

## Chemicals

## Chem Weekly: Hydrogen costs for FC cars, Red Sea disruption, PFAS update

Industry Overview

## Hydrogen for FC cars getting pricey

The Hydrogen Fuel Cell Network, a coalition of automakers, regulators and hydrogen producers, has a map on their website with the locations and fuel availability of 54 hydrogen refueling stations in California. Roughly half these stations are in the LA area and half are currently out of hydrogen (see Exh 1). While the source of this supply challenge is not clear, the shortage has led to an average price of \$22/kg, with some stations over \$30/kg. While the distance per kg is 2x the range per gallon of gasoline, these operating costs would be 3x the cost of a similar sized ICE vehicle. We understand the automakers generally provide 3 yrs of hydrogen fuel for leased or purchased fuel cell vehicles; our concern is that these lofty hydrogen prices will discourage further investments in fuel cell vehicles. We do see significant potential for clean hydrogen, particularly blue (post sequestration), for industrial users, given a significant amount of hydrogen is already distributed via pipeline in regions such as Texas and Louisiana where the geology is suitable for sequestration. We note Louisiana recently received primacy from the EPA to regulate Class VI injection wells, which could accelerate the permitting process. The **Dept of Energy's Sustainability leader will provide the keynote address at our Ag/Materials Conference in Florida on Feb 28-29.**

## Red Sea shipping disruption could benefit US petchems

Our [shipping colleagues have estimated that 28% of global container ships travel via the Red Sea](#), many of which have been attacked by Iranian-backed Houthi rebels. The Red Sea is primarily the travel path between Asia and Europe, and the alternative path around Africa adds 2-3 weeks of travel time. We note that ships using the Panama Canal have also been delayed due to drought in the region. While most chlor-alkali products are not shipped in containers, polymers such as polyethylene, polypropylene, PVC, and epoxy resins are shipped in containers. While the impact on pricing may be modest, we suspect the Red Sea challenges could lead to greater exports from the US.

## ~5% opt-out of Dupont PFAS settlement

On January 3<sup>rd</sup>, the Public Water Suppliers (PWS) that opted out of DuPont's proposed settlement from the AFFF multi-district litigation (MDL) were disclosed, comprising around 5% (717 out of 14,167), [consistent with our expectations](#). The remaining 95% are part of a \$1.2bn settlement which was proposed on June 2<sup>nd</sup>. The 717 opt-outs may go to trial, but without a provided list, the sizes of opting-out authorities remain unknown. Some may be disqualified from opting-out due to improper procedures; further, these opt-outs are provisional, allowing Public Water Suppliers to rejoin until March 1<sup>st</sup>. In December 2023, 11 PFAS legislation bills were introduced across states, addressing issues such as PFAS testing, remediation, and use in firefighting gear, signaling sustained scrutiny on PFAS manufacturers and downstream producers. [Please see the Industrials/Multi-Industries recent note on the opt-out and its implications on 3M here](#). While the MDL settlement addresses the costs to implement treatment of public water supplies, there are still other sources of PFAS litigation in development, such as personal injury litigation and a class action lawsuit in NC with 100,000 plaintiffs.

08 January 2024

Equity  
United States  
Chemicals

Steve Byrne, CFA  
Research Analyst  
BofAS  
+1 646 855 5746  
[steve.byrne@bofa.com](mailto:steve.byrne@bofa.com)

Salvator Tiano, CFA  
Research Analyst  
BofAS  
+1 646 855 5904  
[salvator.tiano@bofa.com](mailto:salvator.tiano@bofa.com)

Rock Hoffman  
Research Analyst  
BofAS  
+1 917 565 6205  
[rock.hoffman@bofa.com](mailto:rock.hoffman@bofa.com)

Acronyms:

ICE – internal combustion engine

LA – Los Angeles

PVC – polyvinyl chloride

AFFF – aqueous film forming foam

BofA Securities does and seeks to do business with issuers covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision. Refer to important disclosures on page 19 to 21.

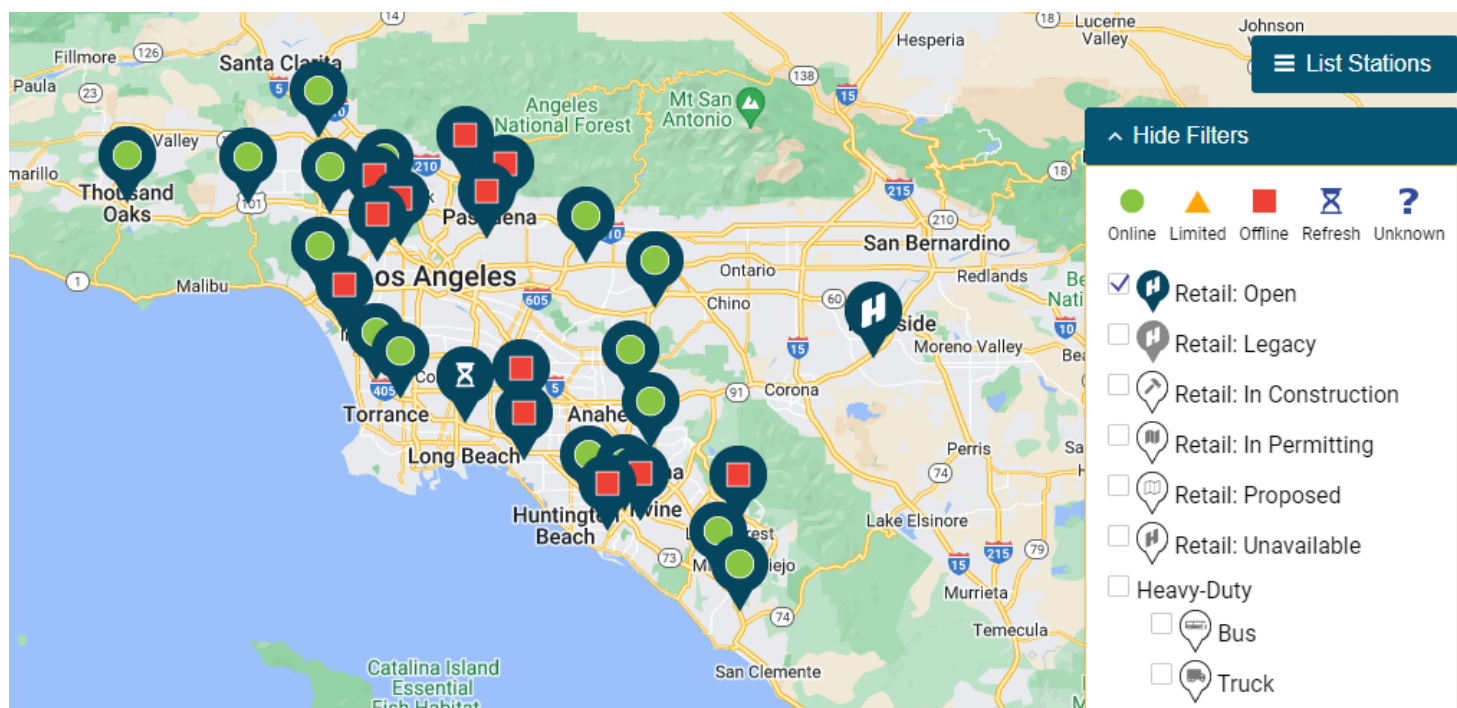
12642690

Timestamp: 08 January 2024 06:50AM EST

W

**Exhibit 1: Map of Hydrogen Fueling Stations in LA**

Half of the hydrogen fueling stations in the LA area are offline



Source: Hydrogen Fuel Cell Partnership

BofA GLOBAL RESEARCH

**Petrochemical & Chlor-Alkali****Exhibit 2: Historical pricing overview for PE, PP, PVC, LNG, Isocyanates**

US ethane margins are currently higher than EU naphtha PE margins

	2018	2019	2020	2021	2022	2023	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
<b>Integrated PE Margins</b>														
US Ethane	34	28	25	58	34	29	42	38	26	28	30	30	25	30
EU Naphtha	31	28	29	49	45	29	36	55	56	34	28	35	23	31
China Naphtha	17	5	11	2	-17	-11	-22	-17	-14	-16	-12	-6	-11	-13
<b>Polyethylene Prices</b>														
HDPE Net Transaction (NA c/lb)	62	52	49	85	69	54	74	78	65	61	55	54	53	55
HDPE Discounted Contract (EU c/lb)	74	66	60	91	87	75	91	100	79	76	77	75	71	75
HDPE Spot (Asia c/lb)	58	44	40	50	47	42	51	50	45	42	43	42	42	41
<b>Ethylene Prices</b>														
Ethylene (US Gulf c/lb)	20	19	19	45	29	20	38	30	25	21	23	19	19	21
Ethylene (EU c/lb)	50	42	27	53	51	35	60	65	40	40	42	32	30	35
Ethylene (SE Asia c/lb)	53	39	33	47	49	41	54	55	44	43	44	40	37	42
<b>Ethylene Cash Costs</b>														
US Ethane (c/lb)	15	11	11	14	23	13	18	27	26	20	12	11	15	12
US Propane (c/lb)	23	13	13	23	32	18	39	34	32	25	20	18	20	15
US Naphtha (c/lb)	29	30	21	24	47	40	61	47	38	43	39	38	46	38
EU Naphtha (c/lb)	30	25	18	29	28	33	43	31	10	29	37	27	35	32
Asia Naphtha (c/lb)	35	33	21	40	53	43	64	55	46	47	45	37	43	46
US Butane (c/lb)	19	11	14	18	31	20	41	32	25	25	24	16	21	20
<b>Feedstock Dynamics</b>														
US Ethane (c/gal)	33	21	19	31	48	24	40	58	54	38	25	21	29	22

**Exhibit 2: Historical pricing overview for PE, PP, PVC, LNG, Isocyanates**

US ethane margins are currently higher than EU naphtha PE margins

	2018	2019	2020	2021	2022	2023	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
US Propane (c/gal)	88	54	47	105	111	71	133	125	106	80	82	67	70	67
US Butane (c/gal)	91	59	53	118	124	80	159	132	108	96	107	63	63	87
Brent Oil (\$/bbl)	72	64	44	71	99	82	97	112	99	89	83	78	85	84
<b>Isocyanates</b>														
US MDI (c/lb)	184	158	142	189	218	171	221	231	223	199	185	175	164	160
US TDI (c/lb)	161	157	226	265	236	263	226	226	228	263	272	270	260	251
EU MDI (Eur c/lb)	150	119	87	130	140	124	139	145	138	137	139	136	114	105
EU TDI (Eur c/lb)	89	117	156	133	105	136	80	82	89	169	173	153	114	106
China MDI (c/lb)	114	71	76	115	98	84	120	104	91	78	86	83	86	81
China TDI (c/lb)	81	123	196	160	86	101	85	77	75	108	114	102	96	90

Source: OPIS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 3: Historical pricing overview for PE, PP, PVC, LNG, Isocyanates**

US ethane margins are currently higher than EU naphtha PE margins

	9/28	10/5	10/12	10/19	10/26	11/2	11/9	11/16	11/23	11/30	12/7	12/14	12/21	12/28	1/4
<b>Integrated PE Margins</b>															
US Ethane	29	28	28	29	30	30	30	31	34	34	29	30	30	30	26
EU Naphtha	20	33	33	33	33	32	32	32	32	32	26	26	26	26	21
China Naphtha	-15	-13	-10	-11	-13	-10	-10	-12	-12	-13	-14	-14	-18	-17	-15
<b>Polyethylene Prices</b>															
HDPE Net Transaction (NA c/lb)	56	56	56	56	56	56	56	56	56	56	53	53	53	53	49
HDPE Discounted Contract (EU c/lb)	73	76	76	76	76	75	75	75	75	75	75	75	75	75	73
HDPE Spot (Asia c/lb)	43	43	43	43	42	42	42	40	40	40	40	40	40	40	40
<b>Ethylene Prices</b>															
Ethylene (US Gulf c/lb)	22	23	23	23	22	22	21	19	21	21	20	19	18	18	18
Ethylene (EU c/lb)	36	36	36	36	36	34	34	34	34	34	34	34	34	34	39
Ethylene (SE Asia c/lb)	40	40	41	42	43	43	43	43	43	43	43	41	41	41	41
<b>Ethylene Cash Costs</b>															
US Ethane (c/lb)	14	15	15	14	13	13	13	12	9	9	11	10	10	10	10
US Propane (c/lb)	19	19	17	17	14	14	12	11	12	13	19	17	16	18	18
US Naphtha (c/lb)	48	45	42	42	41	39	36	36	31	32	40	36	38	38	38
EU Naphtha (c/lb)	40	29	29	29	29	30	30	30	30	30	35	35	35	35	39
Asia Naphtha (c/lb)	48	47	44	44	46	43	43	44	44	46	46	46	51	50	47
US Butane (c/lb)	19	18	15	15	13	15	14	15	16	17	28	30	28	29	29
<b>Feedstock Dynamics</b>															
US Ethane (c/gal)	28	29	29	26	25	26	23	21	21	21	17	20	17	18	20
US Propane (c/gal)	72	68	71	68	66	64	63	64	64	71	69	64	66	70	68
US Butane (c/gal)	75	67	75	78	79	82	84	85	83	96	104	99	96	101	94
Brent Oil (\$/bbl)	93	95	85	91	92	90	85	81	81	81	79	76	77	79	77
<b>Isocyanates</b>															
US MDI (c/lb)	163	163	163	163	160	160	160	160	160	160	160	160	160	160	160
US TDI (c/lb)	259	254	254	254	254	254	254	254	249	249	249	249	249	249	249
EU MDI (Eur c/lb)	104	104	101	99	99	99	100	109	109	110	108	110	110	111	111
EU TDI (Eur c/lb)	101	101	102	104	104	104	106	108	108	110	108	104	106	106	105
China MDI (c/lb)	85	85	82	78	78	81	81	82	81	81	81	81	81	81	81
China TDI (c/lb)	95	89	91	95	95	95	95	87	87	87	87	87	87	87	87

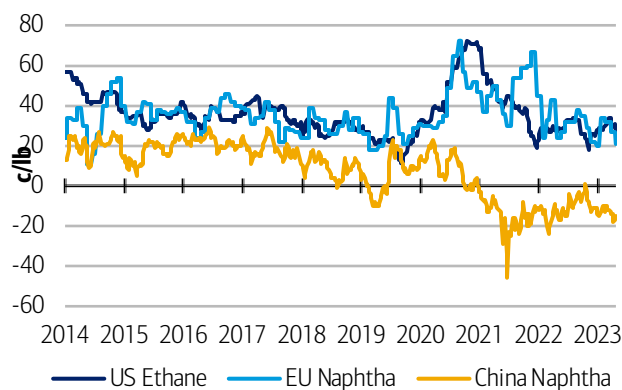
Source: OPIS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH



**Exhibit 4: Global PE Margins based on feedstock mix**

Integrated margins remain negative for Chinese producers



Source: IHS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 5: US premium to global netbacks**

The US polyethylene price continues to have a premium to historic

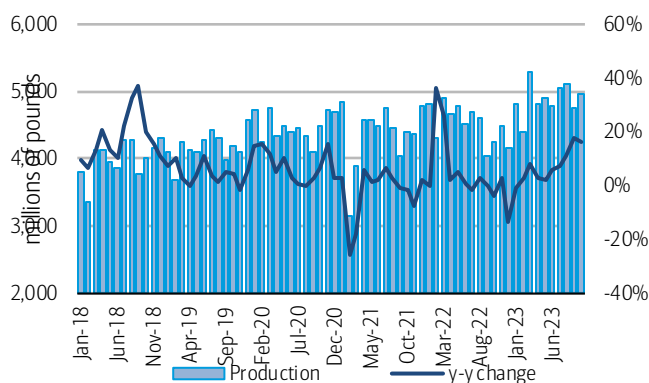


Source: OPIS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 6: US polyethylene production**

Production is accelerating with new capacity

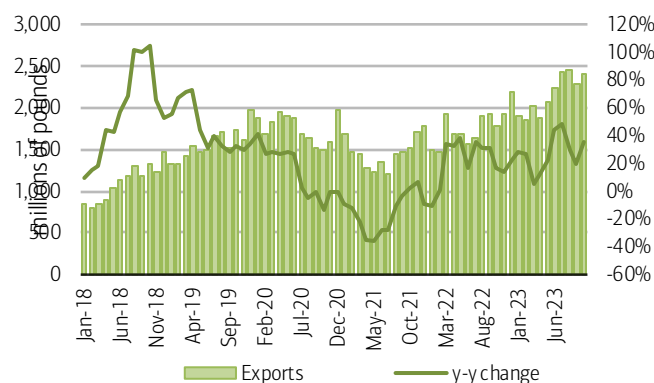


Source: American Chemistry Council, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 7: US polyethylene exports**

Exports have improved more recently

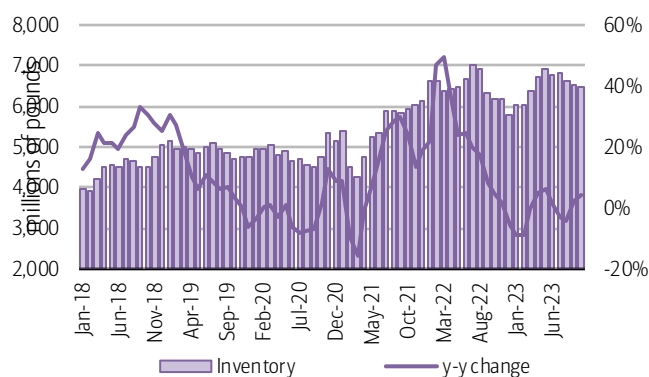


Source: American Chemistry Council, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 8: US polyethylene inventory**

Inventories remain elevated, returning to near peak levels

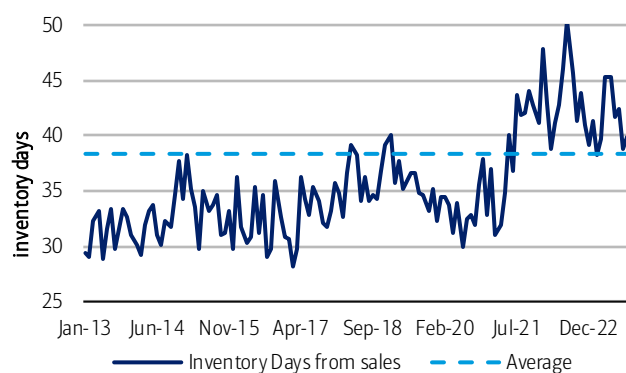


Source: American Chemistry Council, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 9: US polyethylene days of sales in inventory**

Days of sales in inventory are above normal

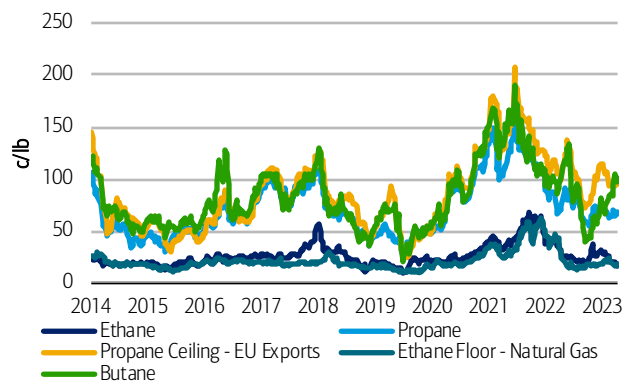


Source: American Chemistry Council, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 10: US NGL Dynamics (c/lb)**

US ethane is at the low end of the PE cost curve

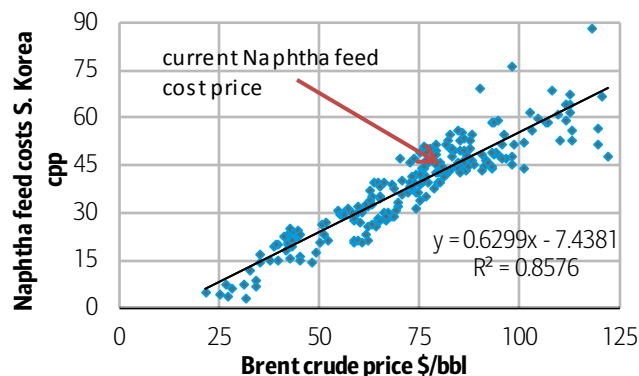


Source: OPIS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 11: Brent Oil vs Naphtha feed cost (S. Korea) price regression**

Naphtha feedstock cost closely follow changes in Brent crude

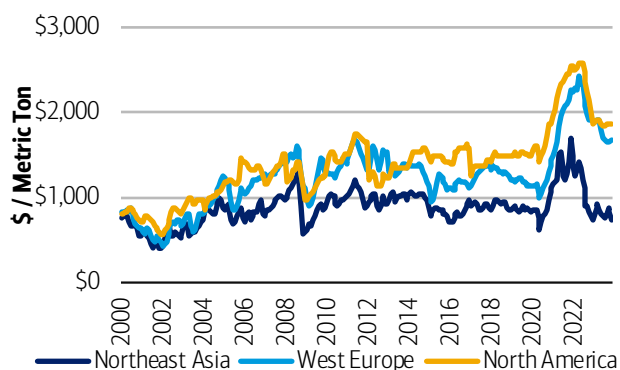


Source: OPIS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 12: PVC prices (\$/mt)**

PVC prices moving off of multi-decade highs

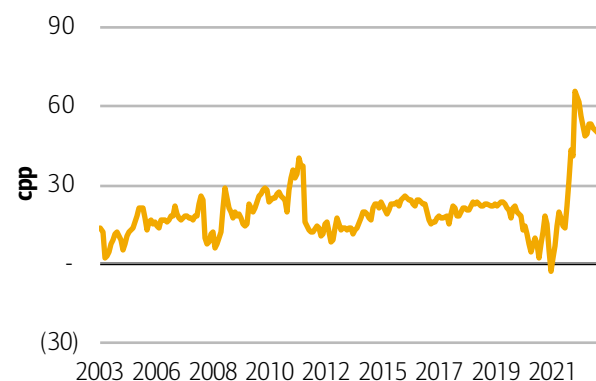


Source: OPIS, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 13: US Contract PVC Premium over Spot**

Spot markets trade at a significant discount to contract

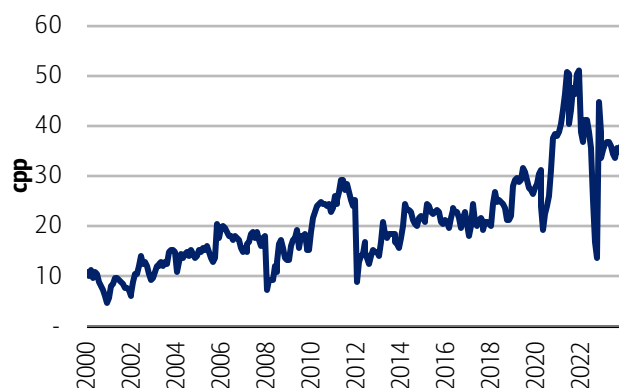


Source: OPIS, BofA Global Research Estimates

BofA GLOBAL RESEARCH

**Exhibit 14: non-integrated PVC margin (80% contract 20% spot)**

PVC margins are moving off peak

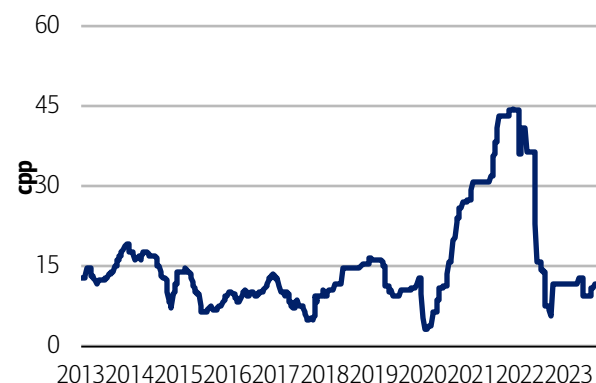


Source: OPIS, Bloomberg, BofA Global Research Estimates

BofA GLOBAL RESEARCH

**Exhibit 15: US ethylene dichloride price**

Prices have collapse with international PVC price

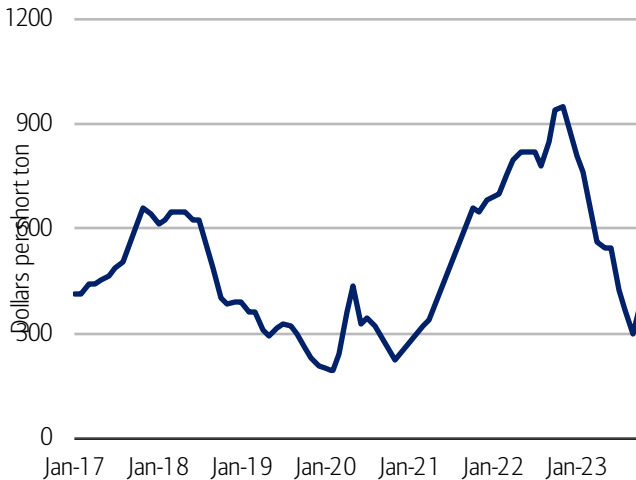


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 16: Caustic export price (\$/ short ton)**

At \$580/short ton caustic export prices have fallen off of highs

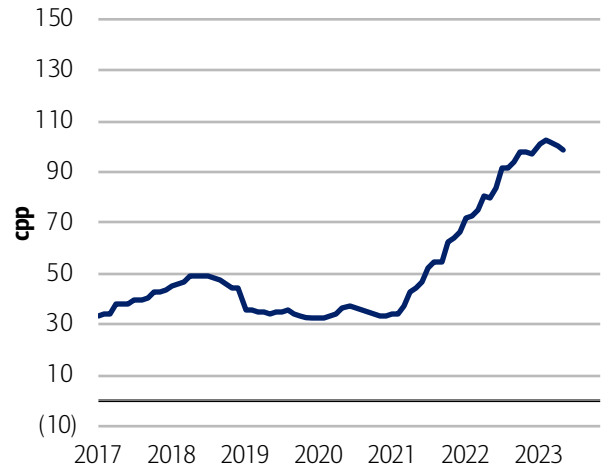


Source: Bloomberg

BofA GLOBAL RESEARCH

**Exhibit 17: US ECU Cash Margins**

Cash margins remain high as cost deflation offset softer contract caustic



Source: Bloomberg, OPIS

BofA GLOBAL RESEARCH

**Exhibit 18: US chlorine price**

Chlorine prices have moved higher on initiatives by Olin

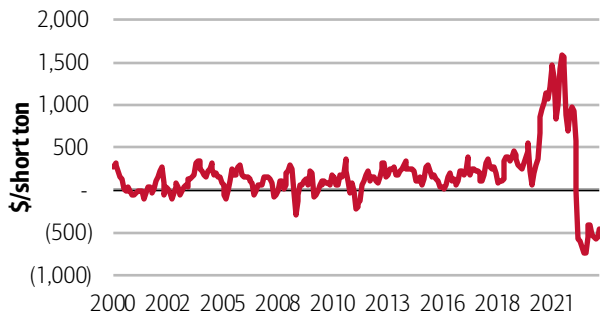


Source: OPIS

BofA GLOBAL RESEARCH

**Exhibit 19: Implied chlorine premium in spot PVC vs. merchant price**

A negative value indicates an incentive to sell chlorine vs spot PVC

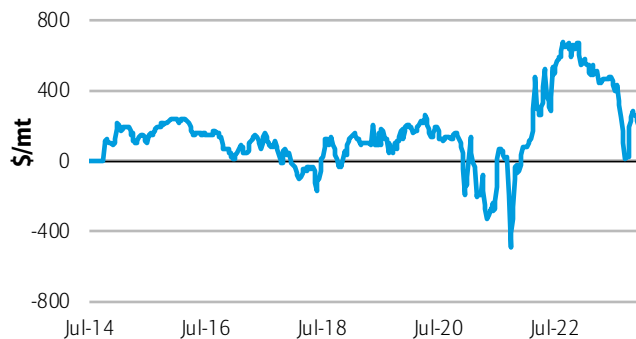


Source: OPIS, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 20: US acetic acid spread to China**

US acetic acid spread to china is near to zero

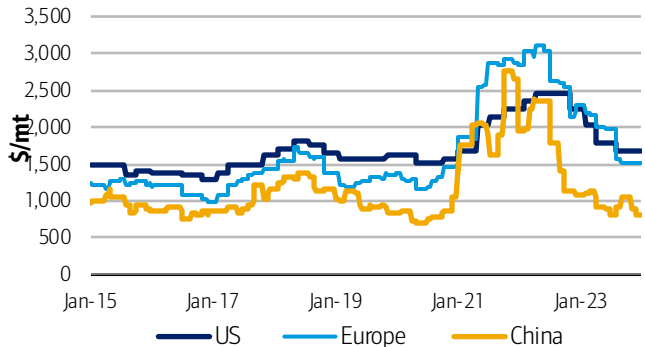


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 21: Global VAM contract prices**

US &amp; European VAM prices remain bid

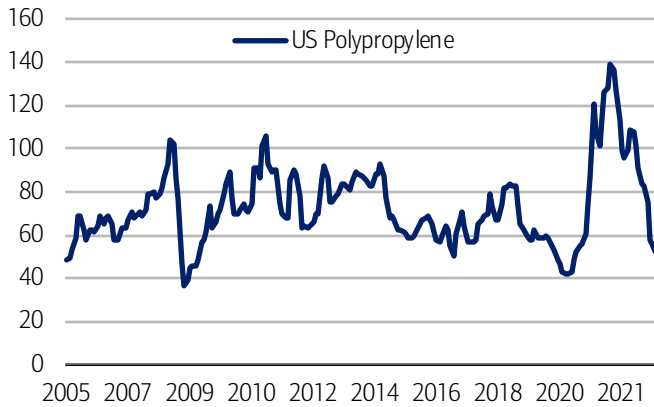


Source: Bloomberg

BofA GLOBAL RESEARCH

**Exhibit 22: US Polypropylene price**

Polypropylene prices have retraced sharply

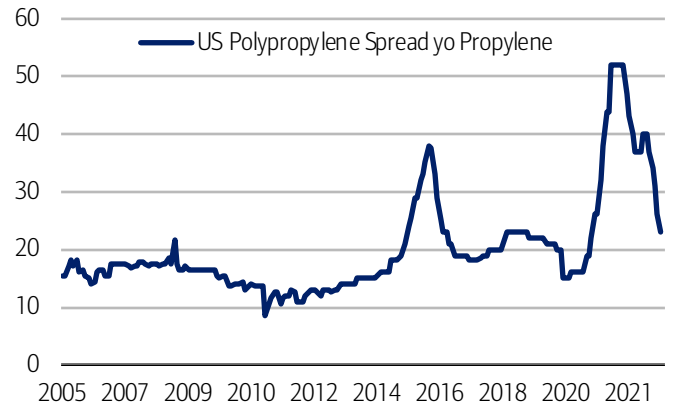


Source: OPIS

BofA GLOBAL RESEARCH

**Exhibit 23: Polypropylene spread to propylene**

PP spread to monomer would seem to have more downside

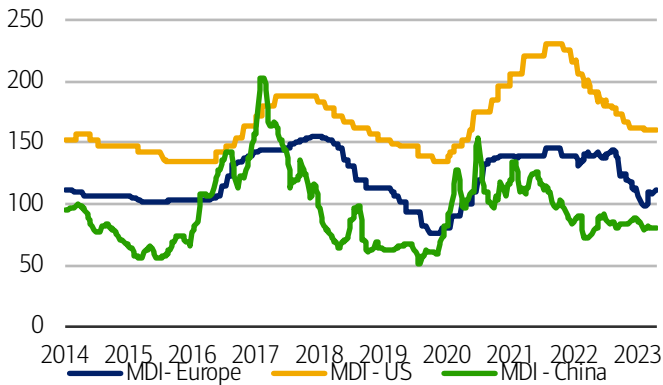


Source: OPIS and BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 24: Global polymeric MDI price deck**

US remains at a healthy premium to global markets

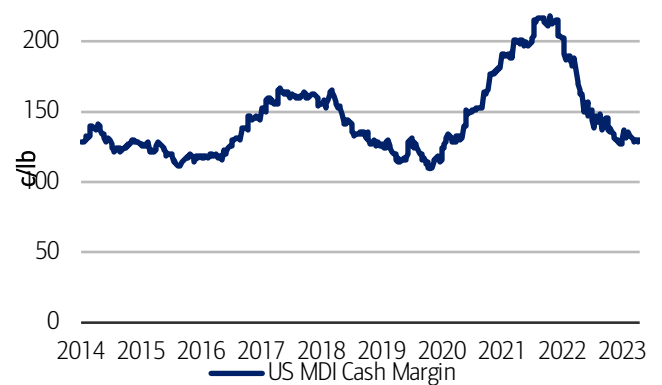


Source: ICIS

BofA GLOBAL RESEARCH

**Exhibit 25: US Polymeric MDI spread over raw material costs**

US margins are off peak, but still at healthy levels

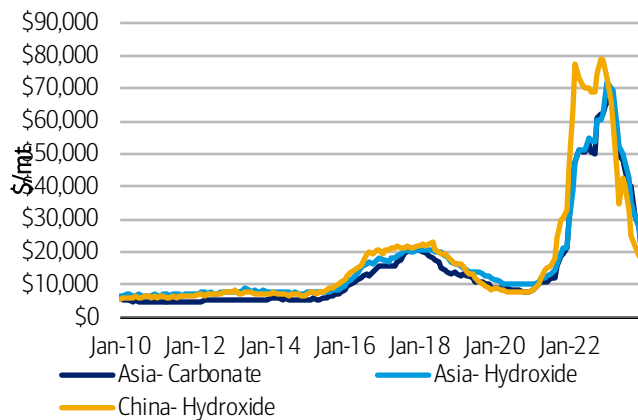


Source: ICIS, OPIS, BofA Global Research Estimates

BofA GLOBAL RESEARCH

**Exhibit 26: China and Asia (non-China) Prices**

China prices continue to trade at a premium to other benchmarks



Source: Benchmark Minerals, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 27: Premium of lithium hydroxide over carbonate**

Hydroxide has historically carried a \$2,000/mt premium over carbonate



Source: Benchmark Minerals, BofA Global Research

BofA GLOBAL RESEARCH

# Nitrogen

## Exhibit 28: Nitrogen pricing overview

Nitrogen prices have started to decrease materially

	2018	2019	2020	2021	2022	2023	1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
<b>Nitrogen Prices</b>														
Urea granular (US NOLA \$/st)	259	244	228	492	601	354	677	613	591	522	342	367	374	334
Urea granular (US Midwest \$/st)	297	302	272	535	667	434	752	679	633	604	421	466	428	422
Urea granular (Mediterranean \$/st)	265	252	238	510	687	364	800	703	682	562	386	317	393	359
Urea granular (SE Asia \$/st)	266	255	240	503	629	352	727	687	570	532	366	325	369	349
Ammonia (US Midwest \$/st)	415	403	328	759	1276	630	1382	1394	1086	1240	834	466	517	703
UAN (US Midwest \$/st)	211	202	160	372	561	300	601	614	482	546	351	285	268	294
<b>Feedstock Costs</b>														
Natural Gas (US HH \$/mmbtu)	3.07	2.53	2.12	3.70	6.49	2.66	4.53	7.39	7.78	6.01	2.71	2.35	2.65	2.92
Natural Gas (UK ICE \$/mmbtu)	7.89	4.86	3.30	15.81	31.84	12.65	32.03	21.98	41.54	31.09	16.30	10.24	10.58	13.48
Anthracite coal (China \$/mt)	139	131	131	164	212	182	237	221	200	194	204	179	183	162
	9/28	10/5	10/12	10/19	10/26	11/2	11/9	11/16	11/23	11/30	12/7	12/14	12/21	12/28
<b>Nitrogen Prices</b>														
Urea granular (US NOLA \$/st)	404	413	376	359	350	355	343	328	299	304	319	302	300	304
Urea granular (US Midwest \$/st)	488	488	450	443	410	413	425	425	425	425	398	385	398	380
Urea granular (Mediterranean \$/st)	397	399	406	395	399	379	374	363	340	332	321	329	312	322
Urea granular (SE Asia \$/st)	395	395	395	383	363	363	363	363	327	322	329	311	315	315
Ammonia (US Midwest \$/st)	713	713	713	713	750	750	730	730	738	738	738	610	610	610
UAN (US Midwest \$/st)	297	297	297	297	297	297	297	297	297	297	287	287	287	275
<b>Feedstock Costs</b>														
Natural Gas (US HH \$/mmbtu)	2.93	3.34	3.24	2.90	3.16	3.52	3.03	2.96	2.86	2.81	2.58	2.49	2.61	2.70
Natural Gas (UK ICE \$/mmbtu)	12.50	12.86	11.56	16.60	15.35	15.25	15.17	14.40	14.17	15.10	13.94	12.18	10.47	10.27
Anthracite coal (China \$/mt)	182	178	176	172	165	164	164	163	164	161	159	157	157	155

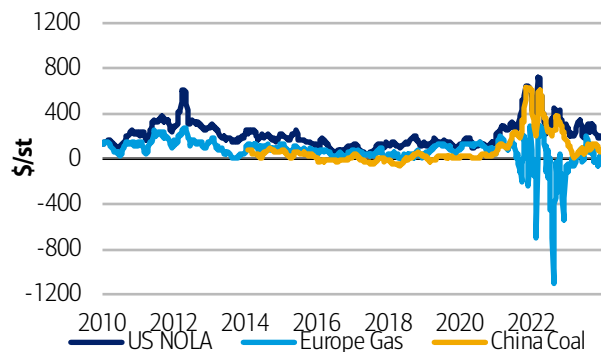
Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH



**Exhibit 29: Global Granular Urea Cash Margins (\$/st)**

European urea margins are negative

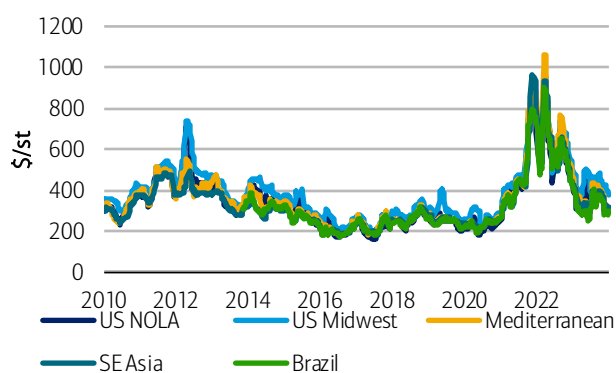


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 31: Global Granular Urea Prices (\$/st)**

Prices have come off their recent highs

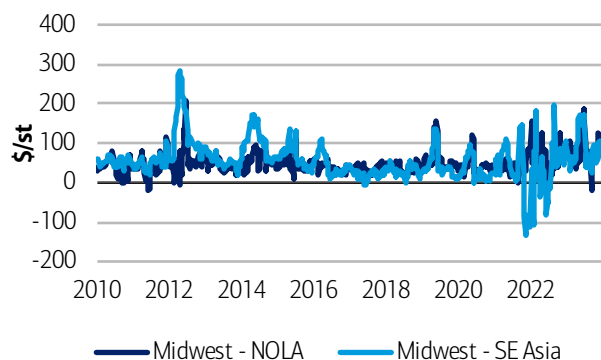


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 33: US Urea Price Differentials (\$/st)**

US Midwest urea prices are above NOLA import price

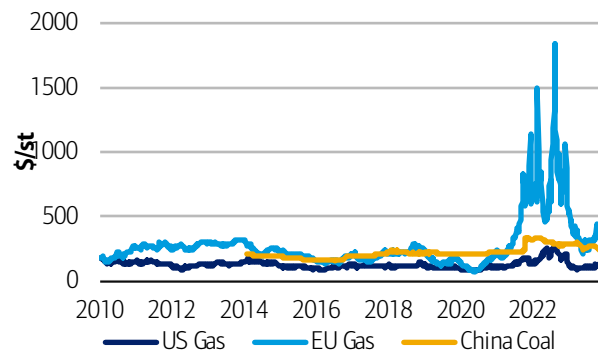


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 30: Global Granular Urea Cash Cost (\$/st)**

US gas costs at bottom of cost curve

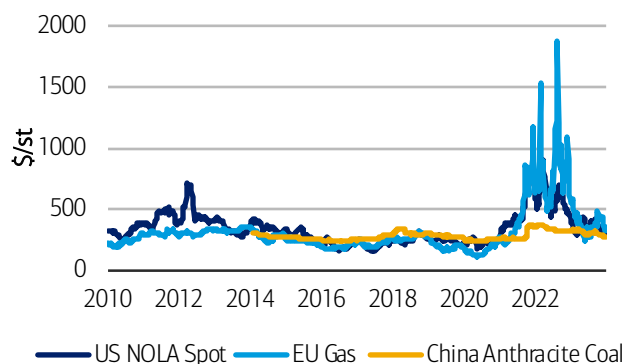


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 32: US NOLA Urea vs Delivered Costs (\$/st)**

Product costs have fallen off their peak, but still remain elevated vs 2019 (pre-covid)

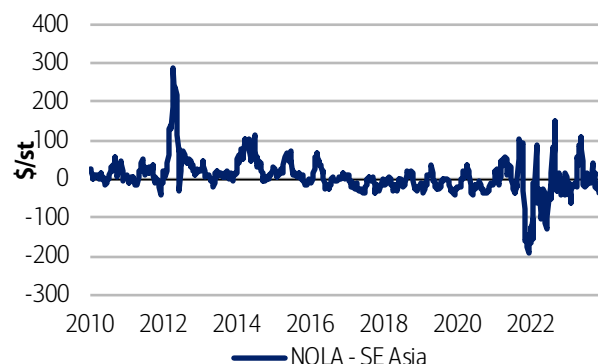


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 34: US NOLA - SE Asia Urea Price (\$/st)**

US NOLA urea price is below Asia prices

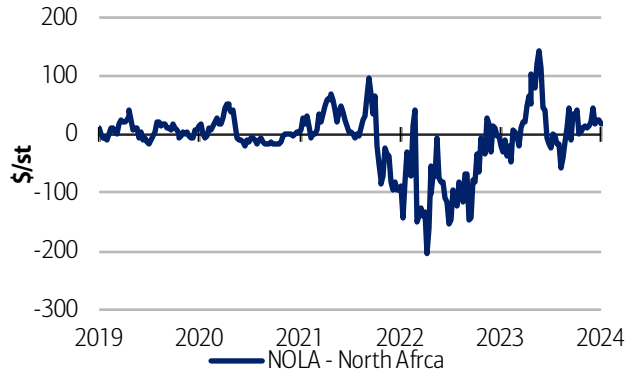


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 35: US NOLA - North Africa Urea Price (\$/st)**

US NOLA urea price is now above North Africa prices

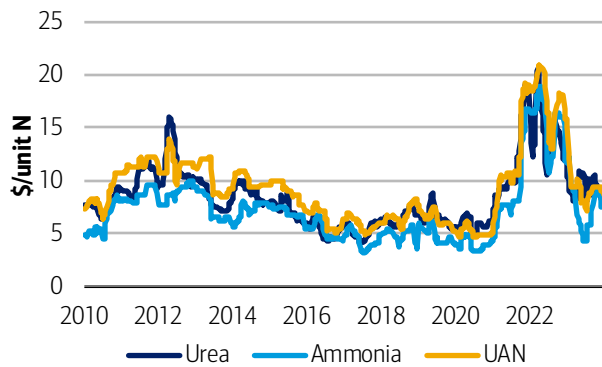


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 37: US Midwest Prices (\$/unit N)**

Midwest UAN prices have surpassed urea on a unit N basis

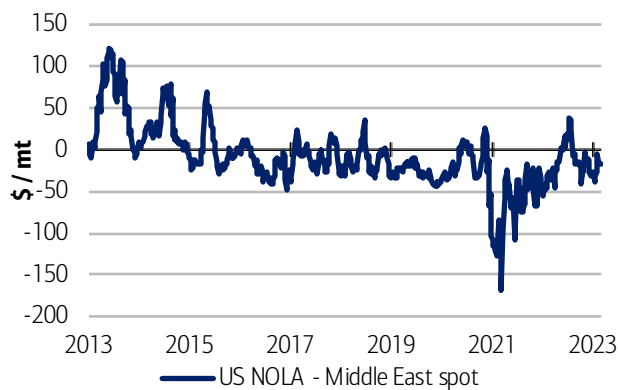


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 39: US NOLA implied vs. Middle East urea price spread**

US NOLA urea price is now comparable to Middle East levels

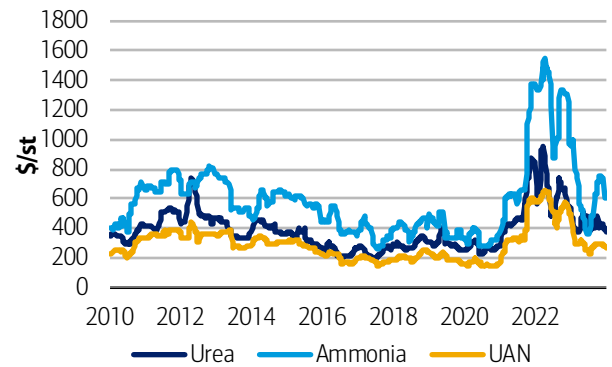


Source: CRU, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 36: US Midwest Prices (\$/st)**

All nitrogen fertilizer products have increased sharply

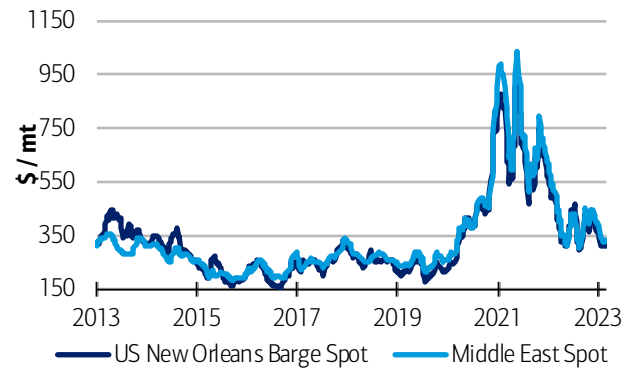


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 38: US NOLA implied vs. Middle East urea prices (\$/mt)**

Prices have both fallen off their peak, but still remain elevated vs 2019 (pre-covid)

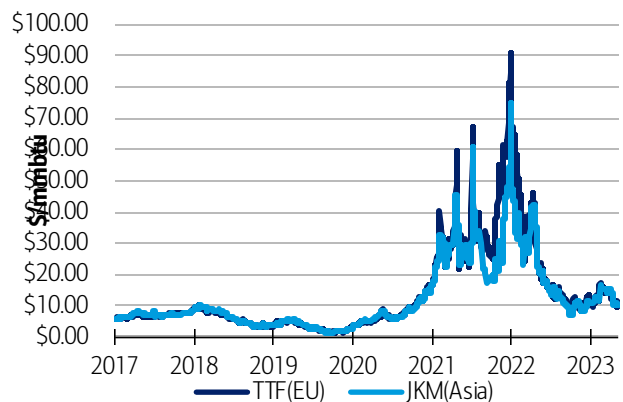


Source: CRU, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 40: EU vs. Asia NatGas Prices (\$/mmBTU)**

Asian nat gas prices are well below EU prices

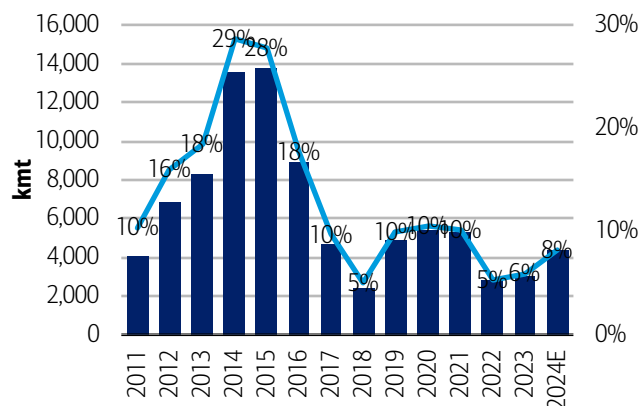


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 41: Chinese Urea Exports & % of World Total**

Chinese urea exports are well below prior peak levels

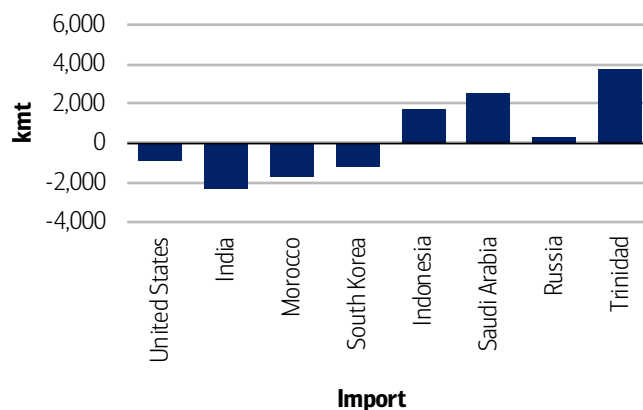


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 42: Global NH3 Trade Balance 2023**

Trinidad is the largest ammonia exporter

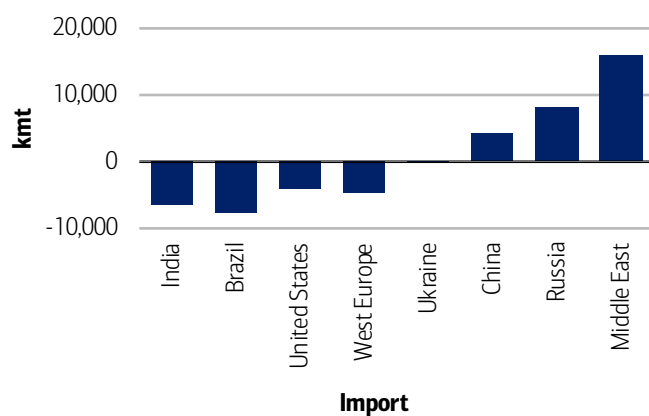


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 43: Global Urea Trade Balance 2023**

Middle East is the largest urea exporter

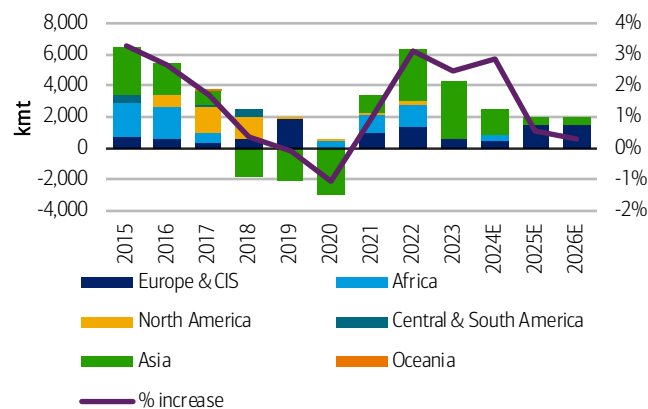


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 44: Global Urea Capacity additions by region**

Global urea capacity additions are set to decrease from the 2022 peak

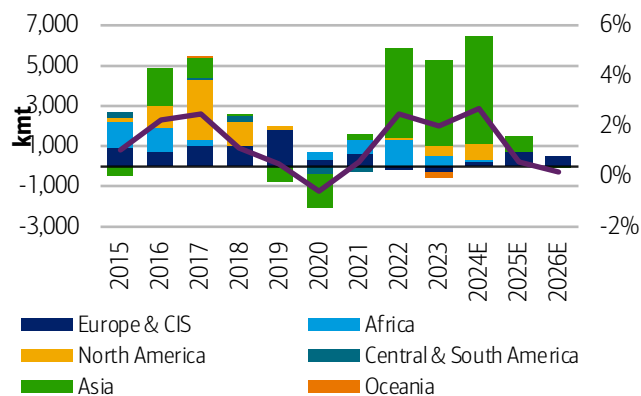


Source: BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 45: Global NH3 Capacity additions by region**

New global ammonia coming in 2022

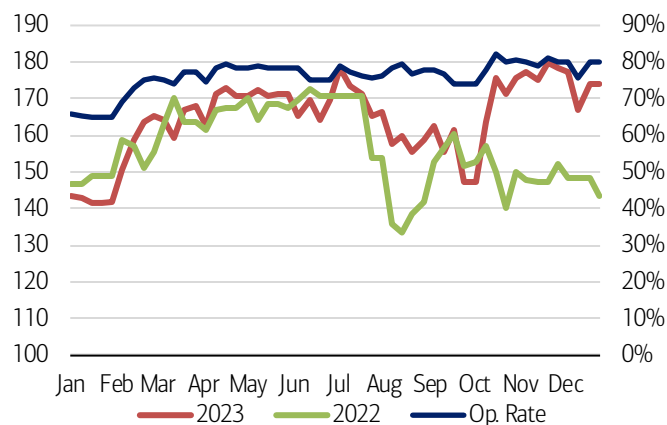


Source: CRU, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 46: Chinese Urea Daily Production (weekly kmt)**

China's urea production has dipped below year-ago levels



Source: CFMW, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 47: Chinese Urea Daily Production as a % of 5-yr max Daily production (weekly kmt)**

China's urea production is seasonally strong

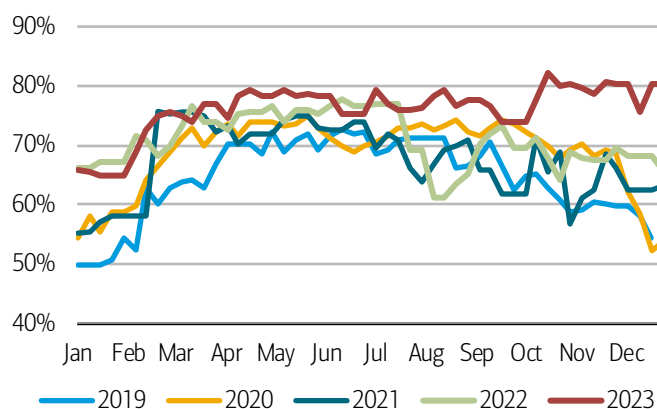


Source: CFMW, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 48: Chinese Urea Operating Rates**

Operating rates have collapsed recently

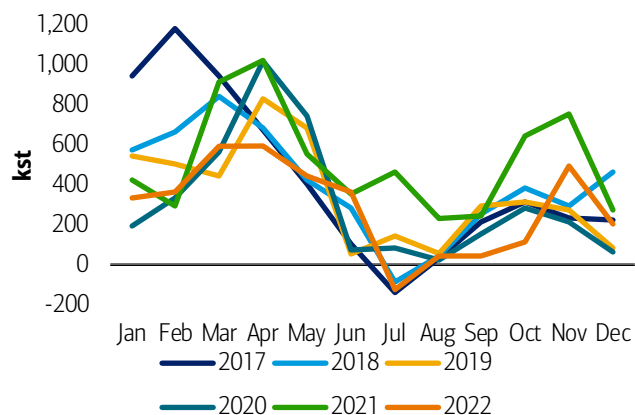


Source: CFMW, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 49: US Urea Net Imports (kst)**

Net imports running at low levels year-to-date

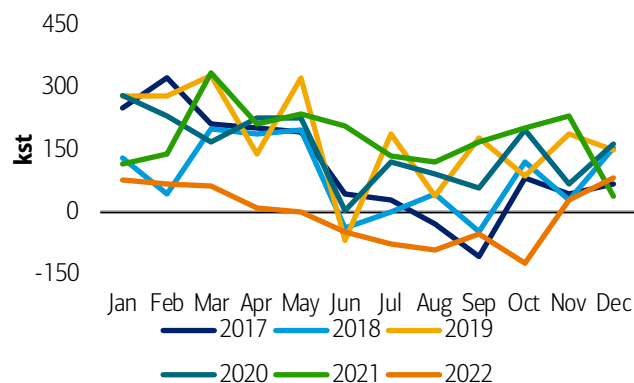


Source: TFI, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 50: US UAN net imports**

UAN net imports are down sharply

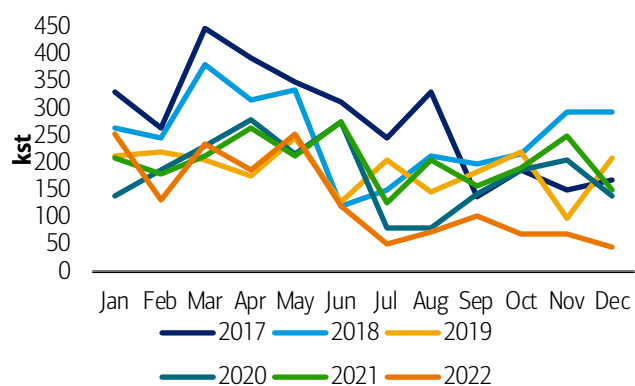


Source: TFI, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 51: US Ammonia net imports**

The US is a net importer of ammonia all year



Source: TFI, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Potash****Exhibit 52: Potash pricing overview**

Potash fertilizer prices have continued to rise

	2018	2019	2020	2021	2022	2023		1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
Potash Prices															
Midwest Spot (\$/mt)	311	333	282	569	799	466		830	875	808	684	503	495	427	439
Brazil Spot (\$/mt)	321	329	239	539	850	391		877	1115	844	565	495	383	351	335
Southeast Asia Spot (\$/mt)	279	293	245	393	781	380		656	929	873	664	494	397	309	318
Vancouver Spot (\$/mt)	281	295	229	432	795	381		755	985	828	611	497	380	326	321
China Contract (\$/mt)	247	290	242	244	550	427		432	590	590	590	590	503	307	307
India Contract (\$/mt)	257	288	248	293	573	428		523	590	590	590	590	422	382	319
	9/28	10/5	10/12	10/19	10/26	11/2	11/9	11/16	11/23	11/30	12/7	12/14	12/21	12/28	1/4
Potash Prices															
Midwest Spot (\$/mt)	422	422	424	419	438	444	441	446	446	446	446	446	446	446	438
Brazil Spot (\$/mt)	355	355	355	343	343	343	343	338	333	333	325	315	315	315	315
Southeast Asia Spot (\$/mt)	315	315	315	315	315	315	320	320	320	320	320	320	320	320	320
Vancouver Spot (\$/mt)	277	278	278	277	281	282	287	284	286	286	286	284	287	287	287
China Contract (\$/mt)	307	307	307	307	307	307	307	307	307	307	307	307	307	307	307
India Contract (\$/mt)	319	319	319	319	319	319	319	319	319	319	319	319	319	319	319

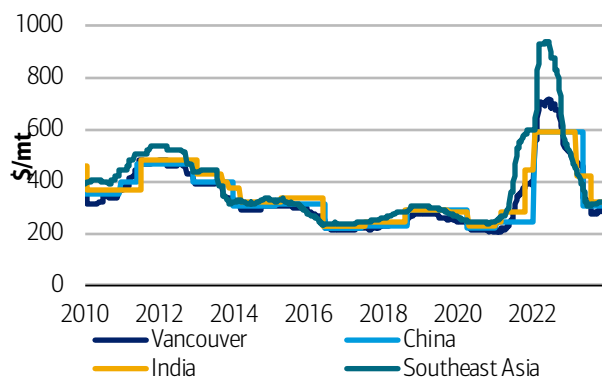
Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH



**Exhibit 53: Global Standard Potash Prices (\$/mt)**

Standard potash prices have fallen from their recent peaks but still remain elevated vs 2019 (pre-covid)

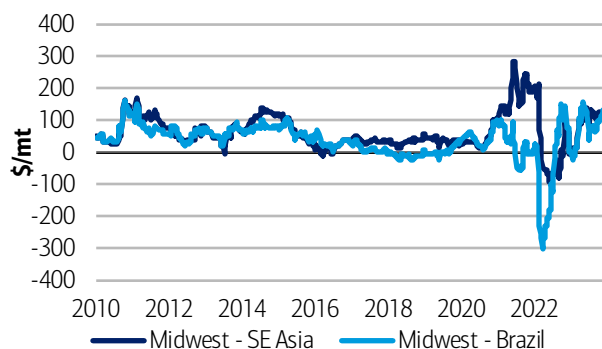


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 55: Potash Price Differentials (\$/mt)**

US Midwest potash prices trade at a discount to global ones

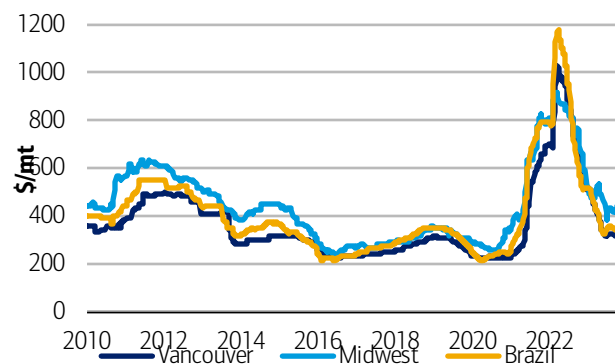


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 54: Global Granular Potash Prices (\$/mt)**

Granular potash prices are off their highs

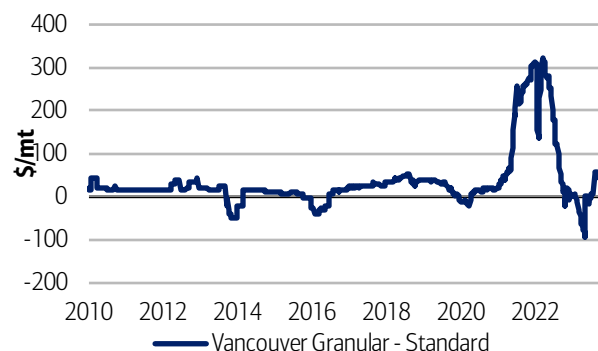


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 56: Granular Premium over Standard (\$/mt)**

The granular premium over standard has recently reversed

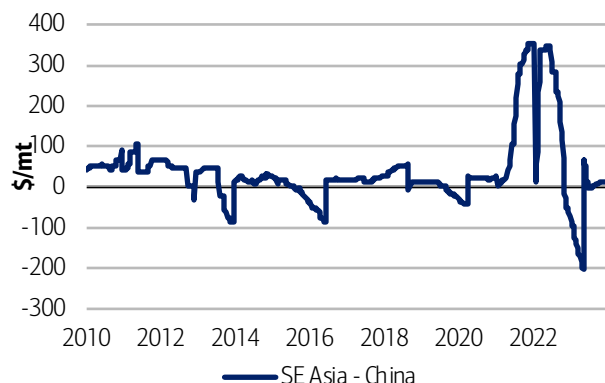


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 57: SE Asia Spot vs. China Contract (\$/mt)**

SE Asia spot potash market is well above the contract price

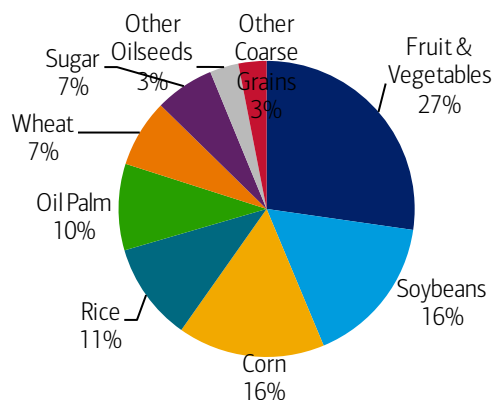


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 59: Global Potash Demand By Crop(2018)**

Potash is used on all crops

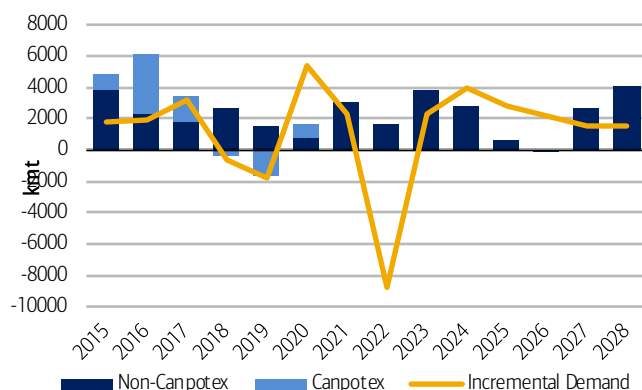


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 61: Global Capacity addition and demand growth**

Most capacity additions were expected to come from Russia

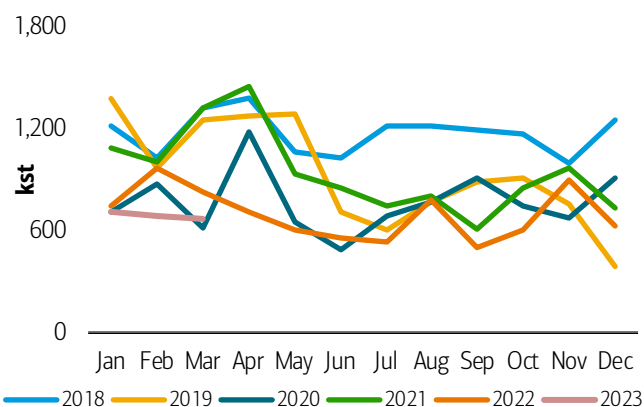


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 62: US MOP Net Imports**

The US normally imports roughly 1mnt of potash per month



Source: TFI, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 58: US NOLA vs. Brazil potash price spread**

US NOLA urea price is now far below Brazil levels

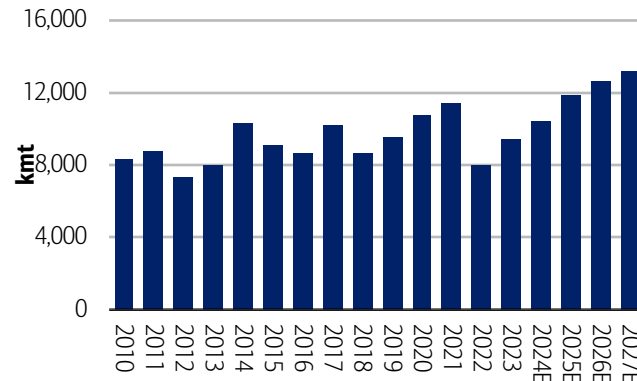


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 60: Russian Potash Exports (kmt)**

Russia remains a large potash exporter

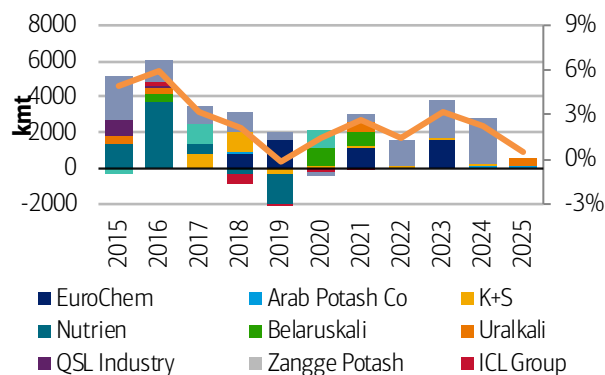


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 63: Net Potash Capacity Addition by Company**

Eurochem has significant Potash capacity to provide to the market

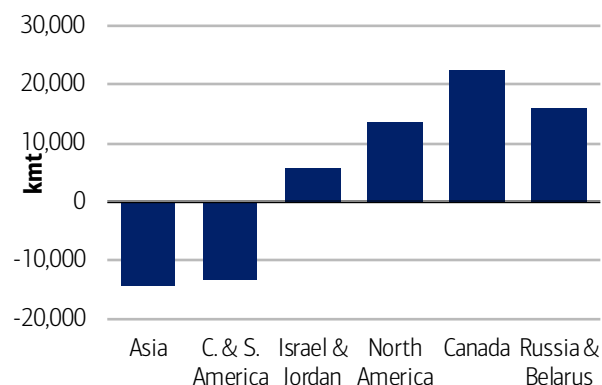


Source: CRU, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 64: Global Potash Trade Flows**

Canada &amp; FSU are key potash supply regions



Source: CRU, BofA Global Research

BofA GLOBAL RESEARCH

**Phosphate****Exhibit 65: Historical pricing data for phosphate fertilizer**

Phosphate pricing is four-fold higher than mid-2020 levels

	2018	2019	2020	2021	2022	2023		1Q22	2Q22	3Q22	4Q22	1Q23	2Q23	3Q23	4Q23
Phosphate Prices															
DAP (US Midwest, \$/mt)	471	402	384	706	912	692		928	1000	888	830	740	743	622	664
DAP (US Gulf/Tampa, \$/mt)	419	344	324	644	894	560		950	1115	838	674	644	546	501	550
DAP - barge (New Orleans, \$/mt)	435	338	346	668	846	606		880	932	833	738	676	584	559	603
DAP (China, \$/mt)	435	338	346	668	846	606		880	932	833	738	676	584	559	603
DAP (Morocco, \$/mt)	412	347	323	595	779	557		755	805	845	709	636	503	506	583
MAP (US Gulf/Tampa, \$/mt)	429	361	323	655	964	589		979	1203	917	759	685	557	524	589
MAP - barge (New Orleans, \$/mt)	418	344	322	659	898	552		959	1114	845	674	641	525	497	546
MAP (Morocco, \$/mt)	445	339	357	707	870	634		907	967	869	736	637	568	643	687
MAP (Brazil, \$/mt)	427	361	326	679	964	574		1008	1195	934	720	668	553	514	562
Feedstock Costs															
Phosphate Rock (N. Africa, FOB, \$/mt)	91	95	90	137	277	269		212	286	320	290	300	295	263	218
Ammonia, (Tampa, CFR, \$/mt)	312	247	233	604	1160	514		1168	1272	1089	1110	744	369	343	598
Sulphur, (Tampa, FOB, \$/mt)	122	83	53	166	313	97		297	481	362	110	124	107	59	98
	9/28	10/5	10/12	10/19	10/26	11/2	11/9	11/16	11/23	11/30	12/7	12/14	12/21	12/28	1/4
Phosphate Prices															
DAP (US Midwest, \$/mt)	648	648	656	656	661	661	650	650	650	650	694	694	678	678	714
DAP (US Gulf/Tampa, \$/mt)	543	543	543	540	543	550	550	550	550	550	550	560	560	560	560
DAP - barge (New Orleans, \$/mt)	584	573	587	587	592	587	581	590	601	598	615	623	623	687	642
DAP (Morocco, \$/mt)	580	590	590	590	590	590	590	590	590	590	590	585	585	585	585
MAP (US Gulf/Tampa, \$/mt)	538	538	538	538	538	545	545	545	545	545	545	560	560	560	560
MAP - barge (New Orleans, \$/mt)	689	705	717	711	683	692	697	659	650	661	664	672	678	747	689
MAP (Morocco, \$/mt)	533	543	543	543	543	545	548	573	578	578	578	578	578	578	578
MAP (Brazil, \$/mt)	533	550	550	550	550	555	558	560	563	563	563	563	563	563	563
Feedstock Costs															
Phosphate Rock (N. Africa, FOB, \$/mt)	215	215	215	215	215	215	220	220	220	220	220	220	220	220	220
Ammonia, (Tampa, CFR, \$/mt)	575	575	575	575	625	625	625	625	625	625	625	625	525	525	525
Sulphur, (Tampa, FOB, \$/mt)	55	55	102	102	102	102	102	102	102	102	102	102	102	102	102

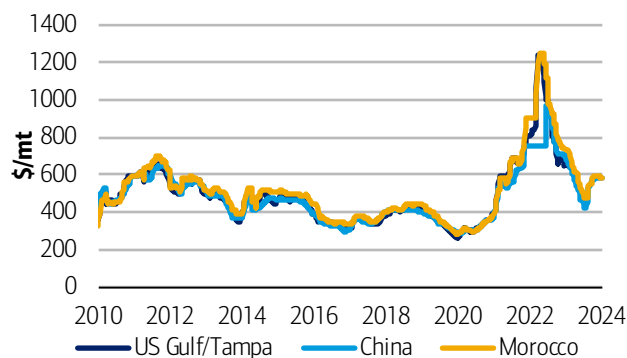
Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH



**Exhibit 66: Global DAP Prices**

DAP prices globally are up sharply

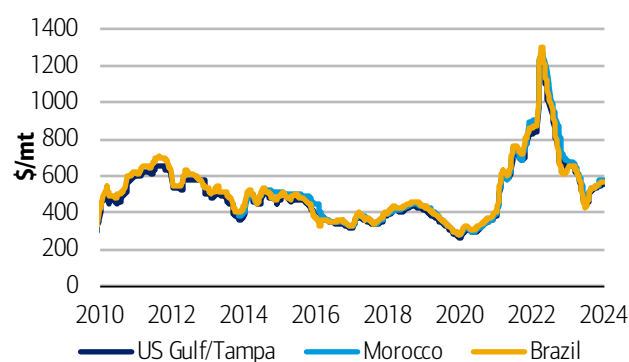


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 67: US MAP Prices (\$/mt)**

Morocco currently has the highest MAP prices

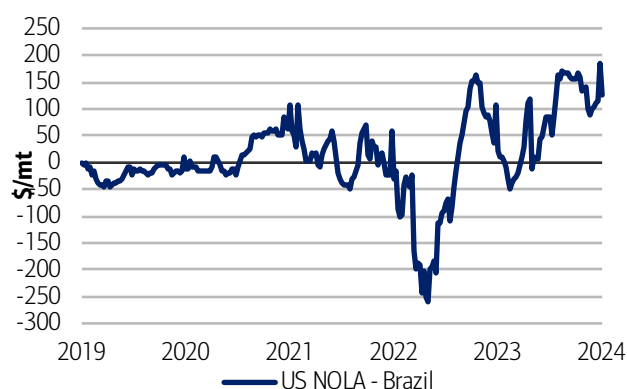


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 68: US NOLA vs Brazil phosphate price spread**

US NOLA phosphate prices is above Brazil levels

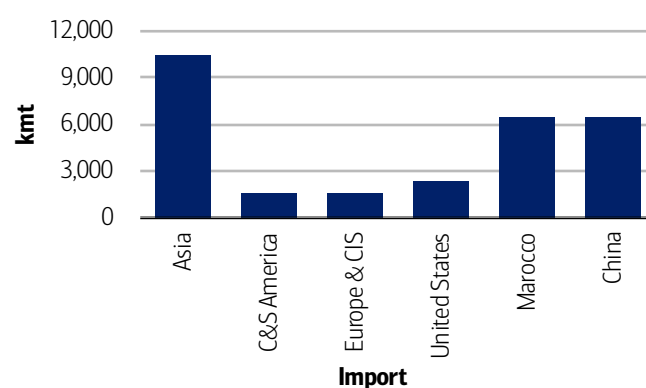


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 69: Global Phosphate Trade Flows 2021**

China is the largest phosphate importer

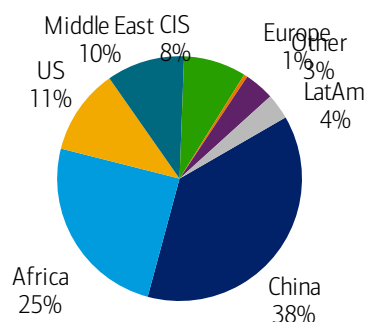


Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

**Exhibit 70: Phosphate Rock Production by Region**

China is the largest phosphate rock supplier



Source: CRU, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH



# Disclosures

## Important Disclosures

**FUNDAMENTAL EQUITY OPINION KEY:** Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. **VOLATILITY RISK RATINGS**, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. **INVESTMENT RATINGS** reflect the analyst's assessment of both a stock's absolute total return potential as well as its attractiveness for investment relative to other stocks within its Coverage Cluster (defined below). Our investment ratings are: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. An investment rating of 6 (No Rating) indicates that a stock is no longer trading on the basis of fundamentals. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster <sup>R1</sup>
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

<sup>R1</sup> 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.

**INCOME RATINGS**, indicators of potential cash dividends, are: 7 - same/higher (dividend considered to be secure), 8 - same/lower (dividend not considered to be secure) and 9 - pays no cash dividend. *Coverage Cluster* is comprised of stocks covered by a single analyst or two or more analysts sharing a common industry, sector, region or other classification(s). A stock's coverage cluster is included in the most recent BofA Global Research report referencing the stock.

BofA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible.

## Other Important Disclosures

From time to time research analysts conduct site visits of covered issuers. BofA Global Research policies prohibit research analysts from accepting payment or reimbursement for travel expenses from the issuer for such visits.

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for any recommendation in relation to an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report and in relation to a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BofA Securities trading desks.

The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

Recipients who are not institutional investors or market professionals should seek the advice of their independent financial advisor before considering information in this report in connection with any investment decision, or for a necessary explanation of its contents.

Officers of BofA or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments.

Refer to [BofA Global Research policies relating to conflicts of interest](#).

**"BofA Securities" includes BofA Securities, Inc. ("BofAS") and its affiliates. Investors should contact their BofA Securities representative or Merrill Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BofA Securities" is a global brand for BofA Global Research.**

### Information relating to Non-US affiliates of BofA Securities and Distribution of Affiliate Research Reports:

BofAS and/or Merrill Lynch, Pierce, Fenner & Smith Incorporated ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BofASE (France): BofA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF). BofA Securities Europe SA ("BofASE") with registered address at 51, rue La Boétie, 75008 Paris is registered under no 842 602 690 RCS Paris. In accordance with the provisions of French Code Monétaire et Financier (Monetary and Financial Code), BofASE is an établissement de crédit et d'investissement (credit and investment institution) that is authorised and supervised by the European Central Bank and the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers. BofASE's share capital can be found at [www.bofam.com/BofASEdisclaimer](http://www.bofam.com/BofASEdisclaimer); BofA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BofA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; BofA Europe (Madrid): Bank of America Europe Designated Activity Company, Sucursal en España, regulated by the Bank of Spain, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSCF); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Canadian Investment Regulatory Organization; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; BofAS Japan: BofA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BofAS India: BofA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority.

This information: has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BofASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BofAS Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSCF; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BofAS India; and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distributes this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of Bank of America N.A., Australia Branch, neither MLEA nor any of



its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BofA Europe (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BofA Securities entities, including BofA Europe and BofASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BofA Securities group. You may be contacted by a different BofA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please refer to the [Electronic Communications Disclaimers](#) for further information.

This information has been prepared and issued by BofAS and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BofAS and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for information distributed to BofAS and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BofAS and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information. For clients that are not accredited investors, expert investors or institutional investors Merrill Lynch (Singapore) Pte Ltd accepts full responsibility for the contents of this information distributed to such clients in Singapore.

#### General Investment Related Disclosures:

Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BofA Securities. This document provides general information only, and has been prepared for, and is intended for general distribution to, BofA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute, investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document.

Securities and other financial instruments referred to herein, or recommended, offered or sold by BofA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. Digital assets are extremely speculative, volatile and are largely unregulated. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

This report may contain a short-term trading idea or recommendation, which highlights a specific near-term catalyst or event impacting the issuer or the market that is anticipated to have a short-term price impact on the equity securities of the issuer. Short-term trading ideas and recommendations are different from and do not affect a stock's fundamental equity rating, which reflects both a longer term total return expectation and attractiveness for investment relative to other stocks within its Coverage Cluster. Short-term trading ideas and recommendations may be more or less positive than a stock's fundamental equity rating.

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned herein. Investors in such securities and instruments, including ADRs, effectively assume currency risk.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information.

In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS). If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

#### Copyright and General Information:

Copyright 2024 Bank of America Corporation. All rights reserved. iQdatabase® is a registered service mark of Bank of America Corporation. This information is prepared for the use of BofA Securities clients and may not be redistributed, retransmitted or disclosed, in whole or in part, or in any form or manner, without the express written consent of BofA Securities. BofA Global Research information is distributed simultaneously to internal and client websites and other portals by BofA Securities and is not publicly-available material. Any unauthorized use or disclosure is prohibited. Receipt and review of this information constitutes your agreement not to redistribute, retransmit, or disclose to others the contents, opinions, conclusion, or information contained herein (including any investment recommendations, estimates or price targets) without first obtaining express permission from an authorized officer of BofA Securities.

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS or any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein. Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies. Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.

