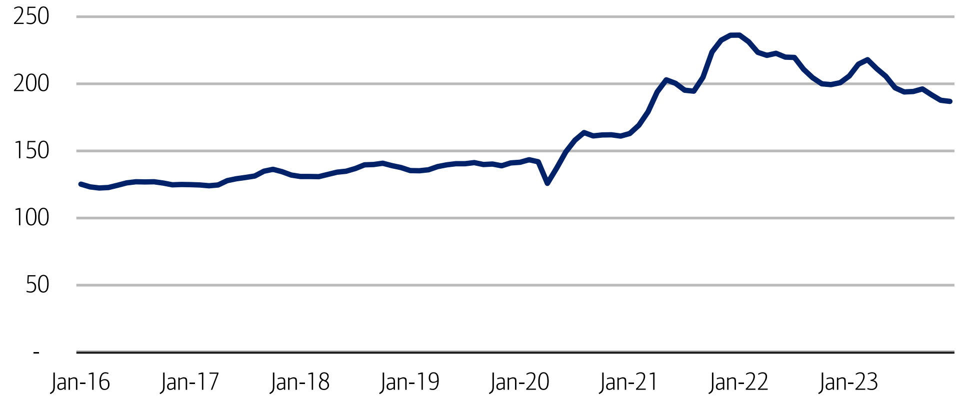
Autos expect flatness in 2024 production

The macro backdrop is quite challenging for auto sales as consumer spending is constrained due to inflation. Still lofty interest rates have substantially increased the costs of ownership through financing, while used car prices are declining rapidly lowering the value of trade-ins. On the other hand, the negative impact in US production from UAW strike was underwhelming and largely behind us, with 2H23 North America auto production only down 4.5% sequentially vs 1.4% sequential decline in 2H22. Our US team recently lowered its forecast for NA light vehicle production growth in 2024; furthermore, as shown in Exhibit 61-62, BofA sees auto production flat to slightly down this year largely driven by conservatism and recession worries. Globally, this brings production volumes down slightly to ~90mn units well below the pre-pandemic hopes of a ~100mn unit global market.

Exhibit 60: Manheim Used Car Index

The price of a used car fell 7% y/y in December '23



Source: Bloomberg, Manheim

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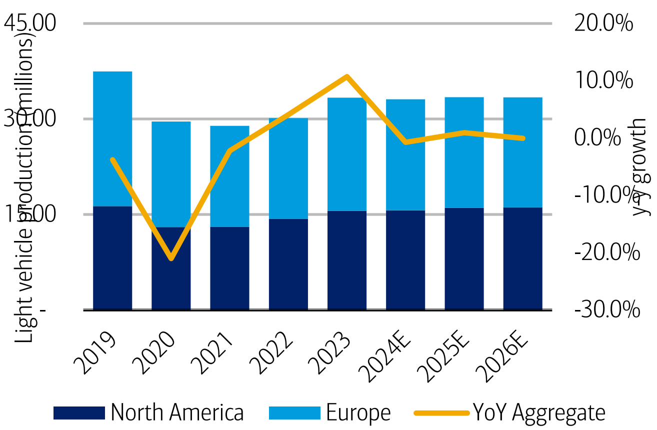
Exhibit 61: BofA N America + Europe Light Vehicle Production

Forecasted production is expected to be about flat y-y in 2024



Source: BofA Global Research Estimates, IHS Markit, JD Power

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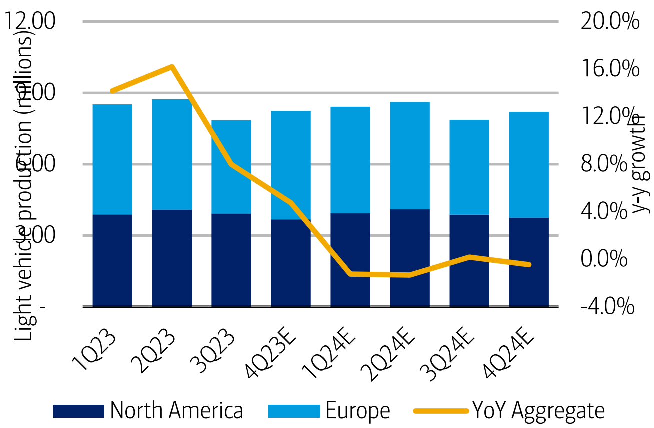
Exhibit 62: BofA N America + Europe Light Vehicle Production

Forecasted weakness in 2024 is pretty evenly distributed, but slightly more 1H driven from a growth % standpoint



Source: BofA Global Research Estimates, IHS Markit, JD Power

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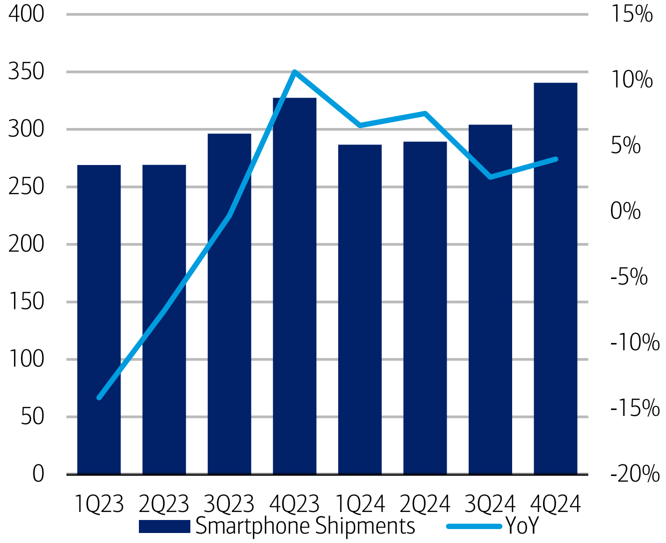
Electronics exposure is a positive in 2024

After some demand and destocking-related headwinds in electronics in 2023, we see the exposure in the electronics end market as favorable given smartphone shipments are expected to be up 5% in 2024. It is worth noting that feature phones are expected to be down 15% in this timeframe, but this subset only makes up ~15% of the total handset market, so it is not a major driver. Additionally, specialty chems companies which serve electronics end markets (DD, ESI) likely serve the higher end applications which are typically found in smartphones. 5G continues to be a driver of smartphone shipments driving 13% growth in 2024 vs -10% decline in 4G or below, showing the rapid shift in smartphones towards the higher end. Similarly, we expect 4% growth in 2024 for core semiconductors (ex-memory) units sold which unlike smartphone shipments is largely 2H weighted. In any case, growth in both these categories bodes well for any specialty chems names selling into the electronics end market, especially if they can position themselves to the higher end customers/applications which will offer higher margins.

Exhibit 63: Smartphone Shipments (mn units)
Smartphone shipment y/y growth is largely 1H24 driven



Source: BofA Global Research Estimates

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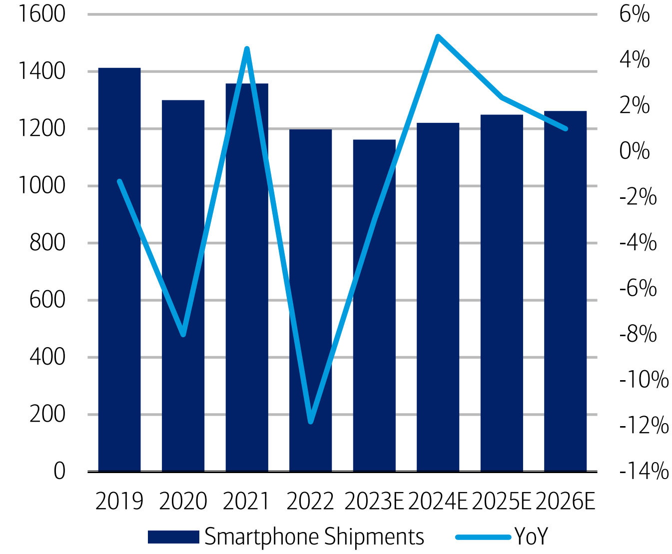
Exhibit 64: Smartphone Shipments (mn units)
We expect 5% y/y growth in smartphone shipments in 2024



Source: BofA Global Research Estimates

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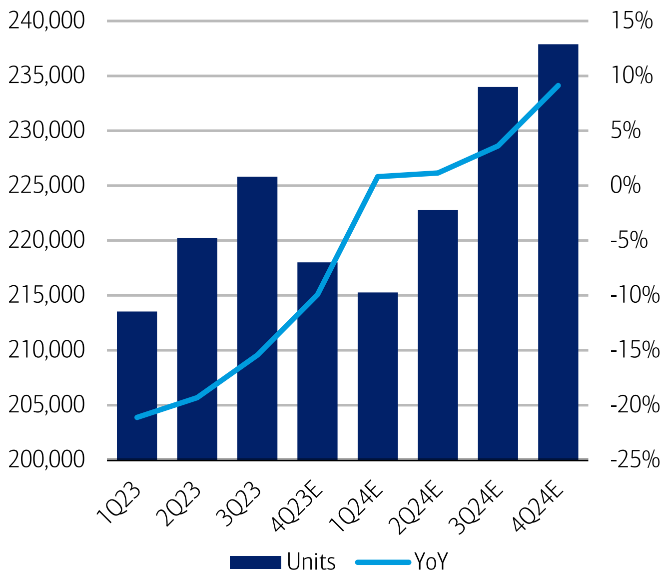
Exhibit 65: Semiconductors Ex-Memory Units Sold (mn units)
Semiconductors Units Sold y/y growth is largely 2H24 driven



Source: BofA Global Research Estimates

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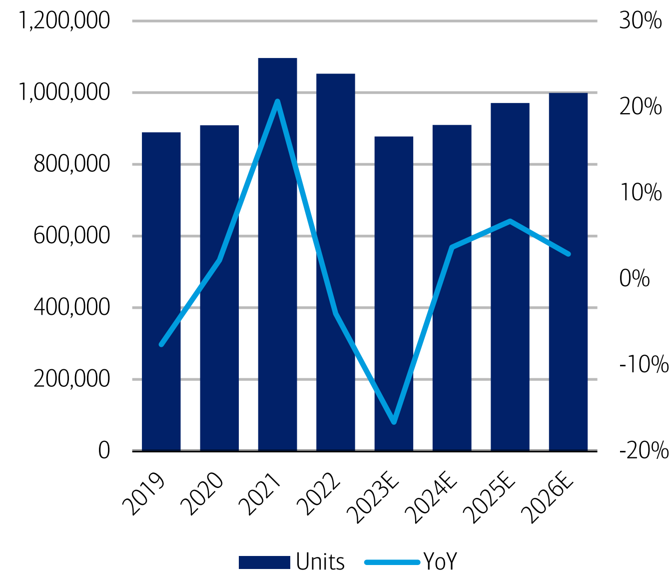
Exhibit 66: Semiconductors Ex-Memory Units Sold (mn units)
We expect 4% y/y growth in semiconductors sales volume in 2024



Source: BofA Global Research Estimates

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Estimate revisions

Air Products (Ticker: APD, Neutral, PO $292): We shift our F1Q24 and F2024 (12ME 9/30) slightly to $2.97 and $13.15, from $2.99 and $13.10, respectively, primarily from changes in FX headwinds, positively affecting our Asia and Europe segments and negatively affecting our Americas segment compared to what we had posted before. Our PO, however, falls to $290 from $295, based on the average of our DCF (7.5% WACC vs 7.7% prior and 3.5% terminal growth vs 4.0% prior) and a 20.5x (previously 22.0x) P/E applied to C2024 earnings. Note our WACC falls due to a lower current share price, our terminal growth falls due to less conviction on longer term projects particularly in the hydrogen for mobility end market, and our multiple falls due to a calendar roll forward and a decrease to the historical average of where the name trades.

Albemarle (Ticker: ALB, Neutral, PO $147): Our 4Q and 2023 Adj EBITDA (and EPS) fall to $161mn ($0.75 EPS) and $3,243mn ($21.15 EPS) from $241mn ($1.27 EPS) and $3,323mn ($21.66 EPS), respectively, due to lower 4Q lithium spot prices driving down our estimate of price received for lithium, which now implies (52%) y/y pricing decline in 4Q in the Energy Storage segment vs (47%) which we had modeled prior. Further, our 2024 Adj EBITDA (and EPS) fall to $1,136mn (3.94 EPS) from $1,433 ($6.55 EPS) prior, due to a lower spot estimate lowering the price expected to be received for the non-fixed portion of ALB's pricing contracts. We now estimate a sales price of $16.4k/mt Lithium Carbonate and $16.9k/mt Lithium Hydroxide in 2024, vs $17.8k/mt and $18.9k/mt, respectively. Our PO falls to $147 ($149 prior), based on a higher NAV valuation of $214 ($192 prior) assuming an unchanged 9.2% WACC, averaged with an unchanged 10x multiple of 2024E EBITDA. Note, the NAV valuation has increased due to a roll-forward to 2024.

Archer Daniels Midland (Ticker: ADM, Neutral, PO $85): We reiterate our Neutral rating on concerns re: future earnings as trading and crushing earnings decline and slower growth for the high-multiple Nutrition business. . Our updated price deck leads us to revise our 2024-25 EPS estimates slightly lower, to $6.05 (from $6.20) and $6.20 (from $6.30), respectively. Our PO (reflecting the avg of our DCF and P/E methodologies) declines to $85 from $90.

Axalta Coatings (Ticker: AXTA, Buy, PO $38): Our 4Q and 2023 EPS fall to $0.44 and $1.59, from $0.45 and $1.60, respectively, seasonal volume declines in Performance Coatings (macro driven) and weaker Class 8 commercial vehicle production volumes, partially offset by a lower than originally expected negative impact from UAW strikes on light vehicle production. Our 2024 EPS remains at $1.80, expecting flat volumes on a consolidated basis (slightly positive for Performance and slightly negative for Mobility) as well as low single digit pricing and cost deflation. Our PO remains at $38, based on an average of a DCF-derived present value (8.0% WACC vs 7.7% prior, 2.0% terminal growth) and a 18.0x P/E (16.0x prior) as applied to our FY24E EPS. Note, our WACC has increased from a higher current share price and our multiple has increased (implying a half turn premium to PPG) due to a calendar roll forward and an increase to the historical average of where the name trades.

Bunge (Ticker: BG, Buy, PO $140): We remain Buy-rated on BG as valuation remains attractive despite moving past the earnings peak and given our positive view on the Vieterra acquisition. Our 2024E EPS estimate is lowered by 5c to $11.60, but for 2025 we reduce our forecast by 30c, to $11.65 as we see additional pressure on Refining profitability. Note that these forecasts don't include the Viterra acquisition, which we see as marginally accretive to EPS (given step-up D&A) but double-digit accretive to FCF/share. In fact our accretion/dilution analysis is now more favorable for BG, as we now have reduced our expectations for crushing and refining margins, businesses where Viterra is underweight. Our 4Q23E EPS remains unchanged at $2.85. Our PO is raised to $140 from $135, as we now start baking in the benefits of the Viterra acquisition; note that without this methodology change our PO would have dropped to $127. We continue to value legacy BG based on an average or our DCF analysis and P/E (11.5x). We then add 10% to the standalone BG PO, which is based on the average of our estimated EPS and FCF/share accretion from the acquisition over the next three years.

CF Industries (Ticker: CF, Buy, PO $95): We reiterate our Buy rating on CF given our view that urea prices in the US and globally should rise in the first half of 2024 and the company's attractive valuation. Nonetheless our updated fertilizer price deck (primarily reflecting lower urea pricing) results in a drop in our EBITDA forecasts for 4Q23 and 2024. Our 4Q23 EBITDA estimate is lowered to $631mn from $643mn, as better-than-expected ammonia prices were more than offset by lower urea realizations. For 2024 our updated EBITDA forecast is now $2,484mn vs $2,578mn previously. Our $2,337mn EBITDA estimate for 2025 is little changed. We continue to value CF at 8x our 2024 EV/EBITDA multiple, resulting in a reduced PO of $95 from $100 previously.

Corteva (Ticker: CTVA, Neutral, PO $52): Significant near-term uncertainty remains in both the crop chemicals (destocking) and seed (shift from corn to soybeans) markets, prompting us to stick with our Neutral rating. Our 4Q23 and 2024 EBITDA estimates are trimmed slightly, reflecting a somewhat more challenging environment in Brazil vs when we last updated our forecasts. For 4Q23 we now project EBITDA of $312mn vs $326mn previously. We believe we were already adequately conservative in our 2024 forecasts, and as such we only trim our estimate to $3,701mn from $3,716mn. We continue to model a -1% price/mix for Seed, due to expected declines in US soybean prices and the negative mix impact of selling more soybean seeds vs corn. We still see management's 2025E target of $4.1-4.7bn EBITDA as achievable, and project earnings of $4,245mn for that year. Our PO, reflecting a 10.5x multiple on 2024E EBITDA and baking in a $2bn legal liability ($1.5bn for chlorpyrifos and ~$500mn from PFAS) remains unchanged at $52.

Eastman (Ticker: EMN, Buy; PO: $104): We are staying the course on EMN, with our Buy rating and limited estimate changes. Our 4Q23E EPS is unchanged at $1.24. The same applies for our 2024 estimate of $8.10. Our 2025E EPS is raised to $10.15 from $10, with higher profits projected in all but one segment (Fibers). Overall we continue to expect strong volume recovery in 2024 and 2025 for Additives & Functional Products (A&FP) and Advanced Materials (AM), while spreads for the Chemical Intermediates (CI) business should also widen, in part due to lower feedstock costs. EMN has the highest correlation to our petrochemical sentiment indicator, which is now in upcycle territory. As such we are raising our valuation multiples by half a turn, to 8.5x for EBITDA and 11x for EPS. We also continue to account for our estimated present value of the methanolysis project, at $12/share. As such our PO is raised to $104 from $95.

Element Solutions (Ticker: ESI, Buy, PO $26): Our 4Q23 and 2023 EPS rise to $0.31 and $1.28, from $0.30 and $1.26, respectively, reflecting minor below the line adjustments and rounding. Note, our 2023 Adj EBITDA estimate remains at $490mn). Our 2024 EPS, however, falls to $1.40 from $1.47, primarily reflecting a flatter auto motive production and some lingering 1H destocking headwinds both negatively affecting the Electronics business. Despite our 2024 Adj EBITDA falling to $540mn from $557mn prior, our PO rises to $26 from $24, based on a 15.0x multiple (13.5x prior) as applied to our 2024E EBITDA. Note, our multiple has increased due to movement in the comp average (peer group including DuPont, Rogers Corp, and Entegris).

Green Plains (Ticker: GPRE, Buy; PO: $32): Despite a steep decline in ethanol prices and a decent contraction in ethanol margins, we remain Buy-rated on GPRE. The shares have sold off excessively, in our view, and we believe that current fundamentals still support a much higher valuation (albeit lower than vs a few months ago). Our 4Q23 EBITDA estimate is lowered to $52mn from $57mn previously. Our reduced ethanol margin expectations are also taking a steep toll on our 2024-25 earnings estimates given GPRE's significant leverage to that metric. Recall that a $0.10/bu change can impact annual EBITDA by ~$100. Our 2024E EBITDA is cut to $191mn from $225mn, and our 2025 estimate is reduced to $259mn from $288mn. Our DCF-based valuation results in a significantly reduced PO of $32 vs $36 previously.

Huntsman (Ticker: HUN, Buy; PO $28): We expect strong earnings growth for Huntsman in the next two years as MDI margins widen and volumes recover following two years of precipitous declines. As such we stay Buy-rated. Our 4Q23E EBITDA is raised slightly to $87mn from $84mn, accounting for lower-than-expected benzene pries in the quarter. Our 2024 estimates are little changed, as lower costs such as energy are offset by our cautious view on MDI prices. However, we expect the recover in Polyurethanes to pick up steam next year, and have raised our 2025E EBITDA to $940mn from $901mn previously. Our valuation is now based on 9x our 2024E EBITDA vs 8.5x previously as we enter a more sustainable recovery phase in our view. Our PO is raised to $28 from $27 previously,

International Flavors & Fragrances (Ticker: IFF, Neutral; PO $83): With limited earnings growth potential due to a competitive environment and the sale of some of the fastest-growing businesses, we reiterate our Neutral rating. Our earnings estimates are marginally tweaked, with our 2024E and 2025E EBITDA at $2,144mn and $2,308, respectively. Our 4Q23 EBITDA estimate is unchanged at $451, with our full-year estimate of $1,970mn already in line with the company's most recent update (i.e., EBITDA coming in at the high- end of the $1.85-2bn guide). We are marginally raising our P/E multiple to 18x from 17.5x as the company makes more progress on divestments and we believe the CEO change is being well-received. Our PO, based on our DCF analysis and the 18x P/E multiple, is raised to $83 from $81.

Linde (Ticker LIN, Buy, PO $455): Our 4Q23 and 2023 EPS fall to $3.51 and $14.12, from $3.54 and $14.15, respectively, reflecting slightly less pricing in 4Q across all regions. Our 2024 EPS also falls to $15.85 from $16.14, similarly reflecting less pricing (now ~2% for FY24 in each region). Our PO, however, rises to $455 from $440, based on the average of a 3 stage DCF analysis (7.5% WACC vs 7.4% prior, 4.0% terminal growth rate) and a 25.5x P/E (prev 23.6x) applied to our 2024 EPS estimate. Note, our WACC has increased from a higher current share price and our multiple has increased due to a calendar roll forward and an increase to the historical average of where the name trades.

LyondellBasell Industries (Ticker: LYB, Neutral; PO: $103): Despite our more positive posture on petrochemical companies, we view Lyondell as one of the more challenged, owing to its mix of businesses, and as such stay Neutral. Specifically, we have materially lowered our polypropylene margin assumptions given strong supply growth, while MTBE (methyl tert-butyl ether) prices and refining crack spreads saw big declines in 4Q23. And, taking a step back, while many other petchem companies are expected to see strong earnings growth in 2024-25, we see limited growth for LYB, as its I&D (Intermediates & Derivatives) segment was overearning in 2023 (due to strong oxyfuel margins) and its refinery is still scheduled for closure in one year. Our 4Q23 EBITDA estimate is reduced significantly, to $960mn from $1,112mn. Our 2024 and 2025 EBITDA estimates are lowered to $5,427mn (from $5,792mn) and $5,590mn (from $5,717mn), respectively. With just a ~10% EBITDA growth from 2023 to 2025, we opt to not increase LYB's valuation multiple, which remains at 7.5x 2024E EBITDA. As such our PO is lowered to $103 from $107.

Mosaic (Ticker: MOS, Buy; PO: $49): We reiterate our Buy on MOS given significant upside to our unchanged PO as phosphate markets have surprised to the upside. AS a result, our updated fertilizer price deck results mostly to a more modest reduction in our 2024E EBITDA vs CF and NTR, with higher Phosphate earnings slightly more than offset by lower Potash profitability. Our 2024E EBITDA is now $2,4232mn vs $2,451mn previously. However, our 4Q23 estimate is lowered to $587mn from $599mn, as we incorporate the company's October-November sales update and guidance. Our 2025E EBITDA is trimmed to $2,205mn from $2,282mn. We continue to value the shares at 7.5x 2024E EBITDA, resulting in an unchanged PO of $49.

Nutrien (Ticker: NTR, Buy; PO: $79): We reiterate our Buy rating on NTR given attractive valuation, expectations of a recovery in urea prices in 1H24, and our view that potash markets are bottoming. We are incorporating our updated fertilizer price deck, which results in little change to our 4Q23 EBITDA estimate of $1,118mn. For 2024, however, our forecast is reduced to $5,962mn from $6,098mn. Our 2025 estimate is little changed at $6,017mn. We continue to value NTR shares on a 2024 sum-of-the-parts basis, with a 9x multiple applied to Retail EBITDA, 8x applied to Nitrogen, and 7.5x applied to Potash and Phosphate. We are raising our 2023 EV/EBITDA multiple on fertilizer earnings to 5.5x from 5.25x while keeping our 10x multiple on Retail unchanged. As a result, our PO is lowered to $79 from $82.

Olin (Ticker: OLN, Buy; PO: $63): We reiterate our Buy rating on OLN shares based on an attractive valuation and expectations for a sharp earnings recovery as the macro environment improves and the company lifts its operating rates. Our updated commodity price deck points to lower caustic and EDC (ethylene dichloride prices) vs our prior expectations, but also to lower energy costs. Our 4Q23E EBITDA is little changed at $235mn. For 2024 we continue to expect an almost 10% EBITDA decline vs 2023, driven by lower chlor-alkali prices on a full-year basis – noting that chlorine and particularly caustic pries entered 2023 at a much higher level. That is despite our view of continued earnings growth in Winchester and a decent recovery in Epoxy. We have slightly lowered our 2025E EBITDA to $1,651mn from $1,983mn, but the fact of the matter remains that we forecast a sharp earnings rebound that year. Given our more positive view on commodity chemicals, we are raising our EV/EBITDA multiple on 2024E EBITDA to 8x from 7.5x, with our PO moving to $63 from $58.

PPG Industries (Ticker: PPG, Buy, PO $161): Our 4Q23 and 2023 EPS remain unchanged at $1.55 and $7.70 respectively, reflecting 4Q volumes slightly down in both segments, low single digit pricing in both segments, and mid-single digit raw material cost deflation. Our 2024 EPS also is unchanged at $8.50, reflecting flat to slightly up volumes in both segments and ~1% pricing for the full year along with a modest 1% deflation for the full year. Our PO falls slightly to $161 ($162 prior), based on the average of our DCF-derived present value (8.3% WACC vs 8.0% prior, 3.0% terminal growth rate) and a 17.5x P/E (15.0x prior) applied to FY24 EPS. Note, our WACC has increased from a higher current share price and our multiple has increased (implying a half turn discount to AXTA) due to a calendar roll forward and an increase to the historical average of where the name trades.

Sherwin Williams (Ticker: SHW, Underperform, PO $286): Our 4Q and 2023 EPS increase to $1.77 and $10.30, from $1.72 and $10.25, respectively, reflecting less conservatism around 4Q volumes for all segments, but most materially in the Consumer Brands Group, where we now expect (10.8%) organic growth in 4Q vs (12.4%) prior. Our 2024 EPS also increases to $11.25 from $10.95, reflecting a stronger Consumer Brands and Performance Coatings topline from some recovery in Big Box / DIY channels and performance coatings end market exposure being more favorable. We also model in 2.0% raw material deflation in 2024 vs 1.5% in our prior model, reflecting a walk down from higher recent deflation figures (we estimate 12% in 3Q and 9% in 4QE). Our PO rises to $286 ($275 prior), based on the average of a DCF-derived present value (8.3% WACC vs 8.1% prior, and 3.5% terminal growth) and a 27.0x P/E (prev 26.0x) applied to 2024E EPS. Note, our WACC has increased from a higher current share price and our multiple has increased due to the calendar roll forward and an increase to the historical average of where the names trades.

Sigma Lithium (Ticker: SGML, Buy; PO $33): Our 4Q and 2023 Adj EBITDA (and EPS) fall to $42mn ($0.23 EPS) and $35mn ($0.07 EPS) from $63mn ($0.46 EPS) and $42mn ($0.30 EPS), respectively, due to lower 4Q lithium spot prices driving down our estimate of price received for spodumene in the quarter (we now expect $1.5k/mt spodumene vs $1.9k/mt spodumene prior). Further, our 2024 Adj EBITDA (and EPS) fall to $138mn ($0.73 EPS) from $166mn ($1.06), based on an average of our previous global outlook on lithium price and the lower spot, assuming the spot converges with our global outlook price by the end of 2024. This implies an average 2024 spodumene price of $1.4k/mt spodumene vs $1.5k/mt prior. Our PO falls to $33 ($37 prior) based on our NAV model with a three-stage DCF (9.8% WACC vs 10.0% prior, no terminal value, and without production phases 4 and 5).

Westlake (Ticker: WLK, Underperform; PO: $129): We believe WLK shares are fully-valued and Street earnings estimates are too high, and as such reiterate our Underperform rating. We have slightly raised our 2024-25 HIP (Housing and Infrastructure Products) outlook in light of a lower interest rates, but this adjustment pales in comparison to our downward changes for PEM (Performance and Essential Materials). This segment's profitability is reduced as our update price deck reflects somewhat lower caustic prices but primarily much lower US domestic and export PVC prices. The market here has remained very weak, and with some new supply coming online this year we are no longer expecting meaningful price traction by 2025. All-in our 2024E EBITDA is lowered to $2,399mn from $2,469mn, and our 2025 estimate is lowered materially to $2,995mn from $3,460mn. Given the more limited earnings recovery from the expected 2024 trough, we are not raising our EV/EBITDA multiple as we did for other commodity chems. Our PO still based on 7.5x 2024E EBITDA, remains $129.

Exhibit 67: Stocks mentioned

Prices and ratings for stocks mentioned in this report

BofA Ticker	Bloomberg ticker	Company name	Price	Rating
APD	APD US	Air Products	US$ 264.13	B-2-7
ALB	ALB US	Albemarle	US$ 126.05	C-2-7
ADM	ADM US	Archer Daniels	US$ 69.56	B-2-7
AXTA	AXTA US	Axalta Coating Syst	US$ 32.94	B-1-9
BG	BG US	Bunge	US$ 94.89	B-1-7
CE	CE US	Celanese	US$ 147.37	B-3-7
CF	CF US	CF Industries	US$ 77.19	B-1-7
CTVA	CTVA US	Corteva	US$ 46.11	B-2-7
DOW	DOW US	Dow	US$ 53.37	B-1-7
DD	DD US	DuPont	US$ 75.53	B-3-7
EMN	EMN US	Eastman Chemical	US$ 86.93	B-1-7
ECL	ECL US	Ecolab Inc	US$ 198.92	B-2-7
ESI	ESI US	Element Solutions	US$ 22.24	B-1-7
FMC	FMC US	FMC	US$ 58.21	B-3-7
GPRE	GPRE US	Green Plains	US$ 21.71	C-1-9
HUN	HUN US	Huntsman Corp	US$ 23.8	B-1-7
IFF	IFF US	Int Flav	US$ 80.25	B-2-8
LIN	LIN US	Linde	US$ 408.92	B-1-7
LINGY	LIN GY	Linde	EUR 370.35	A-1-7
LYB	LYB US	LyondellBasell	US$ 94.43	B-2-7
NTR	NTR US	Nutrien	US$ 51.23	B-1-7
OLN	OLN US	Olin Corp	US$ 51.76	C-1-7
ORGN	ORGN US	Origin Materials	US$ 0.6668	C-2-9
PPG	PPG US	PPG Industries Inc.	US$ 145.55	B-1-7
RPM	RPM US	RPM Intl Inc	US$ 107.16	B-3-7
SHW	SHW US	Sherwin-Williams	US$ 302.51	B-3-7
SGML	SGML US	Sigma Lithium	US$ 26.2	C-1-9
MOS	MOS US	The Mosaic Company	US$ 32.78	C-1-7
WLKP	WLKP US	Westlake Chemical Pa	US$ 23	B-3-7
WLK	WLK US	Westlake Corp	US$ 134.61	B-3-7

Source: BofA Global Research

BofA GLOBAL RESEARCH

Appendix (BofA Petrochemical Sentiment)

Methodology

To track chemical industry trends in a more timely fashion, we developed a proprietary indicator that uses Natural Language Processing to track broad industry sentiment over time using S&P Global Platts weekly Polymerscan reports, a leading global industry report that covers key polymer and associated feedstock markets including, but not limited to; polyvinyl chloride (PVC), polyethylene (PE), polypropylene (PP), and polystyrene (PS); olefins like ethylene, propylene, and butadiene; aromatics such as paraxylene and styrene; and intermediates such as ethylene dichloride (EDC), vinyl chloride monomer (VCM), and methyl methacrylate (MMA).

Indicator created using natural language processing

We used Natural Language Processsing to scan every Platts Polymerscan report ever published (from October 27, 2004 to December 20, 2023) and counted the number of positive and negative words as defined by a comprehensive proprietary dictionary created using a Deep Learning based Word2Vec model. Word2Vec converts words into numeric form such that words used in similar context are closer to each other in numeric vector space. Model was trained on ~400K financial documents to ensure we are only selecting the words used in financial/market context to express positive or negative sentiment. We started with 10 negative and positive words and found words used in similar context to create a dictionary of more than 100 words that we believe either indicate positive or negative sentiment.

Word2vec is a group of related models that are used to produce word embeddings. These models are generally two-layer neural networks that are trained to reconstruct linguistic contexts of words. Word2vec takes as its input a large corpus of text and produces a vector space, typically of several hundred dimensions, with each unique word in the corpus being assigned a corresponding vector in the space. Word vectors are positioned in the vector space such that words that share common contexts in the corpus are located close to one another in the space.

The words were then screened and filtered by our team based on their connotation with tightening or loosening markets and not simply directional trends that could have several meanings. For example, words such as ‘higher’ and ‘lower’ were avoided as they could refer to feedstock costs, margins, or prices, all of which could have different meanings within each market. Instead, words such as ‘robust’, ‘strong’, and ‘tight’ were used as positive indicators, while examples of negative indicators included ‘weak’, ‘soft’, and ‘oversupply’.

We calculated a score for each published report going back to October 27, 2004. Each report was given a score based on the % of positive words picked up our proprietary dictionary, which only picks up negative or positive words. For example, if 150 words are picked up in a single report as either positive or negative and 100 of them are classified as positive, then the score for that weekly is simply 100/150 = 66.6%. In formula form:

$$X_t = (\text{\# of positive words}) / (\text{\# of positive words} + \text{\# of negative words})$$

Moving averages are key to understanding inflection points

We believe moving averages provide a way to differentiate between material trends vs. short term events and potential seasonal impacts. The 3 month, 6 month, and 12 month moving averages can be seen below.

Sentiment seems to track fairly closely to stock prices

We tested the 12MMA of the indicator with stock prices of our global petrochemical coverage and found that correlations were fairly strong over the last 5 and 7 years. Of the 31 tested, 15 stocks had a correlation of 0.70+ with the indicator over the last five years and 8 had a correlation of over 0.80. This correlation generally diminishes over a 7 year timeframe, but still remains quite strong for many.

Exhibit 68: BofA Global Petrochemical Stock correlations to Sentiment Indicator moving averages
The US commodity chemical universe shows significant leverage to the 12MMA over last 5 and 7 years

		12MMA		6MMA		3MMA		
Company	Stock Ticker	5-Year	7-Year	5-Year	7-Year	5-Year	7-Year	Analyst Coverage
Olin Corporation	OLN	0.29	0.20	0.21	0.12	0.11	0.05	Steve Byrne
Dow Inc.	DOW*	0.72	0.72	0.68	0.68	0.56	0.00	Steve Byrne
Orbia	ORBIA* MM	0.89	0.86	0.77	0.77	0.58	0.57	Leonardo Marcondes
NIC	NIC AB	0.86	0.83	0.71	0.71	0.47	0.49	Sashank Lanka
LyondellBasell	LYB	0.60	0.64	0.57	0.62	0.44	0.51	Steve Byrne
Mitsui Chemical	4183 JP	0.29	0.26	0.38	0.33	0.34	0.31	Takashi Enomoto
SABIC	SABIC AB	0.87	0.82	0.74	0.69	0.52	0.46	Sashank Lanka
Eastman	EMN	0.78	0.73	0.80	0.73	0.62	0.56	Salvator Tiano
Yanbu National Petrochemical Co.	YANSAB AB	0.82	0.80	0.77	0.76	0.60	0.58	Sashank Lanka
Braskem	BRKM3 BZ	0.84	0.81	0.60	0.59	0.32	0.36	Leonardo Marcondes
Sumitomo Chemical	4005 JP	0.81	0.74	0.55	0.59	0.25	0.38	Takashi Enomoto
Westlake	WLK	0.15	0.15	0.17	0.17	0.17	0.17	Steve Byrne
Industries Qatar	IQCD QD	0.54	0.34	0.35	0.18	0.15	0.02	Sashank Lanka
Covestro	1COV*	0.67	0.61	0.72	0.66	0.67	0.57	Matthew Yates
Huntsman	HUN	0.52	0.51	0.46	0.46	0.36	0.36	Salvator Tiano
Chemours	CC*	0.48	0.55	0.40	0.49	0.31	0.40	Under Review
Tronox	TROX*	0.78	0.74	0.70	0.67	0.54	0.56	Under Review
Saudi Kayan	KAYAN AB	0.84	0.59	0.73	0.48	0.49	0.29	Sashank Lanka
Sahara International Petrochemical	SIPCHEM	0.32	0.11	0.20	0.01	0.06	-0.07	Sashank Lanka
Alpek	ALPEKA MM	0.50	0.54	0.19	0.31	-0.05	0.06	Leonardo Marcondes
Saudi Industrial	SIIG AB	0.85	0.60	0.80	0.53	0.60	0.38	Sashank Lanka
Lotte Chem	011170 KS	0.62	0.59	0.63	0.62	0.51	0.53	Joon-Ho Lee
BASF	BASF	0.60	0.60	0.52	0.58	0.42	0.48	Matthew Yates
Tosoh	4042 JP	0.53	0.47	0.60	0.49	0.59	0.48	Takashi Enomoto
Formosa Chem & Fibre	1326 TT	0.47	0.58	0.32	0.48	0.19	0.34	Joon-Ho Lee
Kumho Petrochemical	011780 KS	0.65	0.38	0.74	0.45	0.63	0.37	Joon-Ho Lee
Celanese	CE	0.72	0.46	0.72	0.43	0.57	0.34	Salvator Tiano
Hanwha Solutions	009830 KS	0.29	0.13	0.40	0.22	0.37	0.23	Joon-Ho Lee
Advanced Petrochemical	APPC AB	0.75	0.35	0.79	0.36	0.62	0.26	Sashank Lanka

Source: BofA Global Research

BofA GLOBAL RESEARCH

Investment Rationale

Celanese Corporation

We rate Celanese shares Underperform as (1) we see the company's valuation as stretched following a strong 2023 rally, (2) we are concerned about capacity additions for both acetic acid and vinyl acetate monomer in the near-term, which should dampen a recovery in acetyl chain margins, and (3) beyond an expected strong 2024 earnings rebound we see a harder path to continued profitably expansion as the benefits of acquisition synergies and the Clear Lake, TX expansion lapse.

Dow Inc

We rate Dow shares at Buy, based on (1) our petrochemical sentiment indicator moving into positive territory in late-2023 (historically linked to stock outperformance), (2) our view that petrochemical margins and volumes have largely troughed in 2H23, and (3) our projection of a 50% EBITDA growth by 2025 (over 2023) as the supply/demand balance of many chemical chains improves and destocking reverses.

DuPont

We rate shares of DuPont U/P as we see modest earnings recovery in the near-term, lower than other specialty chems comps. Further, we see additional PFAS liabilities under-appreciated by the market, outside of the $1bn liability established in June 2023.

Ecolab Inc

Ecolab has a strong franchise with durable competitive advantages. While the stock trades nearly 7x turns above other specialty chemical companies, we view its service model as favorable, and see upside potential in its Water business due to scarcity and increasing regulation. Neutral

Price objective basis & risk

Air Products (APD)

Our $292 PO is based on the average of a 3 stage DCF analysis and a 20.5x P/E as applied to a CY2024 EPS estimate. The 3-stage DCF is predicated on a 7.5% WACC and a 3.5% terminal growth rate.

Upside risks are a depreciating dollar, higher steel operating rates, a rebound in oil, an acceleration in global industrial production, and increased earnings growth from capital deployment.

Downside risks are a strengthening dollar, steel customer bankruptcy, declining oil prices, a reduction of hydrogen prices on the Gulf, and coal to chemicals customer bankruptcy.

Albemarle (ALB)

Our $147 PO is based on the average of two methodologies, a comprehensive NAV model and a multiple against our 2024E EBITDA. The NAV model generates a value of $214/share. For our NAV, we use WACC of 9.2% and terminal growth rate of 2%. The EBITDA methodology uses an 10x multiple against our 2024E EBITDA forecast which drives a price of $80/share. This 10x is a premium for commodity companies, but reflects the trough nature of the 2024 earnings profile, and implies a more normal, 5.0x our 2025 EBITDA estimate.

Upside risks to our price objective are higher than anticipated selling prices in Lithium, new capacity announcements at ALB, stronger than excepted ramp-ups in production and increasing signs of electric vehicle demand.

Downside risks to our price objective are slower than expected demand growth for consumer electronics and electric vehicles, new supply additions at peers, a potential bidding war for acquisition targets, and price pressure in the lithium and bromine businesses.

Archer-Daniels-Midland Company (ADM)
Our $85 PO is based on the average of our DCF (7.5% WACC and 2% terminal growth rate) and P/E (13.5x 2024E EPS) valuation. This multiple is close to ADM's five-year average, which we believe is appropriate to balance our view of ADM's high-multiple, high-growth Nutrition business and our expectations that earnings will hover near-record levels through 2025, against peak 2022 EPS.

Downside risks to our PO are a supply shock, even if it is temporary, which could result in either excess or insufficient crops and would impact prices and margins. Ethanol margins could deteriorate and African Swine Fever in China could reduce demand for protein meal.

Axalta Coating Systems (AXTA)
Our PO of $38 is based on the average of a 3 stage DCF analysis and a 18.0x P/E multiple as applied to a FY2024 EPS estimate. The 3-stage DCF is predicated on a 8.0% WACC and a 2.0% terminal growth rate.

Downside risks are slower global auto production, penetration of autonomous vehicles and collision avoidance technology, rising raw materials with inability to pass on price, and a strengthening US dollar.

Upside risks are strengthening auto production, delays in autonomous vehicle start-ups and collision avoidance technology, lower raw materials, and a strengthening US dollar.

Bunge Limited (BG)
Our $140 price objective is based on our standalone BG valuation of $127, reflecting the average of our DCF (7.9% WACC, 1.5% terminal growth rate) and P/E (11.5 x 2024E EPS) valuation, upwardly revised by 10% to reflect our expected earnings accretion from the Viterra acquisition.. This P/E multiple is slightly lower than BG's five-year historical average as 2023 earnings should be at above-midcycle levels.

Downside risks are weaker global crush margins or inconsistent operational execution.

Upside risks are further disruptions in global grain and oilseed supply and strong global crush margins.

Celanese Corporation (CE)
Our $135 PO reflects the average of our EV/EBITDA valuation of $136 and our P/E valuation of $134. Our PO is based on an 9x and an 11x multiple for our 2024E EBITDA and EPS estimates.

Downside (upside) risks to our price objective are volatile raw commodity costs, accretive corporate actions, and competitors' addition (reduction) of production capacity in Acetyl Intermediates

CF Industries (CF)
Our $95 PO for CF is based on 8x our 2024 EBITDA estimate, including a $50mn contribution for post-2024 EBITDA from the Waggaman acquisition . The 8x multiple is at the middle of the company's historical average over the last seven years (6-11x). We use this multiple as we think earnings next year will move to a more sustainable long-term level. We also see organic growth coming from an increasing blue/green ammonia opportunity.

Downside risks to our PO are higher US natural gas prices, lower nitrogen prices, a decline in grain prices, a near-term resolution to the Russia/Ukraine conflict, significantly lower than expected demand, and increased use of bacteria-sourced ammonia.

Upside risk to our PO is further supply cuts in nitrogen leading to lower grain production.

Corteva (CTVA)
Our PO of $52 is based on 10.5x our 2024 EBITDA estimate and includes a roughly $2bn adjustment for legal liabilities ($1.5bn for a potential chlorpyrifos liability and roughly $500mn for a potential PFAS liability). We view 11x, around the 5-year average of specialty chemical companies, as appropriate given continued strength of Ag fundamentals balanced by rising risks.

Downside risks are aggressive soybean seed pricing, higher raw material costs, weather disruption, and litigation risks.

Upside risks are price/mix gains in seeds, lower raw material costs, improving LatAm FX rates, and better than expected new product growth

Dow Inc (DOW)
Our PO of $60 is based on a 8.5x 2024E EV/EBITDA multiple. The multiple is a premium to the 7x average forward EBITDA multiple realized by DOW and its closest peer over the last five years, reflecting our view of a strong earnings recovery ahead.

Upside risks to our price objective are improvement in the plastics outlook, new product growth, additional productivity gains, higher oil prices, and a weaker USD.

DuPont (DD)
Our price objective of $80 per share is based on an EV to EBITDA valuation of 13x our 2024 EBITDA estimate. This multiple is derived from a comp-based sum-of-the-parts multiple, discounted for the risk additional PFAS liability in excess of our forecast. We then subtract off the Net Debt and an estimated $1bn in PFAS liabilities, and divide by our year-end 2024E Diluted Shares Outstanding.

Downside risks to our price objective are a further slowdown in the global economy, particularly in China, autos, and electronics, greater than expected litigation issues, failure of the Mobility & Materials divestiture to Celanese to complete on the terms announced, and failure of the Rogers acquisition to complete on the terms announced.

Eastman Chemical Co (EMN)
Our $104 PO is based on the average of our EV to 2024E EBITDA valuation of $95 and our Price to 2024E EPS valuation of $89, as well as an additional $12/share of value attributable to the methanolysis contract opportunity. Our PO is based on 8.5x and a 11x multiples for our 2024 EBITDA and EPS estimates, more in line with historical averages. The $12/share for methanolysis process is attained by multiplying the $300mn in expected EBITDA by 7.0x, and discounting back to 2024 at a WACC of 12%.

Risks to the downside (upside) are a slowdown (acceleration) in the global macroeconomic backdrop, volatility in raw material prices, and the potential for increased industry supply across its various chemical products.

Ecolab Inc (ECL)
Our $216 price objective for Ecolab is based on an average of the DCF-derived present value utilizing a 8.7% WACC and a 4% terminal growth rate, and a valuation based on a P/E of 33.0x applied to our FY2024 EPS estimate.

Downside risks to our price objective are: 1) a weaker recovery in COVID-impacted end-markets and macro conditions, 2) sudden increases in commodity costs, 3) Institutional growth continuing to lag amid changing consumer preferences, and 4) merger and integration risks. Upside risks to our price objective are: 1) faster than expected recovery in COVID-19 impacted volumes, 2) better than expected market share gains, and 3) potentially accretive acquisitions.

Element Solutions Inc. (ESI)
Our $26 PO is based on a 15.0x multiple, as applied to our 2024E EBITDA estimate. This multiple is in line with the average for the broader specialty chemical universe, which we see as fair considering the defensive growth and robust free cash flow generation that ESI has been able to exhibit.

Risks to our PO are a stronger dollar, decline in electronics demand, and reduced OEM automotive production.

FMC Corporation (FMC)
Our $57 PO is derived applying a 10x multiple on our 2024E EBITDA estimate. We opt for a multiple of 10x, on the low end of the historical 5-year range of 9-14x, given increased risks to both the crop chemical market and FMC's own diamides franchise..

Upside risks are higher application rates and pricing for crop protection chemicals as supported by macro and weather-related issues, a weaker dollar, a rally in grain prices.

Downside risks are a shift to generic crop chemicals and concerns about litigation risks.

Green Plains (GPRE)
Our $32 PO is based on a discounted cash flow (DCF) analysis using a 9.5% weighted-average cost of capital (WACC) and 1% terminal growth rate and includes probability-weighed earnings for carbon sequestration and incremental clear sugar capacity. Our DCF assumes continued uplift from the MSC technology beyond 2025 as the company sells higher protein products, extracts more corn oil, and could generate licensing revenues.

Downside risks to our PO are that ethanol margins could deteriorate due to demand pressure from EVs and reduced gasoline consumption more broadly, MSC conversions could take longer than expected and fail to deliver the expected financial results, corn prices could rise more, and adverse policies for carbon sequestration and RFS mandates are possible.

Huntsman Corp (HUN)
Our $28 PO is based on an 9x EV to 2024E EBITDA methodology. This multiple is on the high end of the historic range for HUN, which we believe is appropriate given our expectations of below-normal profitability in 2024.

Downside (upside) risks to our price objective come from volatility in underlying commodity markets, corporate actions, and a slowdown to (expansion in) the broader economic backdrop.

International Flavors & Fragrances (IFF)
Our $83 price objective is based on the average of our 2024 Price to pro forma EPS multiple and a three-stage DCF analysis. The former utilizes a 18x P/E multiple which represents the lower end of the five year historic levels for the company, prudent given cash flow headwinds and the slower macro. The three-stage DCF model is similarly predicated on pro-forma results and uses WACC of 7.1% and terminal growth rate of 2.5%.

Downside risks to our PO are a failed integration of the DuPont Nutrition & Biosciences business, a slower recovery in Fine Fragrance revenues, and additional COVID-19 related restrictions on the global economy.

Linde (LIN / LINGY)

Our $455 PO (EUR416/ADR) is based on the average of a 3 stage DCF analysis and the average 24-month forward P/E multiple over the last ten years as applied to a CY2024 EPS estimate. The 3-stage DCF is predicated on a 7.5% WACC and a 4% terminal growth rate, and the P/E component applies a 25.5x average P/E against our calendar 2024 estimate. The average multiple over the last ten years reflects a cycle average, while also considers the current low interest rate regime has had on multiples.

Upside risks to our PO are increased share repurchases, synergy realization faster than anticipated, a depreciating dollar, higher steel operating rates, a rebound in oil, acceleration in global industrial production and increased gains from productivity initiatives.

Downside risks to our PO are a strengthening dollar, slower global growth, and declining US industrial production.

LyondellBasell Industries (LYB)

Our $103 PO is based on a 7.5x multiple to our 2024E EBITDA ex-Refining , plus the cumulative EBITDA generated by Refining through 2024 year-end. The multiple is a slight premium to historic average levels, reflecting below-normal profitability in 2024.

Upside risks to our price objective are an increase in global polyethylene demand, higher oil prices, and lower US NGL prices.

Downside risks to our price objective are lower oil prices, higher natural gas and feedstock costs and slower global economic growth leading to a slowdown in demand for polyethylene.

Nutrien (NTR)

Our $79 price objective is based on SoTP analysis using a 9x 2024E EBITDA multiple for Retail, 7.5x for Potash, 7.5x for Phosphates, and 8x for Nitrogen.

Upside risks are stronger than expected demand and pricing in key fertilizer markets, supported by potential for lower grains stocks-to-use ratios, rising demand for protein in developing markets, and increases in farm income.

Downside risks are price deflation in Retail from new entrants, lower than expected demand and pricing in key fertilizer markets, higher production costs, reduced farm income, a near-term resolution to the Russia/Ukraine conflict, significantly lower than expected demand, and increased use of bacteria-sourced ammonia.

Olin Corp (OLN)

Our $63 price objective is based on a 8x 2024E EV/EBITDA multiple. This is slightly above the average 5 year forward EBITDA multiple for OLN. We see the premium as warranted, given that earnings are expected to remain at trough levels in 2024.

Upside risks to our PO are a further acceleration in caustic soda, chlorine and EDC pricing, higher than expected demand growth, lower natural gas prices, and a faster than expected recovery in Epoxy segment earnings. Downside risks to our PO are the potential for near-term caustic price headwinds and EDC price headwinds, higher natural gas prices and a slower than expected recovery in Epoxy earnings.

Origin Materials (ORGN)

Our $2 PO for ORGN is based on a discounted cash flow analysis out to 2032, chosen due to the timeline of its projects. We chose a WACC of 12.5% which also incorporates the risks of securing project financing. We also chose a 5% terminal value, above the long term expected demand growth of PET resin, as ORGN's growth projects have been pushed to the right.

Upside risks to our PO could come from lower-than-expected capex needs, higher EBITDA generation, signing of licensing agreements, and progress in non-dilutive project financing.

Downside risk to our PO could come from additional earnings margin pressure, further cost increases for Origin 2 and other growth projects, lower-than-expected demand for ORGN's novel projects, and dilutive financing.

PPG Industries Inc. (PPG)

Our $161 price objective is based on an average of a 3-stage DCF analysis (WACC of 8.3% and terminal growth rate of 3.0%) and a P/E multiple of 17.5x as applied to our 2024 EPS estimate.

Upside risks to our PO are an inflection in price momentum, an acceleration in global auto production, increase in miles driven and collision rates aiding PPG's refinish business, a pickup in broader industrial activity and strength in the US housing end-market.

Downside risks to our PO are a stronger USD, a downturn in US/global auto production, a slowdown in the US housing market and/or market share losses in the US architectural channel and a downturn in industrial activity.

RPM International Inc (RPM)

Our $99 PO is based on the average of a 3 stage DCF analysis and a 17.5x multiple as applied to a CY2024 EPS estimate. The 3-stage DCF is predicated on a 7.9% WACC and a 3.0% terminal growth rate.

Downside (upside) risks to our price objective are prolonged (brief) impacts from COVID19, weakness (strength) in construction and remodeling activity, a stronger (weaker) USD, and rising (falling) raw material costs.

Sherwin-Williams Company (SHW)

Our $286 PO is based on the average of a 3 stage DCF analysis and a 27.0x P/E as applied to our CY2024 EPS estimate. The 3-stage DCF is predicated on a 8.3% WACC and a 3.5% terminal growth rate. The multiple reflects a premium to the current multiple, given the two-year cycle of earnings beats.

Downside risks to our price objective are a slower housing recovery, input cost inflation, and lost market share of paint contractors due to the Home Depot/PPG initiative.

Upside risks to our price objective are a faster housing recovery, input cost deflation, and demand shifts away from the do-it-yourself (DIY) channel where SHW is less exposed.

Sigma Lithium (SGML)

Our $33 PO is derived from our comprehensive net asset value (NAV) model, which is predicated on a three-stage buildout and a 9.8% WACC with no terminal value.

Downside risks to our forecast are lower lithium prices, higher operating costs, and failure to successfully commission the new assets.

Upside risks are further resource discovery, faster speed to commissioning new assets, higher lithium prices, and lower operating costs

The Mosaic Company (MOS)
Our $49 price objective is based on a sum-of-the-parts valuation, where we apply a 7.5x multiple on 2024E EBITDA, These multiples are on the lower-end of MOS's 6-11x five year range given earnings remain elevated.

Downside risks to our PO are declines in fertilizer prices from increased supply, potential declines in grain prices from larger than expected crop production, a stronger US dollar, acceleration in global fertilizer production capacities, a shift to less fertilizer intensive crops, environmental concerns over phosphate mining, and a near-term resolution to the Russia/Ukraine conflict.

Upside risks to our PO are increases in fertilizer prices from decreased supply, increases in crop prices, a weaker US dollar, and a slowdown in global fertilizer production capacities.

Westlake Chemical Partners, LP (WLKP)
Our $22 PO is based on a 450bps yield premium vs the 10yr Treasury. This represents a narrower premium vs historical average, which we believe is warranted given WLKP's defensive characteristics and the current macro environment.

Upside risks are rising market prices for ethylene and co-products, drop downs at a faster pace and/or on more attractive terms that would result in accelerated growth in future dividend distributions, as well as lower interest rates.

Downside risks are higher interest rates, any significant deterioration in WLK credit quality, prolonged operational disruptions, prolonged weakness in US ethylene margins, illiquidity of WLKP units and changes in the US tax code that impacts the qualifying nature of WLKP's income as a publicly traded partnership.

Westlake Corp (WLK)
Our $129 PO is based on a 7.5x 2024E EV/EBITDA multiple. This multiple is in line with the five year average of roughly 7.5x, balancing trough 2024 earnings with concerns about further declines in caustic/PVC prices.

Downside risks to our PO are the absence of a material upturn in PVC/chlor-alkali prices and margins from current levels, faster than expected capacity expansions in chlor-alkali/PVC (versus our expectations for virtual no capacity growth), a deeper trough in polyethylene margins and broader macroeconomic risks, particularly in emerging markets, that would impair the demand outlook for these commodities.

Upside risks to our PO are an inflection in chlor-alkali or polyethylene pricing and margins, an improving economic outlook, and increasing capacity expansion in chlor-alkali and/or polyethylene.

Analyst Certification

I, Steve Byrne, CFA, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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BofA Securities is currently acting as financial advisor to Bunge Ltd in connection with its proposed merger with Viterra Ltd, together with certain affiliates of Glencore PLC, Canada Pension Plan Investment Board, and British Columbia Investment Management Corp, which was announced on June 13, 2023.

BofA Securities is currently acting as Financial Advisor to Green Plains Inc in connection with its proposed acquisition all of the publicly held common units of Green Plans Holdings LLC, the general partner of Green Plains Partners LP, not already owned by Green Plains Inc in a stock-for-unit exchange, which was announced on May 4, 2023.The proposed transaction was approved by shareholders of Green Plains Partners LP on September 18, 2023.This research report is not intended to provide voting advice, serve as an endorsement of the proposed transaction, or result in the procurement, withholding or revocation of a proxy.

BofA Securities is currently acting as strategic advisor to Sigma Lithium Corp in their review of strategic alternatives.

US - Chemicals Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Axalta Coating Systems	AXTA	AXTA US	Steve Byrne, CFA
	Bunge Limited	BG	BG US	Salvator Tiano, CFA
	CF Industries	CF	CF US	Steve Byrne, CFA
	DuPont	DD	DD US	Steve Byrne, CFA
	Eastman Chemical Co	EMN	EMN US	Salvator Tiano, CFA
	Element Solutions Inc.	ESI	ESI US	Steve Byrne, CFA
	Green Plains	GPRE	GPRE US	Salvator Tiano, CFA
	Huntsman Corp	HUN	HUN US	Salvator Tiano, CFA
	Linde	LIN	LIN US	Steve Byrne, CFA
	Linde	LINGY	LIN GY	Steve Byrne, CFA
	Nutrien	NTR	NTR US	Steve Byrne, CFA
	Olin Corp	OLN	OLN US	Steve Byrne, CFA
	PPG Industries Inc.	PPG	PPG US	Steve Byrne, CFA
	Sigma Lithium	SGML	SGML US	Steve Byrne, CFA
	The Mosaic Company	MOS	MOS US	Steve Byrne, CFA
NEUTRAL				
	Air Products	APD	APD US	Steve Byrne, CFA
	Albemarle	ALB	ALB US	Steve Byrne, CFA
	Archer-Daniels-Midland Company	ADM	ADM US	Salvator Tiano, CFA
	Celanese Corporation	CE	CE US	Salvator Tiano, CFA
	Corteva	CTVA	CTVA US	Steve Byrne, CFA
	Dow Inc	DOW	DOW US	Steve Byrne, CFA
	FMC Corporation	FMC	FMC US	Steve Byrne, CFA
	International Flavors & Fragrances	IFF	IFF US	Salvator Tiano, CFA
	LyondellBasell Industries	LYB	LYB US	Steve Byrne, CFA
	Origin Materials	ORGN	ORGN US	Steve Byrne, CFA
UNDERPERFORM				
	Ecolab Inc	ECL	ECL US	Steve Byrne, CFA
	RPM International Inc	RPM	RPM US	Steve Byrne, CFA
	Sherwin-Williams Company	SHW	SHW US	Steve Byrne, CFA
	Westlake Chemical Partners, LP	WLKP	WLKP US	Steve Byrne, CFA
	Westlake Corp	WLK	WLK US	Steve Byrne, CFA

Disclosures

Important Disclosures

Equity Investment Rating Distribution: Chemicals Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	66	47.83%	Buy	33	50.00%
Hold	33	23.91%	Hold	16	48.48%
Sell	39	28.26%	Sell	20	51.28%

Equity Investment Rating Distribution: Non-Ferrous Metals/Mining & Minerals Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	58	53.70%	Buy	26	44.83%
Hold	24	22.22%	Hold	10	41.67%
Sell	26	24.07%	Sell	13	50.00%

Equity Investment Rating Distribution: Global Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	1895	53.62%	Buy	1083	57.15%
Hold	832	23.54%	Hold	454	54.57%
Sell	807	22.84%	Sell	383	47.46%

[R1] Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.

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Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster[R2]
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

[R2]Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

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