Chemicals

Polyethylene Markets are in Digestion

Industry Overview

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Equity
United States
Chemicals

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Operating rates 80% globally as capacity outpaces demand

Our last detailed report (see here) on the polyethylene (PE) market in 2019 was bearish. We called for global operating rate reductions, project cancellations, shifting trade flows, and a lasting headwind to margins. COVID and associated stimulus created a hyper-compressed cycle in 2021-2022, but we have since retraced much of these gains. Our 2019 margin forecast proved too bearish (crude is $20/bbl higher today), though many of the other calls played out. But where does the industry go from here? Commodity stocks are bottoming as profit expectations are troughing. Inventory destocking is creating abnormally poor fixed cost leverage, and thus we should be near lows. The global PE utilization rate is sub-80%, as per OPIS (formerly IHS). We suspect rates will tighten from here, but it will take another 18 months at least before we return to operating rates that support sustained market improvements (excluding oil to gas spread expansion). This may mean a muted profit recovery for U/P rated Dow and Lyondell.

Supply growth slows, but rates will still be curtailed

Global PE capacity grew at a CAGR of 5.3% between 2019 and 2023. That outstrips the estimated demand CAGR of 3.2%, but is ~100bps below the capacity growth rate initially discussed in our 2019 report due to project cancellations. However, the net result has still been a compression in utilization rates from ~87% in 2015-2020 to less than 80% in 2023. As we surmised in 2019, despite a favorable cost position, US producers were still left to scale back production to help balance the market. In 2024, supply growth should be a more muted 2.2%, largely on the annualization of 2023 capacity gains. Demand should outpace this growth, but global operating rates could remain at ~81%.

Profit backdrop looks better in 2025 and 2026

Excess supply can hinder normal cost curve economics, such that higher crude prices may not translate into higher PE prices, or at least dilutes historic correlations (Exh 6-8). Therefore, tightening utilization rates is imperative for producers. Here, the backdrop looks better into 2025/2026 as capacity growth slows to 1.5%, and demand likely outpaces incremental supply starting in 2024. With global GDP growth expected at 2.5-3% over the next two years, we could see PE demand tracking closer to 3.5-4%. This would bring operating rates closer to the mid-80s by 2025/2026, which would be more conducive to supplier pricing power, and thus better returns for the industry.

It is early, but 2027 looks like a bumper year for supply

Even in regions where permitting and construction can be expedited, a new, world scale integrated, PE complex could take 3+ years to go from planning to commissioning. Thus, there is supply visibility out to 2026/27. As per OPIS and our own research, global PE capacity growth could reach 9mn tons in 2027 from ~3-4mn tons in 2024-26. More than half of this jump is coming from a few projects. While project delays are likely, this level of supply could create a shorter profit recovery window for the industry.

Jargon Buster:

Bbl = barrel

CAGR = compounded annual growth rate

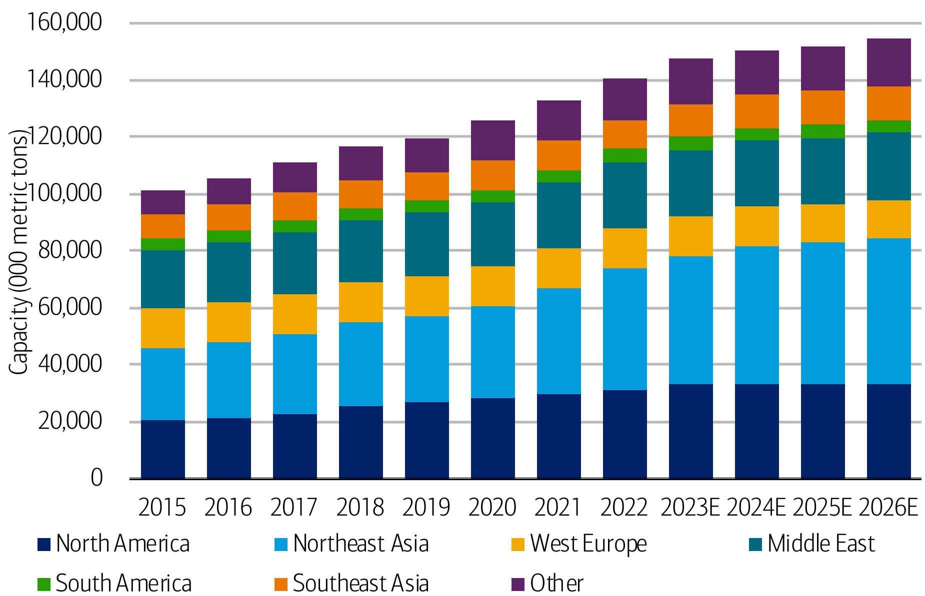
OPIS = Oil Price Information Service

PE = polyethylene

Pace of capacity adds slowing down after rapid expansion

The current capacity wave has been driven largely by China and the US. Given the long lead times for projects we generally know how markets will progress as long as demand stays at or near trend (not always the case). The shift to capacity expansions in China does make this a bit more difficult, as it takes half as long to construct a plant in this market vs. others. Even still, we should know the supply function over the next ~24 months. This gives us confidence in making medium-term market outlook calls, with the current outlook calling for incremental tightening as supply growth ebbs. After increasing by ~25% over the last four years, supply is expected to increase at a more manageable 3% over the next two. Even then, much of this growth comes from annualizing the plants which commissioned in 2023. This leads to the flattening out of the supply function in Exhibit 1.

Exhibit 1: Global polyethylene supply growth should slow as we move into middle of the decade
Global polyethylene capacity growth is set to slow down post-2023



Source: OPIS, BofA Global Research

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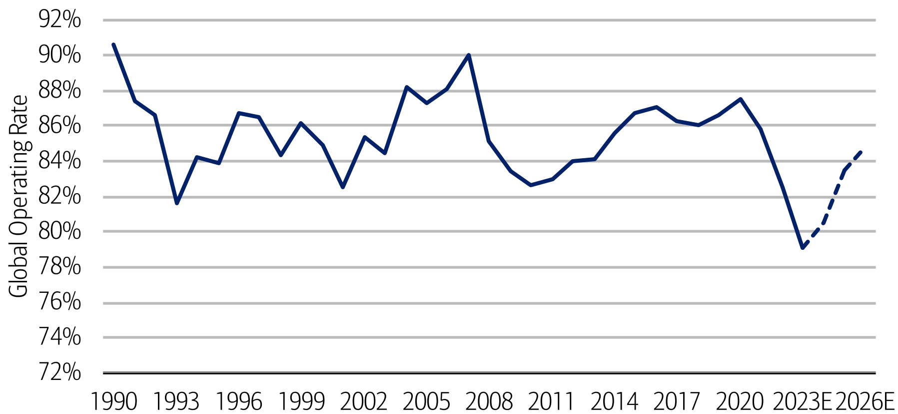
But operating rates are in uncharted territory

Exacerbating the headline capacity expansion issue is two years of below trendline demand growth in 2022 and 2023. 2022 saw demand destruction in markets after significant price inflation and a hangover from a strong 2020 and 2021. This transitioned to destocking and inflation-driven consumer headwinds in 2023. OPIS (formerly IHS) is calling for 1.3% demand growth in 2023, which results in a global polyethylene operating rate just below 80%. This is a level we have not seen in over 30 years (Exhibit 2). However, there is also reason to believe the OPIS demand number for 2023 is even optimistic, as it is predicated, in part, on ~1% demand growth in North America in 2023, when the American Chemistry Council's own data is showing domestic sales are already tracking down ~9% y-y. This can be recovered by other markets, as North America is ~15% of global demand (for example, China demand would need to grow ~6.5% to recover), but we don't get the sense that other markets are seeing particularly robust demand trends.

Exhibit 2: Operating rates in 2023 will be the lowest in over 30 years
Global polyethylene operating rates



Source: OPIS, BofA Global Research Estimates

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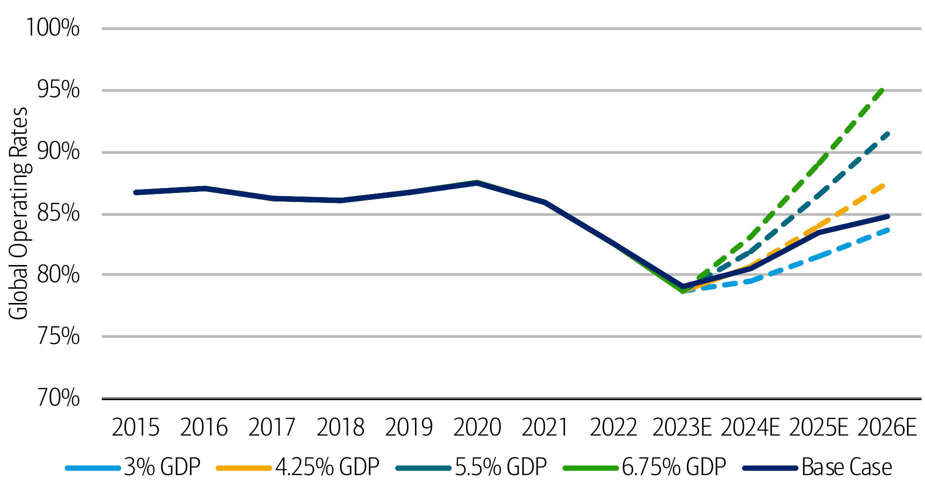
New capacity cannot be digested over a one-year window

Historically, chemical industries would need to see operating rates between 85-90% before a more constructive price backdrop could materialize. BofA estimates said rates will ultimately bottom in 2023 between 79-80%. This is important, as the industry can now work to repair itself after two years of constant pressure on operating rates. We suspect some plants have closed during this time, while others may still shutter. That said, decommissioning a plant is a tough decision, and one which is often stayed given political, social and capital expenditure considerations. Capacity additions will dribble into the market from here, but demand should begin to outpace supply starting in 2024. However, given the magnitude of supply imbalance, it could still take ~24 months to lift rates back into the mid 80% range. Said differently, if global demand ex China grew at a modest premium to trend line next year, demand from China would need to grow nearly 16% to bring operating rates back to 85%. This would reflect 11-14% GDP growth given historic multipliers. We just do not see this as likely. Instead, we suspect 2024 is a year of improved, though still below normal margins. Even Lyondell and Braskem suggest that the backdrop for polyethylene does not improve materially until 2H24 and 2025, respectively. We show the impact different global GDP growth would have on operating rates to illustrate the backdrops required to get more constructive.

Exhibit 3: Global GDP needs to sustain in excess of 5% to tighten the market by 2024
Global GDP scenario analysis on the implications to PE operating rates



Source: OPIS, BofA Global Research Estimates

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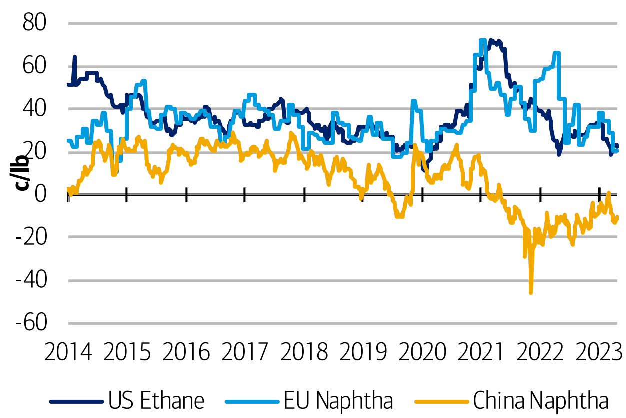
Margins likely at bottom, but facing uphill battle

Polyethylene margins surged in the US and Europe on the back of COVID induced economic policies and logistics constraints. The spread of price between China and these countries (Exhibit 5) proved unsustainable, which led to a sharp correction over 2022 and into 2023. With operating rates likely at or near trough, we suspect the pressure on global margin structures should begin to ease. Margins in China have already been improving over the past six months, though remain in the red. This relief has been more a function of lower naphtha costs than higher prices, as margin relief was necessary to stem further facility stress given the duration of earnings losses to date. From here, oil prices have been marching higher, as has naphtha. In a healthy market, this move in oil would lift the cost curve as producers are forced to pass on the higher costs (every $10/barrel move in crude is ~$0.04/lb in PE price). So far this has not happened, and China market prices have remained sluggish. This has meant margins in China have moved lower over the last few weeks. Ultimately, this is what oversupply looks like, it drives a failure of normal margin and cost curve economics. Higher oil prices may not lead to higher PE prices over the near term, which could stymie further margin expansion given already low ethane prices in the US. We will watch how China prices respond to crude inflation in the future, as this will set the tone for profits from here.

Exhibit 4: Global PE margins remain near historic trough levels
US, European and Chinese PE margins



Source: OPIS, Bloomberg, BofA Global Research Estimates

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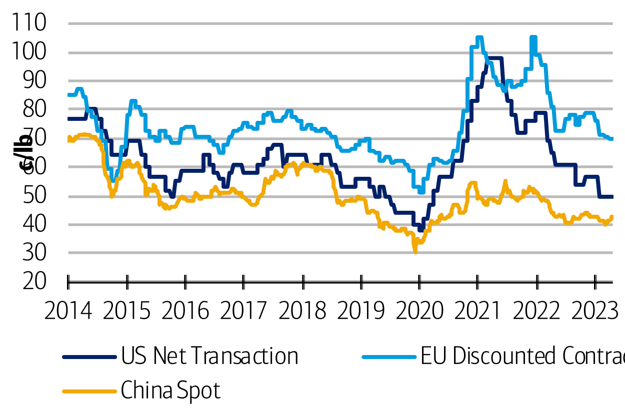
Exhibit 5: Global prices have not responded to recent crude strength
US, China and Europe polyethylene prices



Source: OPIS

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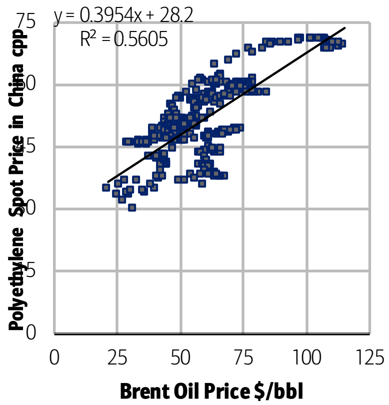
Traditional correlations breaking down

Although the high end of the global PE cost curve is driven by Chinese coal/methanol-to-olefins production, said feedstocks are losing ground as utilization rates have rendered this portion of the cost curve less impactful. Naphtha has been increasingly important over the last two years in setting marginal cost. Below we look at the relationship between brent crude (as a proxy for naphtha) and Chinese HDPE prices since mid-2014. Over time, as we expand the period under review, the R^2 has been in decline, now at just 0.14. However, the data show a tale of two (or three) periods, with traditional relationships breaking down post-2021, in our view due to extraordinary conditions tightening the market during COVID and now oversupply making the cost curve less relevant.

During 2014-2020, Chinese PE prices were reasonably correlated to brent prices. However, this relationship has decoupled since COVID. If we look at data from Jan 2021 till today, we get no statistical significance, i.e., the change in brent oil prices had no relationship to Chinese PE prices. It appears that this was largely caused by a decline in PE prices in 2021 despite higher crude. Setting aside 2021, from 2022 onward we observe a return to statistical significance with an R^2 value of 0.56. **However, there is a catch: the slope of the curve has greatly flattened, from 0.40 in 2014-2022 to just 0.23 after 2022, meaning that even though Chinese PE prices are still**

positively correlated to brent, the degree by which they move has significantly declined.

Exhibit 6: Brent vs China PE 2014-2020
Historically China PE moved with brent



Source: OPIS, Bloomberg, BofA Global Research
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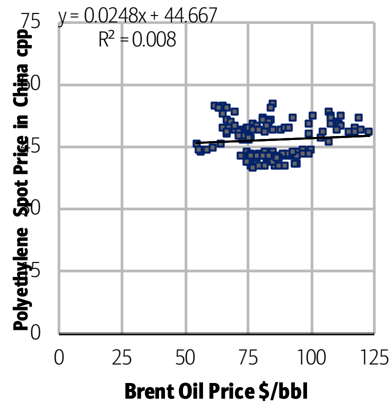
Exhibit 7: Brent vs China PE 2021+
Since 2021 data shows no relationship...



Source: OPIS, Bloomberg, BofA Global Research
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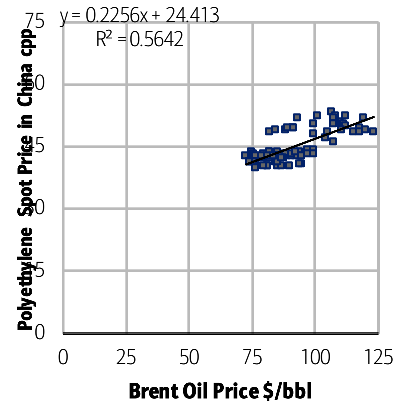
Exhibit 8: Brent vs China PE 2022+
... but the R^2 is 0.56 when we exclude 2021



Source: OPIS, Bloomberg, BofA Global Research
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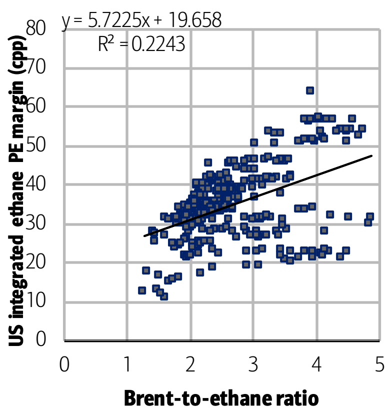
Another rule-of-thumb is that the wider the gap between crude oil and natural gas/ethane in the US, the wider the US ethane-based integrated PE margin due to a steeper global cost curve. While the relationship between the ratio of brent/ethane pricing and PE margins is not linear, there is clearly a directional link. This relationship, however, has also broken down post 2021, with our analysis below showing a negative slope – i.e., ethane-based PE margins in the US actually narrowed despite a widening of the brent/ethane ratio.

How can this be explained? We believe that US PE margins during COVID expanded to sky-high levels of 70cpp or more due to extraordinary conditions, such as logistics challenges preventing an influx of imports to close the arbitrage, strong demand for packaging due to COVID, and major weather-related outages. Over the past 1-2 years these conditions gave way to oversupply, making traditional relationships (which rely on cost curve support) less relevant. We suspect this relationship can be repaired, though it hinges on the efficacy of crude oil in driving the global cost curve higher.

Exhibit 9: Brent/ethane ratio vs US PE margin 2014-2020
There is clear directional relationship



Source: OPIS, Bloomberg, BofA Global Research
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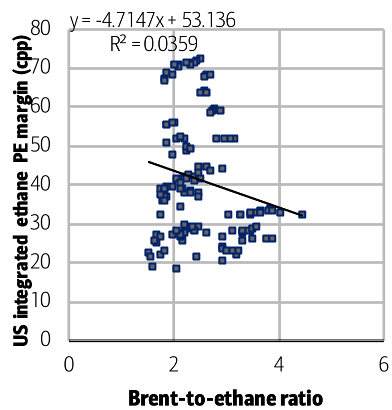
Exhibit 10: Brent/ethane ratio vs US PE margin 2021+
Since 2021 the directional link has inverted...



Source: OPIS, Bloomberg, BofA Global Research
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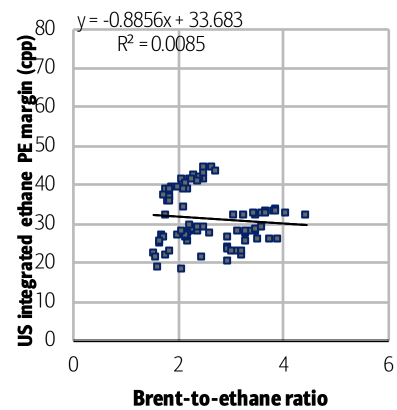
Exhibit 11: Brent/ethane ratio vs US PE margin 2022+
... which is the case even if we exclude 2021



Source: OPIS, Bloomberg, BofA Global Research
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Next hurdle – looking to 2027 as next wave builds

Given the aforementioned long lead times, the industry is now getting clarity on projects for 2027. As per OPIS and our own research and adjustments, annual global PE capacity growth is expected to step up to over 9mn tons in 2027 from ~3-4mn tons in 2024-26. More than half of this jump is coming from just a handful of projects, some of which are already in construction phase. These include the 2.08mtpa CPChem/QatarEnergy JV plant in Orange, TX (with ~half of this production online in 2027), the 1.68mtpa CPChem/QatarEnergy project in Ras Laffan, Qatar (scheduled to come online in late 2026), the ~1.5mtpa by Abu Dhabi Polymers Company/Borouge in Al Ruwais, UAE, and 600ktpa (as assessed by OPIS) by Red Sea National Refining and Petrochemicals in Egypt. On top of these we have the usual flurry of Chinese expansion, estimated at over 3mtpa in 2027 by OPIS, and a couple of less probable mega-projects in Saudi Arabia and Russia.

While 2027 is too far out to "panic" today, we note that 9mpta of new capacity would require a ~7% global demand growth rate that year to be absorbed, a difficult scenario to imagine. Note that even in 2020, when COVID drove a spike in demand for plastics, growth came in at 5.8%. We thus believe that operating raised will most likely come under pressure that year, creating a shorter window for margin performance in late 2024-2026.

Exhibit 12: Stocks mentioned
Prices and ratings for stocks mentioned in the report

BofA Ticker	Bloomberg ticker	Company name	Price	Rating
DOW	DOW US	Dow	US$ 55.29	B-3-7
LYB	LYB US	LyondellBasell	US$ 100.97	B-3-7

Source: BofA Global Research

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Price objective basis & risk

Dow Inc (DOW)

Our PO of $55 is based on a 9.0x 2023E EV/EBITDA multiple. The multiple is a premium to the 7x average forward EBITDA multiple realized by its closest peer over the last five years (noting that DOW's trading history is still limited). With 2023 likely to be the trough, we see building in a premium as prudent.

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.

Downside risks are slower growth in key end markets including autos, electronics, and infrastructure, and a stronger US dollar.

LyondellBasell Industries (LYB)

Our $99 PO is based on a 9.0x multiple to our 2023E EBITDA ex-Refining , plus the cumulative EBITDA generated by Refining through 2023 and 2024. The multiple is a 2.0x premium to historic average levels, reflecting a trough in our estimates and potential recovery.

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.

Analyst Certification

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

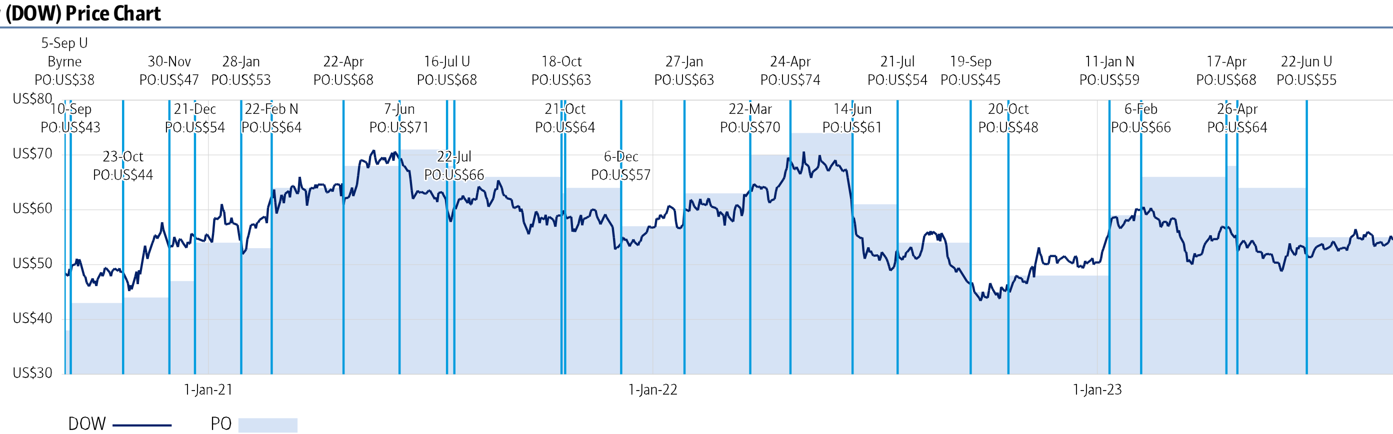
US - Chemicals Coverage Cluster

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	Matthew DeYoe, CFA
	Element Solutions Inc.	ESI	ESI US	Steve Byrne, CFA
	FMC Corporation	FMC	FMC US	Steve Byrne, CFA
	Green Plains	GPRE	GPRE US	Salvator Tiano, CFA
	Linde	LIN	LIN US	Steve Byrne, CFA
	Linde	LINGY	LIN GY	Steve Byrne, CFA
	Livent	LTHM	LTHM US	Matthew DeYoe, 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	Matthew DeYoe, CFA
	The Mosaic Company	MOS	MOS US	Steve Byrne, CFA
	Tronox Holdings	TROX	TROX US	Matthew DeYoe, CFA
NEUTRAL				
	Air Products	APD	APD US	Steve Byrne, CFA
	Albemarle	ALB	ALB US	Matthew DeYoe, CFA
	Archer-Daniels-Midland Company	ADM	ADM US	Salvator Tiano, CFA
	Celanese Corporation	CE	CE US	Matthew DeYoe, CFA
	Chemours Company	CC	CC US	Matthew DeYoe, CFA
	Corteva	CTVA	CTVA US	Steve Byrne, CFA
	International Flavors & Fragrances	IFF	IFF US	Matthew DeYoe, CFA
	Origin Materials	ORGN	ORGN US	Steve Byrne, CFA
	Sherwin-Williams Company	SHW	SHW US	Steve Byrne, CFA
	Westlake Corp	WLK	WLK US	Steve Byrne, CFA
UNDERPERFORM				
	Dow Inc	DOW	DOW US	Steve Byrne, CFA
	Ecolab Inc	ECL	ECL US	Steve Byrne, CFA
	Huntsman Corp	HUN	HUN US	Matthew DeYoe, CFA
	LyondellBasell Industries	LYB	LYB US	Steve Byrne, CFA
	RPM International Inc	RPM	RPM US	Steve Byrne, CFA
	Westlake Chemical Partners, LP	WLKP	WLKP US	Steve Byrne, CFA

Disclosures

Important Disclosures

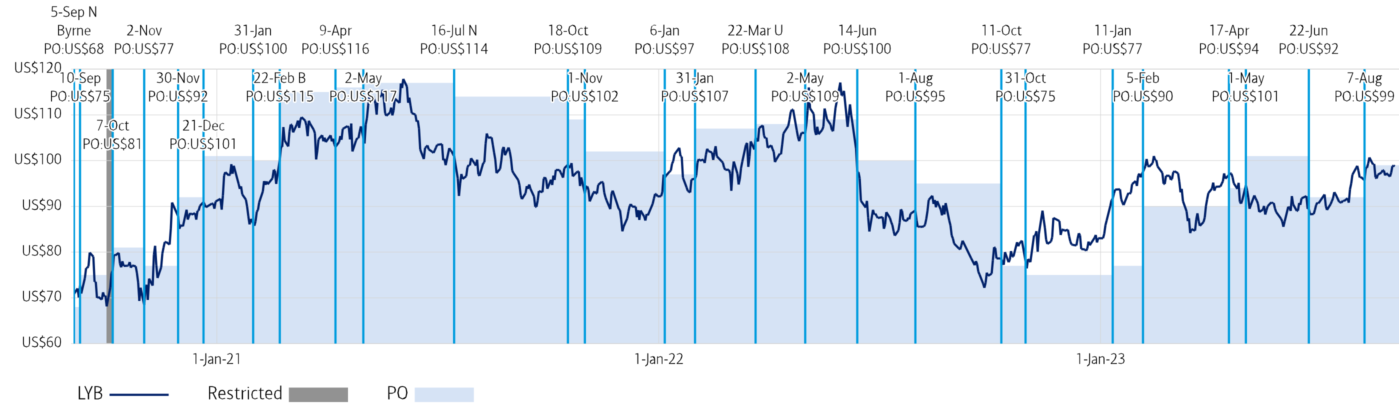
Dow (DOW) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

LyondellBasell (LYB) Price Chart



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Equity Investment Rating Distribution: Chemicals Group (as of 30 Jun 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	65	48.51%	Buy	31	47.69%
Hold	34	25.37%	Hold	19	55.88%
Sell	35	26.12%	Sell	20	57.14%

Equity Investment Rating Distribution: Global Group (as of 30 Jun 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	1877	53.28%	Buy	1040	55.41%
Hold	815	23.13%	Hold	464	56.93%
Sell	831	23.59%	Sell	385	46.33%

[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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