BofA SECURITIES

Metals Strategist

The copper supply crisis is here

Correlations decouple as metals dance to their own tune

The mined commodities usually follow the business cycle closely. Yet, some of these correlations have broken down: copper has rallied, as iron ore has dropped. Is that sustainable? Yes, in our view, as raw materials increasingly "dance to their own tune". We expect the supply constrained MIFTs (metals important for future technologies) copper, in particular, as it is at the epicentre of the energy transition) to benefit from: (1) investment in green technologies; (2) a rebound of the global economy; (3) restocking; and (4) rate cuts. Meanwhile, the fundamentals of the bulk commodities, the PGMs (platinum group metals) or lithium, do not look quite as constructive.

Base metals: the copper supply crisis is here

Tight **copper** mine supply is increasingly constraining refined production: the much-discussed lack of mine projects is finally starting to bite. Similarly, **aluminium** production growth has halved. Keeping in mind the steady demand backdrop, we are therefore bullish both metals and see copper and aluminium rising to an average US$12,000/t (US$5,44/lb) and US$3,250/t (US$1.47/lb) by 2026. China dialling back on its green investment is a key risk to that bullish forecast. We also expect a **zinc** deficit this year as mine supply is likely to disappoint.

Precious metals: gold and silver rally

Gold and **silver** are among our most preferred commodities, with the yellow metal pushed up by central banks, China investors and, increasingly, Western buyers on a confluence of macro factors, including an end to hiking cycles. Accordingly, we see the yellow metal rally to US$3,000/oz by 2025. **Silver** benefits from that too, with prices also boosted by stronger industrial demand. This could take prices above US$30/oz within the next 12 months. Meanwhile, **palladium** prices are set to trend lower; given palladium demand is dominated by auto catalysts, it should also underperform **platinum**.

Steel and bulks: iron ore rally subsides

The bulk commodities, including **iron ore** and **coal**, have had a good run, but are now rebalancing, likely keeping prices capped near-term. Protectionism has given US steel mills significant pricing power, which should push **hot rolled coil** up again as the economy bottoms out, infrastructure spending remains strong and lead times expand.

MIFTs and exotics: cautious lithium/REE, bullish uranium

Meanwhile, we acknowledge the recent rally in spodumene prices, but production discipline is still the name of the game in **lithium**. Hence, we see upside capped for now, with scope for a more sustained rally once projects are curtailed. We are also constructive on **uranium** as years of inventory drawdowns are compounding. We recently also lowered our **rare earths** forecasts, but see an end to the destocking in **diamonds.**

08 April 2024

Commodities
Global

Global Commodity Research
BofA Europe (Madrid)

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

Francisco Blanch
Commodity & Deriv Strategist
BofA Europe (Madrid)
+34 91 514 3070
francisco.blanch@bofa.com

Warren Russell, CFA
Commodity Strategist
BofAS
+1 646 855 5211
warren.russell@bofa.com

Rachel Wiser
Commodity Strategist
BofAS
+1 646 743 4069
rachel.wiser@bofa.com

Andy Pham
FICC Quant Strategist
BofAS
+1 646 743 3365
apham3@bofa.com

Equity Research
Jason Fairclough >>
Research Analyst
MLI (UK)
jason.fairclough@bofa.com

Matty Zhao >>
Research Analyst
Merrill Lynch (Hong Kong)
matty.zhao@bofa.com

Lawson Winder, CFA >>
Research Analyst
Merrill Lynch (Canada)
lawson.winder@bofa.com

Chen Jiang >>
Research Analyst
Merrill Lynch (Australia)
chen_jiang@bofa.com

Sathish Kasinathan
Research Analyst
BofAS
sathish.kasinathan@bofa.com

See Team Page for List of Analysts

In this report, we make several changes to our short- and long-term commodities forecasts. See Exhibit 1 for details.

Contents

Overview: constructive outlook

Price forecasts: mined commodities could push higher

Moving into the second quarter, we update our price forecasts. Most notably, the much-discussed lack of mine projects is becoming an increasing issue for **copper**. This, along with investment in green technologies and a rebound of the global economy, should lift prices to US$10,250/t (465c/lb) by 4Q24. Similarly, while we mark-to-market **aluminium** down, we also expect a cyclical rebound to support the white metal. Meanwhile, given the Sino-Indonesian overinvestment in capacity, **nickel** should, for now, continue to trade at marginal cost. Finally, we are also bullish **zinc** as mine supply may once again disappoint this year.

Exhibit 1: BofA price forecasts
We lift copper, gold, silver and lithium forecasts

		2024E			2025E		
		New	Old	Change	New	Old	Change
Base metals							
Aluminium	$/t	2,447	2,563	-4.5%	3,000	3,000	0.0%
	c/lb	111	116	-4.5%	136	136	0.0%
Copper	$/t	9,321	8,625	8.1%	10,750	10,500	2.4%
	c/lb	423	391	8.1%	488	476	2.4%
Lead	$/t	2,022	2,000	1.1%	1,750	1,750	0.0%
	c/lb	92	91	1.1%	79	79	0.0%
Nickel	$/t	17,460	18,750	-6.9%	17,625	20,000	-11.9%
	c/lb	792	851	-6.9%	800	907	-11.9%
Tin	$/t	27,919			26,500		
	$/t	1,266			1,202		
Zinc	$/t	2,706	2,375	13.9%	2,688	2,250	19.4%
	c/lb	123	108	13.9%	122	102	19.4%
Precious metals							
Gold	nominal, $/oz	2,317	1,975	17.3%	2,513	2,150	16.9%
	real, $/oz	2,317	1,975	17.3%	2,451	2,098	16.9%
Silver	nominal, $/oz	26.46	23.26	13.8%	32.50	24.75	31.3%
	real, $/oz	26.46	23.26	13.8%	31.7	24.15	31.3%
Platinum	$/oz	990	1,050	-5.7%	1,000	1,250	-20.0%
Palladium	$/oz	844	750	12.6%	600	500	20.0%
Bulk Commodities							
Iron ore fines	$/t cif	107	125	-14.1%	90	90	0.0%
Hard coking coal	$/t fob	280	270	3.6%	230	215	7.0%
Semi-soft	$/t fob	193	178	8.3%	152	142	7.0%
Thermal Coal	$/t fob	145	150	-3.6%	125	125	0.0%
MIFTs and other commodities							
Lithium spodumene	$/t	1,107	650	70.3%	1,488	1,438	3.5%
Lithium carbonate	$/t	14,135	10,500	34.6%	16,313	15,500	5.2%
Lithium hydroxide	$/t	13,304	11,613	14.6%	17,313	17,000	1.8%
Alumina	$/t	347	340	2.0%	348	348	0.0%
Cobalt	$/lb	16.0	18.0	-11.3%	16.0	18.0	-11.3%
Uranium	$/lb	105.0	105.0	-0.0%	120.0	115.0	4.3%
Molybdenum	$/lb	19.9	18.1	10.1%	19.9	18.1	10.1%
Manganese ore	$/lb	4.2	4.3	-3.9%	4.2	4.3	-3.9%
Steel							
Northern Europe	$/t	683	683	0.0%	714	714	0.0%
North America	$/t	937	959	-2.3%	882	799	10.3%
China	$/t	595	595	0.0%	602	602	0.0%

Source: BofA Global Research

BofA GLOBAL RESEARCH

Gold remains one of our favourite metals and we expect prices to average US$2,500/oz by the fourth quarter, potentially hitting US$3,000/oz by 2025. Notably, demand from central banks and China's retail buyers has been strong. If Western investors join the party on rate cuts, the yellow metal will move a leg higher; this may also be necessary, if sentiment in China improves, and less investment flows into gold. **Silver** should also benefit from lower rates, but will likely outperform gold as industrial demand rebounds and PV (photovoltaic) manufacturers move to panels that require more of the precious

metal. Meanwhile, the **PGMs** are challenged given demand is heavily exposed to cars with internal combustion engines, which are losing market share to EVs (electric vehicles). Given the lack of production discipline, we are particularly concerned about palladium, which will likely continue to underperform platinum whose demand is less exposed to the auto industry.

The bulk commodities, including **iron ore** and **coal**, have had a good run, but are now rebalancing, likely keeping prices capped near term. Protectionism has given US steel mills significant pricing power, which should push **hot rolled coil** up again as the economy bottoms out, infrastructure spending remains strong and lead times expand.

Meanwhile, we acknowledge the recent rally in spodumene prices, but production discipline is still the name of the game in **lithium**. Hence, we see upside capped for now, with scope for a more sustained rally once projects are curtailed. We are also constructive on **uranium** as markets remain in deficit and several years of inventory drawdowns are now compounding. We recently also lowered our **rare earths** forecasts, but see an end to the destocking in **diamonds**.

Exhibit 2: Quarterly and annual price forecasts
We see copper, aluminium, gold and silver end the year higher

		Current	1Q24	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	2023	2024E	2025E	2026E	2027E	2028E	LT price
Base metals															
Aluminium	US$/t	2,413	2,240	2,300	2,500	2,750	3,000	3,000	2,254	2,447	3,000	3,250	3,015	2,781	2,546
	USc/lb	109	102	104	113	125	136	136	102	111	136	147	137	126	115
Copper	US$/t	9,209	8,534	9,000	9,500	10,250	10,500	10,500	8,484	9,321	10,750	12,000	11,206	10,411	9,617
	USc/lb	418	387	408	431	465	476	476	385	423	488	544	508	472	436
Lead	US$/t	2,098	2,087	2,000	2,000	2,000	1,750	1,750	2,136	2,022	1,750	2,024	2,217	2,409	2,602
	USc/lb	95	95	91	91	91	79	79	97	92	79	92	101	109	118
Nickel	US$/t	17,638	16,839	17,500	17,500	18,000	18,000	17,500	21,483	17,460	17,625	17,500	17,475	17,449	17,424
	USc/lb	800	764	794	794	817	817	794	974	792	800	794	793	792	790
NPI, 8-12%	CNY/t	930	938	975	975	1,003	1,003	975	1,131	973	982	975	1,053	1,132	1,210
Tin	US$/t	28,771	26,175	28,000	28,500	29,000	26,500	26,500	25,922	27,919	26,500	25,500	25,333	25,167	25,000
	USc/lb	1,305	1,187	1,270	1,293	1,315	1,202	1,202	1,176	1,266	1,202	1,157	1,149	1,142	1,134
Zinc	US$/t	2,601	2,475	2,600	2,750	3,000	2,750	2,500	2,648	2,706	2,688	2,424	2,596	2,769	2,942
	USc/lb	118	112	118	125	136	125	113	120	123	122	110	118	126	133
Precious metals															
Gold, nominal	US$/oz	2,334	2,069	2,300	2,400	2,500	2,500	2,300	1,943	2,317	2,513	2,625	2,448	2,270	2,093
Gold, real	US$/oz		2,069	2,300	2,400	2,500	2,439	2,244	1,943	2,317	2,451	1,995	1,946	1,898	1,850
Silver, nominal	US$/oz	27.80	23.33	26.00	27.50	29.00	31.00	29.00	23.39	26.46	32.50	35.00	33.14	31.28	29.42
Silver, real	US$/oz		23.33	26.00	27.50	29.00	30.24	28.29	23.39	26.46	31.71	33.31	30.88	28.44	26.00
Platinum	US$/oz	939	910	950	1,000	1,100	1,000	1,000	967	990	1,000	950	1,124	1,297	1,471
Palladium	US$/oz	1,014	978	900	800	700	600	600	1,340	844	600	500	824	1,147	1,471
		Current	**1Q24**	**2Q24E**	**3Q24E**	**4Q24E**	**1Q25E**	**2Q25E**	**2023**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**LT price**
Bulk Commodities															
Hard coking coal	US$/t fob	224	308	240	280	290	290	200	296	280	230	220	222	224	226
Semi-soft	US$/t fob	148	238	158	185	191	191	132	220	193	152	145	134	133	132
Thermal Coal	US$/t fob	129	127	148	151	153	125	125	176	145	125	112	112	113	113
Iron ore fines	US$/t CIF	99	120	100	100	110	90	90	120	107	90	90	94	98	102
		Current	**1Q24**	**2Q24E**	**3Q24E**	**4Q24E**	**1Q25E**	**2Q25E**	**2023**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**LT price**
Other materials															
Lithium spodumene	US$/t	1,035	927	1,200	1,100	1,200	1,200	1,500	3,821	1,107	1,488	1,750	1,650	1,550	1,450
Lithium carbonate	US$/t	14,100	13,789	14,500	13,750	14,500	15,250	16,000	40,469	14,135	16,313	18,000	18,667	19,333	20,000
Lithium hydroxide	US$/t	14,100	11,965	14,000	13,250	14,000	14,750	17,500	44,500	13,304	17,313	19,500	20,167	20,833	21,500
Alumina	$/t	372	367	340	340	340	348	348	344	347	348	357	375	394	412
Uranium	$/lb		96.90	95.00	110.00	118.00	115.00	120.00	60.17	104.98	120.00	135.00	110.00	85.00	60.00
Molybdenum	$/lb	19.5	19.93	19.93	19.93	19.93	19.93	19.93	24.12	19.93	19.93	19.93	17.54	15.15	12.76
Cobalt	$/lb	16.4	15.96	15.96	15.96	15.96	15.96	15.96	17.38	15.96	15.96	18.44	19.84	21.23	22.63
Manganese ore	$/dmtu	4.20	4.18	4.18	4.18	4.18	4.18	4.18	4.74	4.18	4.18	4.93	5.52	6.11	6.70
Steel, HRC															
HRC, Europe	US$/t	627	719	701	639	674	721	702	767	683	714				
HRC, US	US$/t	920	1,024	1,009	909	805	882	882	993	937	882				
HRC, China	US$/t	512	568	585	602	623	592	597	565	595	602				

Source: BofA Global Research

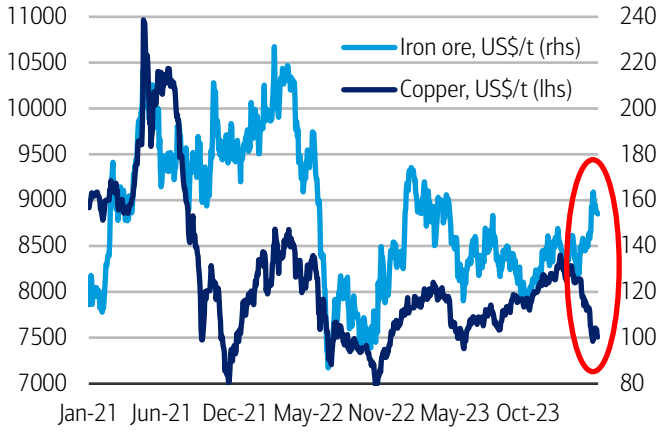
BofA GLOBAL RESEARCH

Overview: green spending and economic rebound

Copper versus iron ore: green economy versus old economy

Prices of the mined commodities usually follow the business cycle closely. Yet, Exhibit 3 highlights that copper has rallied, at the same time as iron ore has dropped. Is that sustainable? Yes, in our view, as these two raw materials and other commodities increasingly "dance to their own tune".

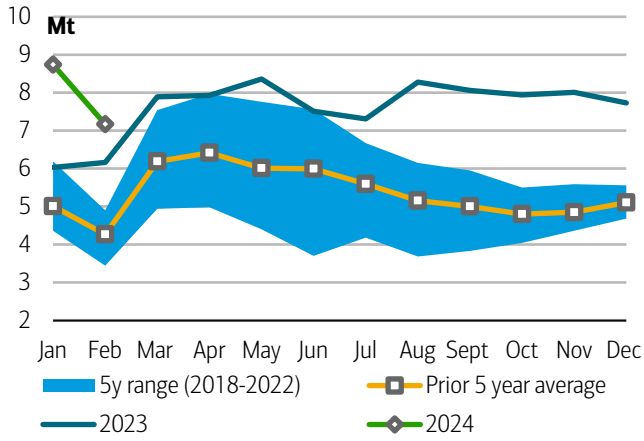
Exhibit 3: Copper and iron ore prices
Prices movements have diverged of late



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 4: China, steel exports
Steel shipments have been extremely high



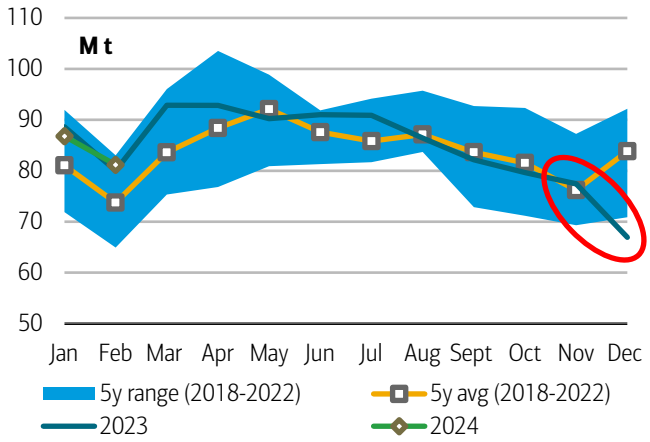
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Taking a closer look into the fundamental backdrop, Exhibit 4 shows that China's steel exports have been extremely high on weak domestic demand, partially because the property market remains under pressure. Indeed, this prompted unseasonal steel production cuts late last year (Exhibit 5).

Meanwhile, copper's fundamentals look very different, with Exhibit 6 outlining that apparent demand (refined production + net imports - inventory changes) has rallied by 23% YoY YTD, partially because spending on the green economy has held up. Beyond that, globally, there is a trickle of other sectors, including data centres, that have been adding to consumption. Mine supply is also increasingly constraining refined production, with China's smelters discussing a 5-10% production cut of late (more on this below).

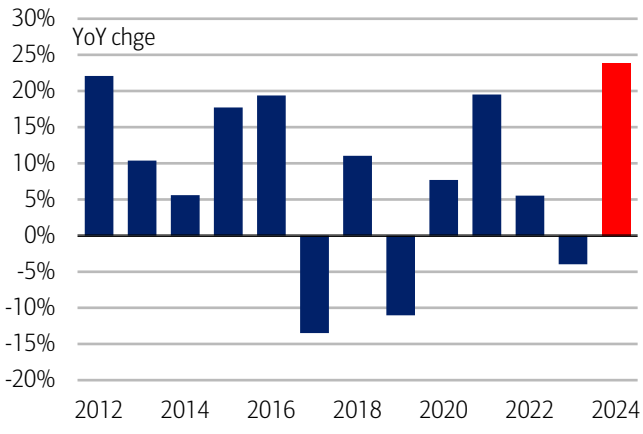
Exhibit 5: China steel production
Steel production has been declining unseasonally in 4Q23



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 6: China apparent copper demand YTD
Apparent copper demand was very healthy in January and February



Source: Bloomberg, CRU, Woodmac, BofA Global Research

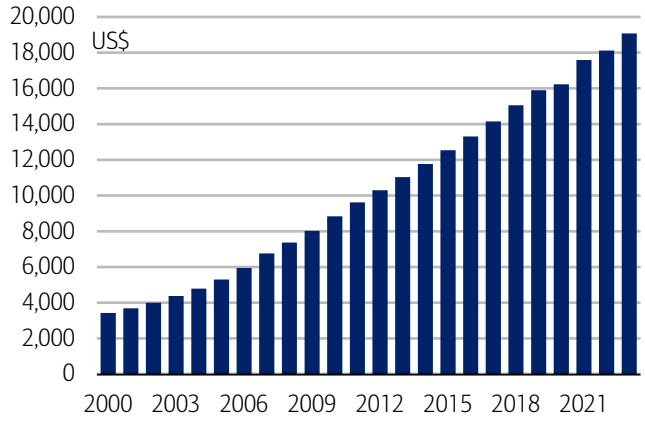
BofA GLOBAL RESEARCH

China has a structural issue

Productivity growth has slowed; debt is less effective in generating growth

Sticking with headwinds in China, the country industrialised rapidly after joining the WTO in 2001, with GDP per capita rising almost tenfold over the past 20 years (Exhibit 7). Yet those growth rates have now slowed visibly (Exhibit 8). This deceleration is not unusual for emerging markets, often giving rise to concerns about falling into the middle-income trap, whereby rising wages erode competitiveness, making it hard for EMs to compete with DMs, which tend to be more productive and innovative.

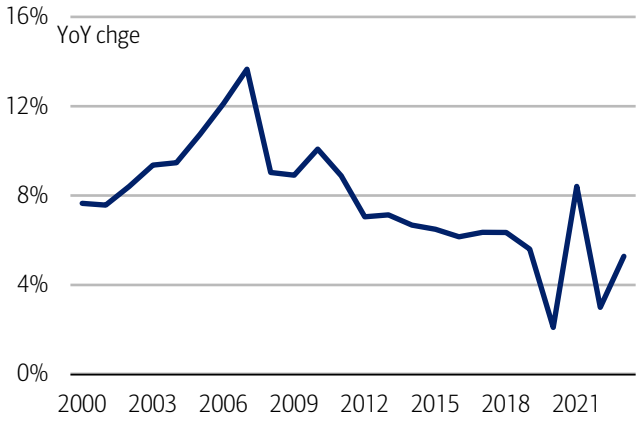
Exhibit 7: China GDP per capita
GDP per capita has risen steadily



Source: IMF, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 8: China GDP per capita growth
The growth in GDP per capita has slowed gradually

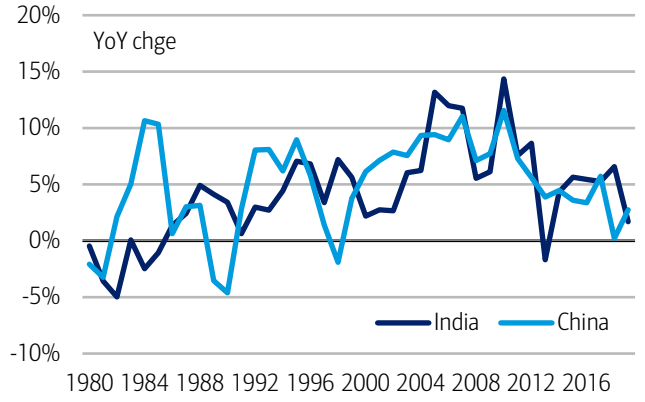


Source: IMF, BofA Global Research

BofA GLOBAL RESEARCH

These issues are reflected in various growth metrics. Exhibit 9, for instance, shows that China outpaced India's productivity growth in the decade before the Global Financial Crisis, but it has since fallen behind. The structural headwinds to growth have also been mirrored in debt dynamics, with China now forced to spend more to generate a unit of GDP growth (Exhibit 10). Overcapacity, not just in housing, is a big issue.

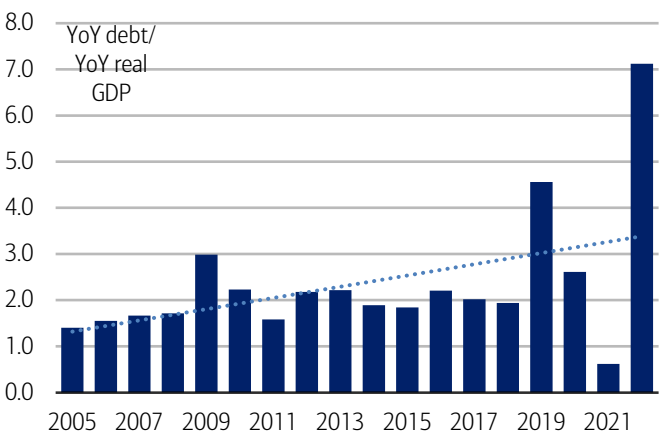
Exhibit 9: Labour productivity per hour worked
China has fallen behind India



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 10: China debt versus real GDP increases
Debt has delivered less bang for the buck



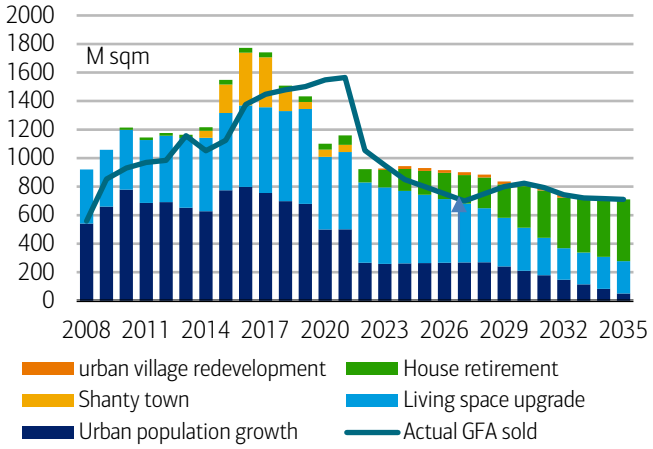
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Housing – inventory overhang an issue

China's housing market has historically accounted for around one-third of domestic copper demand. However, we argue that the sector is in structural decline (Exhibit 11), with housing demand set to fall gradually in the coming years. Exhibit 12 shows that housing starts are running well below demand.

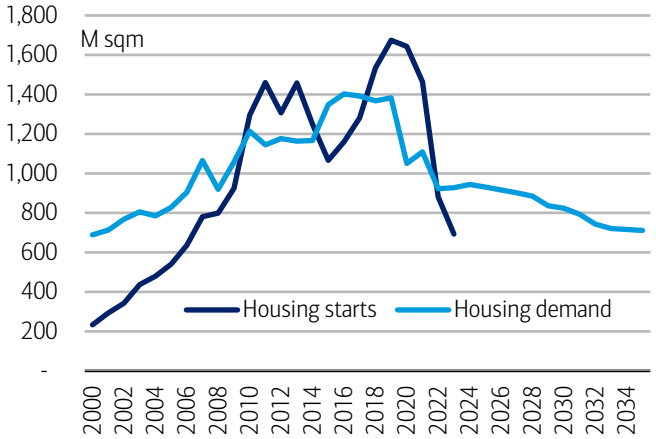
Exhibit 11: China, housing demand
The demand in China for housing will likely keep trending lower



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 12: China, housing demand and housing starts
Housing starts are running well below demand



Source: BofA Global Research

BofA GLOBAL RESEARCH

Our China property team estimates that vacant secondary stocks represent five to six years of new home demand, so mathematically, new home demand can be satisfied entirely by vacant secondary stocks for now.

Exhibit 13: China, housing markets
Activity is set to contract

	2023	2024E (new)
National sales volume	-8.20%	5% to 10% drop
National sales value (commodity housing only)	-6.00%	9% to 16% drop
Residential new starts	-21.00%	9% to 15% drop
Residential Completion	17.20%	5%-10% drop

Source: BofA Global Research

BofA GLOBAL RESEARCH

For housing starts to stabilise, secondary stock owners need to stop putting their vacant units up for sale (possible if they feel more confident, or if prices keep falling to below cost level), or new starts will have to run low for a few years to allow destocking to take place. Either way, while the property sector has been stabilising at a low level, it is unlikely to make a meaningful contribution to commodities demand again. That's why other sectors, including grid investment and car production, matter so much.

China tackling shortcomings, which matters for metals

Encouragingly for the metals, the Chinese authorities have acknowledged the issues at hand and are investing heavily in updating the country's industrial base to give the economy a sustained boost. Indeed, maintaining elevated growth is a focus of China's Communist Party (CCP), so it is not surprising that the authorities are increasingly concerned about issues like youth unemployment. The government's ambitions have been captured in industrial policies like Made in China 2025, which targets making China the leading manufacturing power by 2049. Importantly for commodities, many of the industries with government focus are metals intensive. New materials, along with energy savings and new energy vehicles, are seen as critical for the country.

Indeed, the government takes a hands-on approach to industrial policy, guiding on capital allocation, policy coordination and tech-related innovation. Of course, this ultimately aims at lifting the country out of the middle-income trap through transformation of the manufacturing base, which is set to focus on higher value-adding activity that is increasingly independent of foreign technology.

Exhibit 14: Key milestones in China
China aims to be the leading manufacturing power by 2049

Main Steps	Milestones
2025	Major manufacturing power
2035	Global manufacturing power
2049	Leading manufacturing power

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 15: China's 10 core industries
The government focuses on 10 core industries, many of which are metals-intensive

Source: BofA Global Research

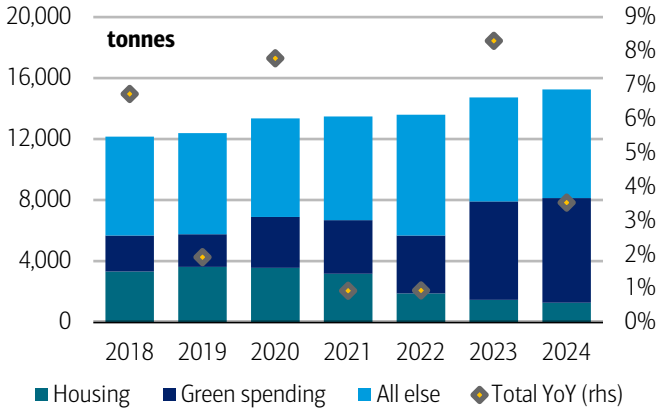
BofA GLOBAL RESEARCH

Notwithstanding, the three Ds – deflation, debt and demographics – are formidable challenges for the CCP. Managing those, while reconfiguring the economy will be tricky. Wider demand weakness is the key issue in China, and that is unlikely to be remedied by measures targeting the supply side of the economy, like credit easing. Indeed, the government has been putting together a policy mix that should lift sentiment. Testament to that, the authorities are now looking to boost equity markets. Overall, from a metals perspective, we are focused on how committed the authorities are to invest in the 10 core industries to sustain metals demand.

Demand supported by green spending

Exhibit 16 highlights that China's focus on the energy transition already made a big contribution to copper offtake in 2023, more than offsetting weakness in the housing market.

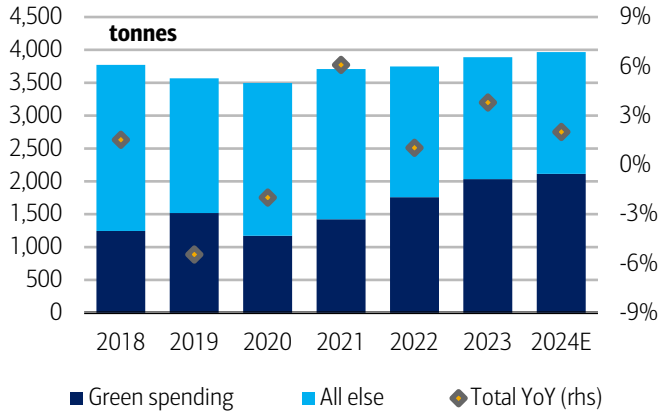
Exhibit 16: China copper demand
Green spending has offset the weakness in the housing market



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 17: Europe copper demand
Green spending has been adding to copper demand in Europe



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

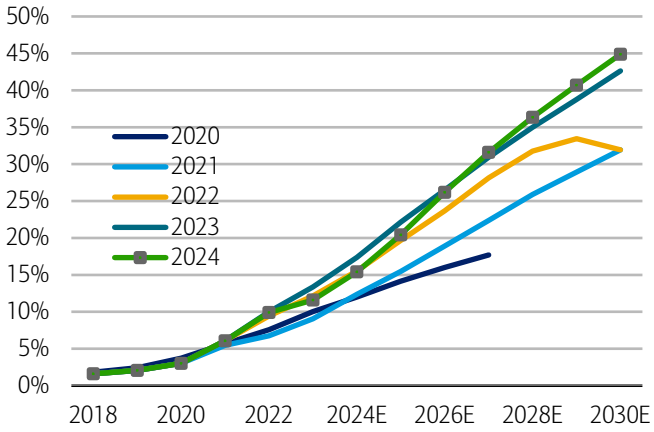
While China's State Grid is targeting CNY500bn of grid investment this year, slightly below 2023's level, spending by the Grid should nonetheless support consumption. Other countries also remain focused on facilitating the energy transition, so demand for copper-containing renewables will likely be healthy ex-China too. Exhibit 17 shows our assumptions for Europe, highlighting that demand is likely pulling higher in that region too, despite the weak macroeconomic backdrop. What other sectors beyond renewables are also supporting demand? We answer this question in the sections below.

Autos – an important growth driver; lowering EV penetration rates

We have lowered EV penetration rates

Looking at transportation, usually 10% of copper demand, we have cut electric vehicle penetration rates from 17.4% to 15.4% in 2024, shown in Exhibit 18.

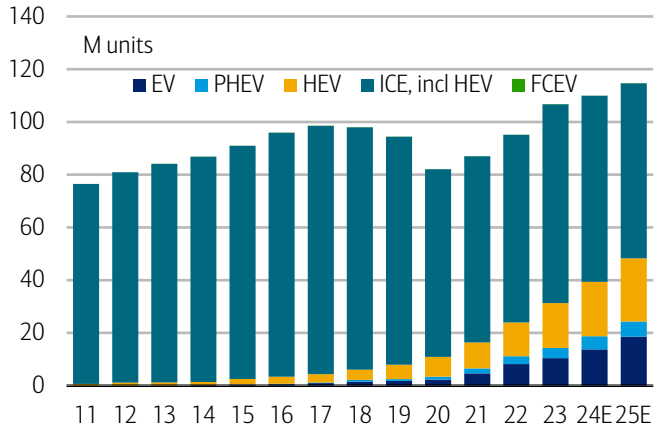
Exhibit 18: EV penetration rates
We have reduced EV penetration rates in 2024 and 2025



Source: Platts, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 19: Global car production
Car production is expanding



Source: Platts, BofA Global Research

BofA GLOBAL RESEARCH

This matters because EVs have a higher copper content than internal combustion engine cars. Notwithstanding, Exhibit 19 shows that total car production should still expand. Pulling this together, global copper demand from transportation is set to increase by around 5% this year. Yet, factoring in lower EV penetration rates, we have reduced copper demand by around 200kt pa in 2024 and 2025, or around 0.7% of global consumption, compared to our previous forecasts.

Less copper needed in new EVs, but still more than in traditional cars

Car technology, which is transforming rapidly, is another focus and we follow changes to the power system closely. There are two electricity circuits in an EV: one for the drivetrain and an ancillary system. Tesla recently announced a shift toward a 48V architecture in the ancillary system, which currently runs on 12V in all cars, even in EVs. Working through the numbers, Tesla said that a 48V system may require 75% less copper. The drivetrain battery contains around 40kg of copper, which is just under 50% of the total EV copper content. Assuming the drivetrain is unchanged, Tesla's comments imply that the total copper content would fall by around 38% or by 30kg to 50kg, compared to 30kg in an internal combustion engine car. Therefore, updating the ancillary infrastructure does reduce the copper intensities of EVs, but these vehicles still need more copper than traditional cars. Copper demand should therefore increase, as long as more cars are put on the road.

Data centres will add 500Kt to copper demand by 2026

Against the backdrop of rising metals demand from the electrification of the global economy, there is increased focus on the impact of investment in data centres and artificial intelligence on the mined commodities. Copper, in particular, has been discussed and is important in two sets of applications:

- **Cabling** within the data centre, acknowledging that there is an ongoing debate on whether fibre or copper cables will ultimately prevail;
- **Electricity** network, i.e., power generation and transmission/distribution.

Sticking with the second bullet point, electricity demand in data centres comes from three processes; these matter for efforts to reduce electricity intensity:

- **Computing** accounts for 40% of electricity demand;
- **Cooling** requirements to achieve stable processing efficiency make up about another 40%;
- Other **associated IT equipment** accounts for the remaining 20%; this includes the power supply system, storage devices and communication equipment.

All in, the IEA[1] estimates that data centres, cryptocurrencies, and artificial intelligence consumed about 460TWh of electricity worldwide in 2022, equivalent to around 1.7% of total demand.

Exhibit 20: Regional breakdown of electricity demand, 2021-26
Electricity demand is set to grow in all regions

TWh	2021	2022	2023	2026	2022/21	2023/22	CAGR 2024-26
Africa	753	765	780	887	1.6%	2.0%	4.4%
Americas	6,219	6,382	6,353	6,677	2.6%	-0.5%	1.7%
of which US	4,170	4,277	4,208	4,404	2.6%	-1.6%	1.5%
APAC	13,193	13,733	14,394	16,459	4.1%	4.8%	4.6%
of which China	8,307	8,615	9,164	10,573	3.7%	6.4%	4.9%
Eurasia	1,302	1,316	1,335	1,386	1.1%	1.4%	1.3%
Europe	3,813	3,674	3,586	3,845	-3.6%	-2.4%	2.4%
of which EU	2,736	2,651	2,568	2,749	-3.1%	-3.1%	2.3%
Middle East	1,172	1,210	1,235	1,347	3.2%	2.1%	2.9%
World	26,452	27,080	27,683	30,601	2.4%	2.2%	3.4%

Source: IEA, BofA Global Research

BofA GLOBAL RESEARCH

Global electricity consumption of data centres, cryptocurrencies and artificial intelligence is set to range from 620-1,050TWh in 2026, with a base case estimate of around 800TWh. Of course, the trajectory of electricity demand from data centres falls within a relatively wide range because technology is evolving fast:

- More **efficient cooling systems** can lower electricity demand by 10%. Research shows that power consumption can be reduced by as much as 20% when operating with direct-to-chip water cooling and specific low viscous fluids to cool all other components.
- **Machine learning** can reduce the electricity demand from servers by optimising their adaptability to different operating scenarios. Google reported its DeepMind AI reduced electricity demand of its data centre cooling systems by 40%.

So what does that mean for copper demand? Exhibit 20 implies that the share of data centres, AI and crypto should increase to 2.6% of electricity demand by 2026. Or put differently: demand is set to increase by 3,521TWh, with IT contributing 340TWh, or 10%, to that number. We assume that copper demand from electricity will rise by 4.7Mt between 2022 and 2026. This number does not include data centres outright. Hence, global copper consumption could be around 500Kt higher by 2026 than we had originally assumed; to put this into context, this is equivalent to a 2% uplift to last year's 26.1Mt. In our view, this is not a game-changer, but definitely an additional contribution to a persistent creep higher in the use of the red metal.

[1] IEA, Electricity 2024 - Analysis and forecast to 2026

Government support to white goods more ambivalent, but it doesn't hurt

As our colleagues in the economics team note (see China Watch: Limited details on equipment renewals & consumer goods trade-in policies 18 March 2024), China's State Council announced an action plan on large equipment renewals and trade-in of consumer goods on 13th March. This plan implements the decisions made at the CEWC (Central Economic Work Conference) last December and the 4th meeting of the Central Financial and Economic Affairs Commission recently.

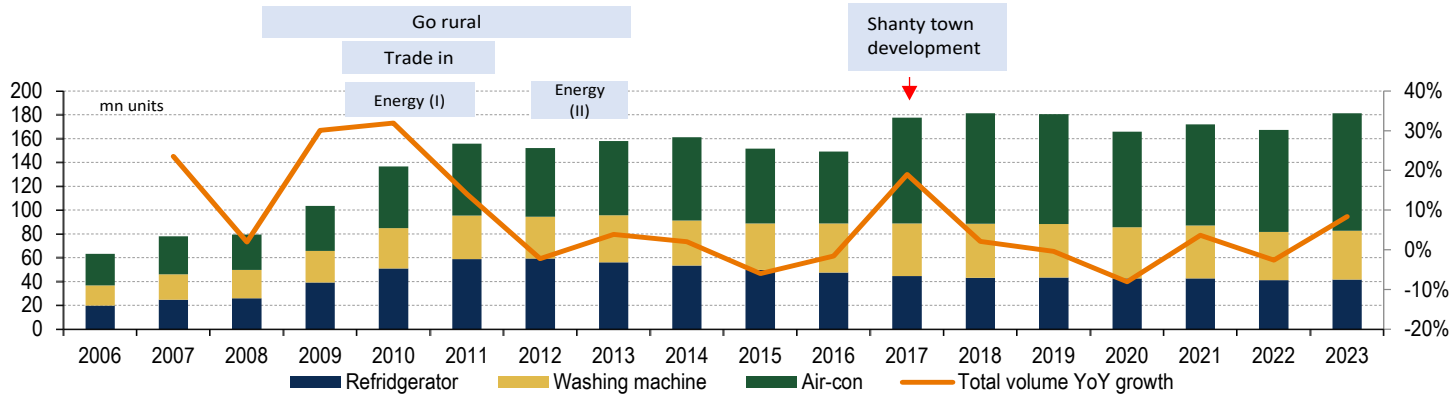
Home appliances: limited impact for now, in our view

The initiative supporting the trade-in of home appliances encourages local governments with "suitable conditions" to offer subsidies for green energy smart home appliances. The plan also sets a target of 30% growth of appliance replacement volume from 2023 to 2027.

However, the plan has not specified the exact amount of subsidies. It also emphasises a market-led approach and calls for local government to maneuver existing funding without the central government committing to extra support. Given fiscal pressure faced by local governments, we only expect limited subsidies to be granted (most of which will be concentrated in wealthy regions, such as Shanghai, which has recently announced a new round of trade-in subsidies), so the impact may not be meaningful nationwide.

This is very different from the last round of trade-in programmes following the Global Financial Crisis. Back then, total trade-in subsidies amounted to RMB30bn covering three years, with 80% funded by the central government and the remaining 20% by local governments. Subsidies were up to 10% of selling prices, which led to RMB342bn home appliance sales over the three-year period. Meanwhile, we also believe the central government will adopt a wait-and-see attitude. Should further downside risks to the economy emerge, we would not rule out the government committing to further funding support in the future to boost home appliance replacement demand.

Exhibit 21: White goods: domestic volume surged during past policy stimulus cycles
Domestic ex-factory volume



Source: China IOL, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 21 picks up on this, showing that previous stimulus programmes have boosted sales in white goods by up to 20-30%. To put this into context, assuming that white products make up around 20% of Chinese demand, this implied a boost to China's copper consumption of around 4-6ppt; globally, this means that demand could end up around 2-3ppt higher. So against all the caveats, the initiative might still add to demand, although we don't factor it in at the moment.

The global economy is also bottoming out

Finally, having discussed the support to metals demand from non-traditional sectors, including renewables, EVs and data centres, it is also worth noting that the global economy is bottoming out, which should ultimately help demand for the cyclical metals (Exhibit 22).

Exhibit 22: GDP, industrial production and investment
Economic activity is set to turn the corner in the US, Europe and China this year

YoY changes	2022	2023	2024	2025
GDP				
US	1.9	2.5	2.7	1.9
Europe	3.5	0.5	0.4	1.1
China	0	5.2	4.8	4.6
Industrial production				
US	3.4	0.2	0.7	1.4
Europe	2.2	-2.1	-0.1	2.6
China	3.6	4.5	4.6	4.2
Investment				
US				
Residential Investment	-9	-10.6	2.7	2.4
Non-residential Investment	5.2	4.4	2.8	1.9
EU				
Investment	2.6	1.4	0.8	1.4
China				
FAI	5.1	3	5	4.8

Note: green colouring represents an acceleration of growth, yellow a deceleration
Source: BofA Global Research

BofA GLOBAL RESEARCH

Base metals

Aluminium: prices supported despite macro headwinds

Overview

Aluminium prices have held up above US$2,200/t ($1/lb) in recent months, as limited supply growth has prevented the market from flipping into a surplus, notwithstanding the recent macro headwinds. Of course, spending on renewables has also helped, with China's focus on solar driving up demand in recent months. We see global supply expanding at half the rate than in the past decade, which, along with steady demand growth, will likely push the market into deeper deficits.

Exhibit 23: Aluminium supply and demand balance
The aluminum market should remain tight

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	68,342	69,881	72,280	73,902	75,238
YoY change	1.4%	2.3%	3.4%	2.2%	1.8%
Global consumption	69,061	70,415	73,447	76,385	79,440
YoY change	0.7%	2.0%	4.3%	4.0%	4.0%
Balance	**-719**	**-534**	**-1,167**	**-2,483**	**-4,203**
Market inventories	8,576	9,120	7,953	5,470	
Weeks of world demand	6.5	6.7	5.6	3.7	
LME Cash ($/t)	**2,706**	**2,254**	**2,447**	**3,000**	**3,250**
LME Cash (c/lb)	**123**	**102**	**111**	**136**	**147**

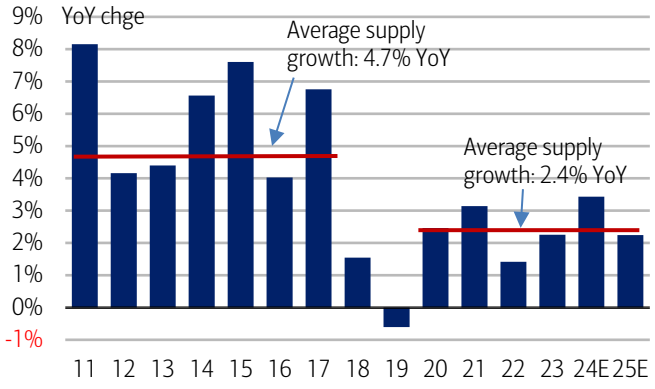
Source: SNL, Woodmac, CRU, Bloomberg, company reports, IAI, BofA Global Research

BofA GLOBAL RESEARCH

Aluminium fundamentals are strengthening

Aluminium prices have found support around US$2,200/t (100c/lb), despite persistent macro headwinds. That support has been driven by a confluence of factors. Most importantly, perhaps, global aluminium supply is expanding by an average of only 2.4% out to 2025E, compared to 4.7% between 2011 and 2017.

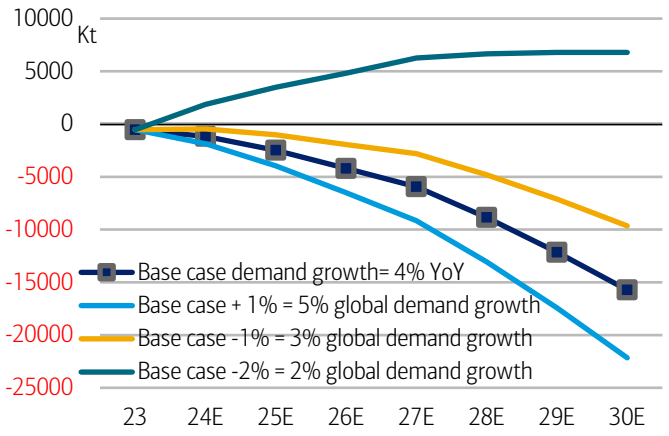
Exhibit 24: Global aluminium production growth
Supply growth has slowed markedly



Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 25: Aluminium balances under different demand scenarios
We expect deficits except under a very bearish demand scenario

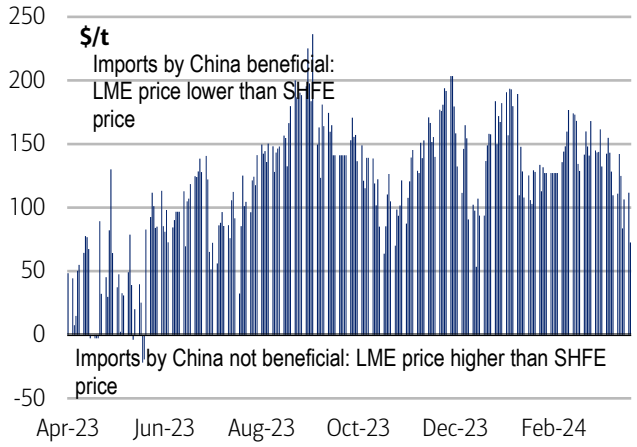


Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Tying in demand, we expect consumption growth of 4% per annum until 2030 in our base case, compared to an average of 5% pa in the past decade, implying sustained deficits. The stronger fundamental backdrop is also mirrored by the tight physical market in China, which through most of 2023 had been the most oversupplied in the past, although we acknowledge some weakening of late.

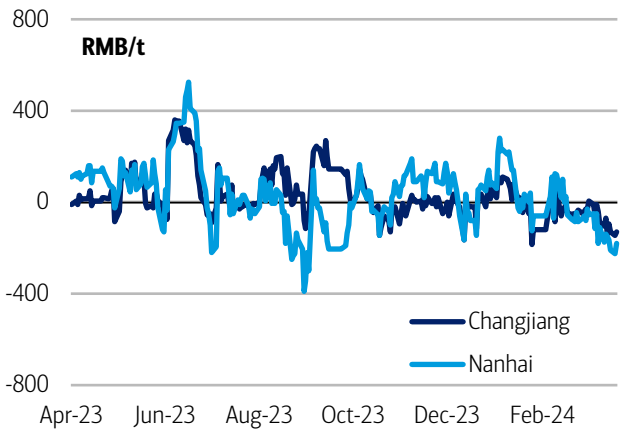
Exhibit 26: Price differentials SHFE and LME
Prices on the Shanghai Futures Exchange have been trading at a premium



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 27: Price differentials local physical markets and SHFE
Local physical markets in China have been trading at a premium to SHFE, although markets have weakened somewhat of late



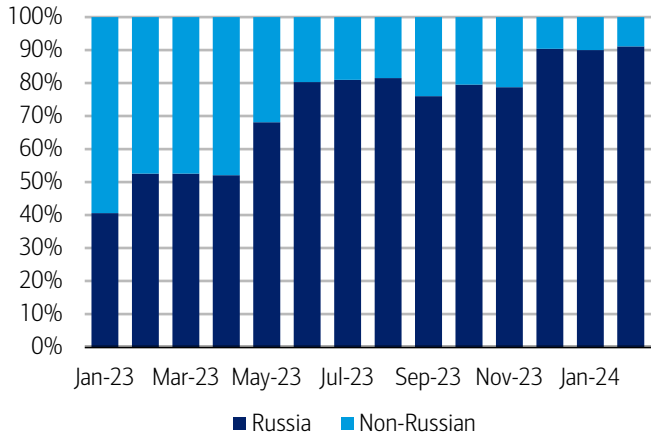
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Sanctions not affecting LME – so far

We usually determine the strength of fundamentals, and hence pricing pressures, by looking at supply and demand. However, there are increasing "non-traditional" or "technical" risks impacting the aluminium market. Indeed, the LME is running physically backed contracts. As inventories have fallen steadily in recent years, Rusal's material now accounts for 91% of stocks, although this has yet to cause issues in the market.

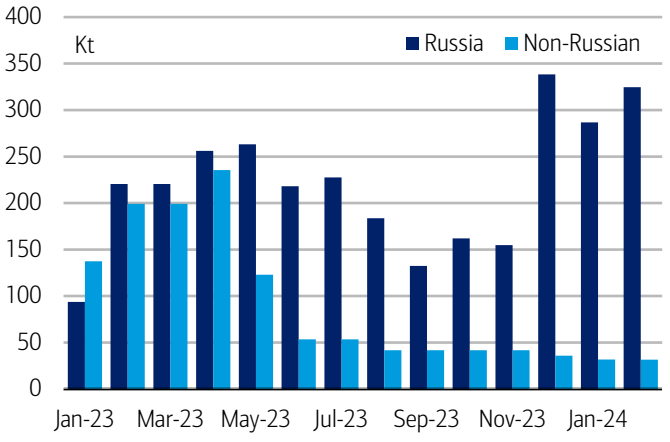
Exhibit 28: LME, breakdown of inventories by origin
Rusal aluminium units dominate LME



Source: LME, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 29: LME, breakdown of aluminium inventories in tonnes
Russia accounts for an increasing share of LME stocks on large deliveries in



Source: LME, BofA Global Research

BofA GLOBAL RESEARCH

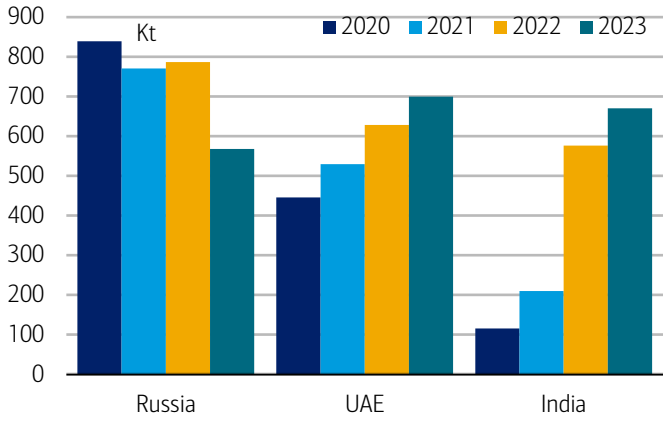
While the UK has imposed limits on British entities trading in Russian material, sanctions from the EU and the US have so far not been specific enough to impact the LME. Yet this could change if consumers/traders were no longer able to accept Russian aluminium due to tighter sanctions. Different sanction scenarios could have varying impacts on prices and premia. As to time spreads[2], the contangos may initially increase, but metal shortages could ultimately flip the curves into backwardation.

[2] Forward prices can be calculated through a cost-of-carry model, i.e., the cash price is the starting point, and holding costs (such as expenses for storage in warehouses or interest) are added. Holding benefits (e.g., from lending a metal) are deducted. Forward curves are normally in contango, i.e., future prices are higher than the cash price. However, future prices can fall below cash prices when markets are extremely tight. In such a situation, metal consumers are prepared to pay a convenience yield, i.e. spend more to have metal available immediately.

EU imports more aluminium with higher carbon footprint

European imports from Russia have fallen from 840Kt in 2020 to 567Kt in 2023, with the United Arab Emirates and India gaining market share.

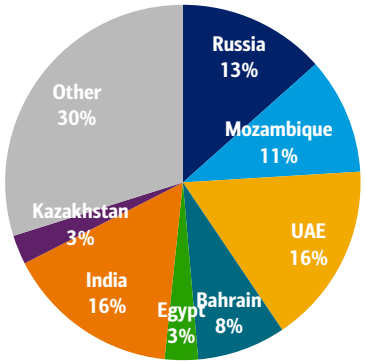
Exhibit 30: EU-27, aluminium shipments from top-3 trading partners
Aluminium imports from Russia have fallen; India/UAE have gained



Source: Eurostat, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 31: EU-27, breakdown of aluminium imports
Asia and the Middle East are a good part of Europe's imports

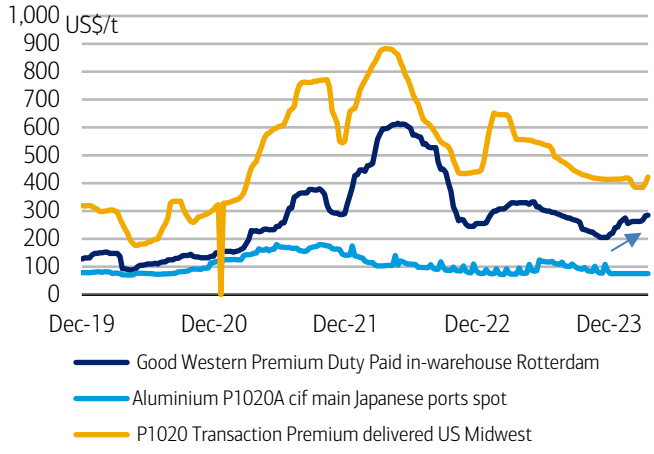


Source: Eurostat, BofA Global Research

BofA GLOBAL RESEARCH

Incidentally, the shift in trading patterns also means that Europe has replaced low-carbon aluminium units with high-carbon ones. In any case, the data shows that aluminium has been rerouted. Looking at this from a different angle, with more material moving from East to West, the Red Sea issues have had an impact on physical markets, with premia (paid on top of exchange-quoted prices and an indicator of regional prices) gradually pushing higher. That said, we don't view these shipping issues as a genuine supply curtailment, but rather more as a logistical headache resulting in longer lead times.

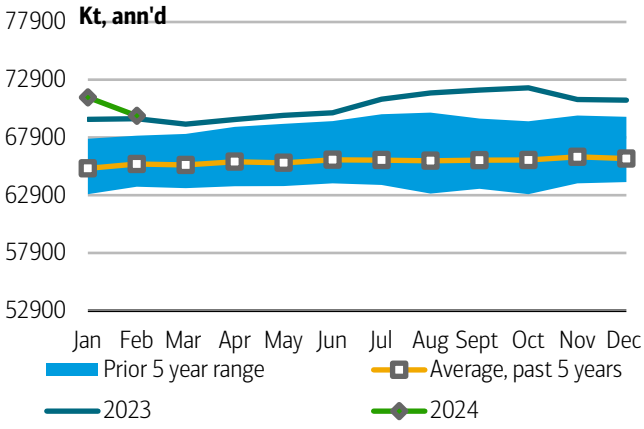
Exhibit 32: Regional aluminium premia
Europe's aluminium premia have risen



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 33: Global aluminium production
Aluminium production has stabilised just under 72mt in 2023



Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Copper: mine supply tightness starts to bite

Overview

Copper is at the epicentre of the energy transition, which means that the lack of mine supply growth is being felt acutely. Indeed, tight concentrates availability is increasingly capping production at China's smelters and refiners, potentially pushing consumers of refined metal back into international markets. At the same time, demand in the US and Europe should bounce back as economies bottom out; this, along with rising demand from the energy transition, will likely move the copper market into deficit this year.

Exhibit 34: Copper supply and demand balance
Copper moving back into small, temporary surplus

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	24,717	26,418	26,544	27,655	28,318
YoY change	1.5%	6.9%	0.5%	4.2%	2.4%
Global consumption	25,164	26,061	26,868	27,943	29,061
YoY change	0.9%	3.6%	3.1%	4.0%	4.0%
Balance	**-447**	**357**	**-324**	**-288**	**-743**
Market inventories	1,030	1,016	692	404	
Weeks of world demand	2.1	2.0	1.3	0.8	
LME Cash ($/t)	**8,822**	**8,484**	**9,321**	**10,750**	**12,000**
LME Cash (c/lb)	**400**	**385**	**423**	**488**	**544**

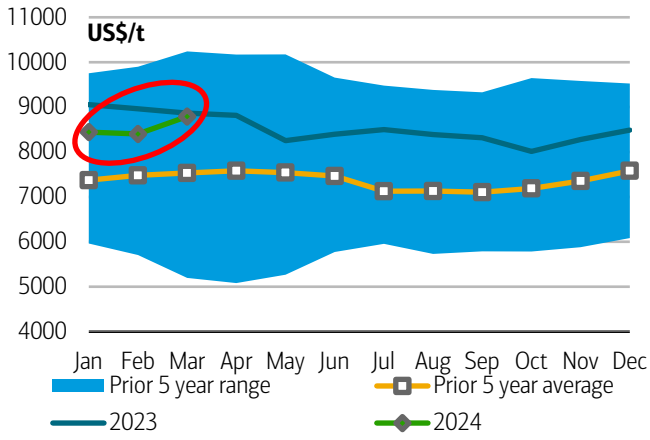
Source: SNL, Woodmac, CRU, Bloomberg, company reports, ICSG, BofA Global Research

BofA GLOBAL RESEARCH

Sell in March and go away

In contrast to some of the energy commodities, the base metals usually follow a longer-term business cycle trend, so they tend to be more stable intra-year. That said, copper prices do show some "seasonality", often outperforming in 4Q, before then giving back those gains.

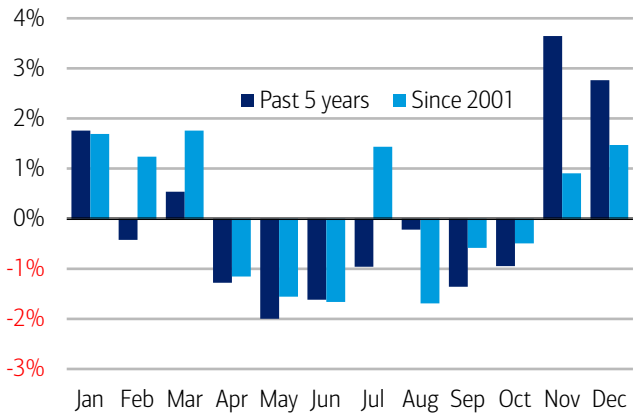
Exhibit 35: Copper price movements
Seasonality tends to be low



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 36: Copper, seasonal price component
Copper tends to outperform in November and December



Source: Bloomberg, BofA Global Research

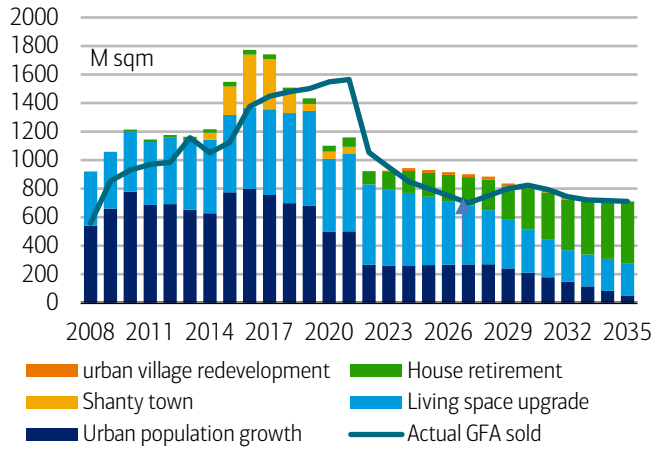
BofA GLOBAL RESEARCH

Year-end rallies have been accompanied by an increase in speculative length, especially in the past two years after the end of COVID and China's re-opening. Meanwhile, the underperformance of copper into spring/summer has often been preceded by rising inventories: Northern Hemisphere winters and Chinese New Year holidays tend to subdue markets. 'Sell in March and go away' can work, but tight mine supply, a bottoming out of the global economy, an end to de-stocking through supply chains and rate cuts have made that trade more difficult in 2024. We remain constructive on copper into 2H24 and expect prices to average US$10,750/t ($4.88/lb) in 2025 and US$12,000/t ($5.44/lb) in 2026.

China has an issue with overcapacity, not just in housing

China's grid investment carried the global copper market in 2023. Our analysis suggests that green spending should also support demand this year. Notwithstanding, the three Ds – deflation, debt and demographics – are formidable challenges for the Communist Party. Managing those, while moving the economy up the value chain, will be tricky. It is encouraging that the government has increasingly acknowledged that sentiment and confidence are an issue, so the focus has shifted from measures targeting the supply side of the economy, including credit easing, towards the demand side. This has perhaps been most visible in a push to drive equity markets higher.

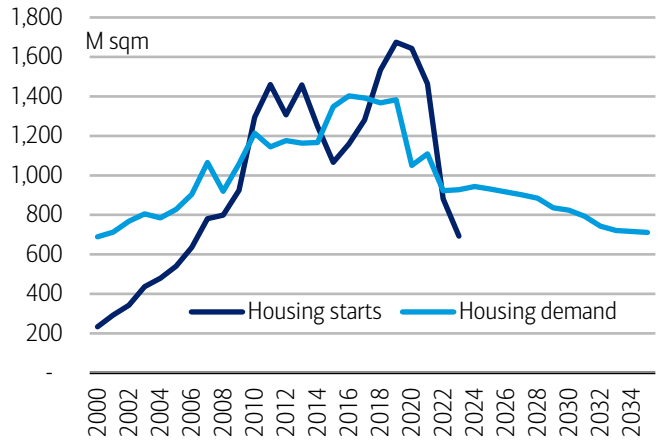
Exhibit 37: China, housing demand
The demand in China for housing will likely keep trending lower



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 38: China, housing demand and housing starts
Housing starts are running well below demand



Source: BofA Global Research

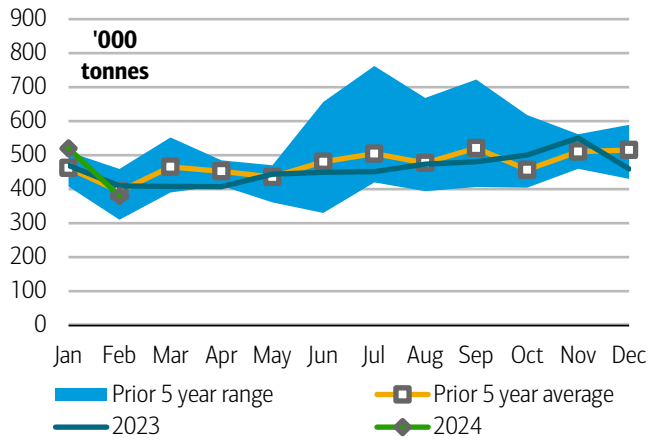
BofA GLOBAL RESEARCH

Incidentally, the challenging structural economic backdrop is also a reason the government will need to keep driving forward its 10 core industries to rejuvenate the country. In our view, it is simply wrong to say that the authorities are not supporting the economy. It's just that support is much more targeted at future-facing industries, many of which are metals intensive. See Exhibit 14 and Exhibit 15.

Supply issues coming to a head

China's copper demand growth was extremely strong last year, but refined copper imports stayed within longer-term ranges (Exhibit 39).

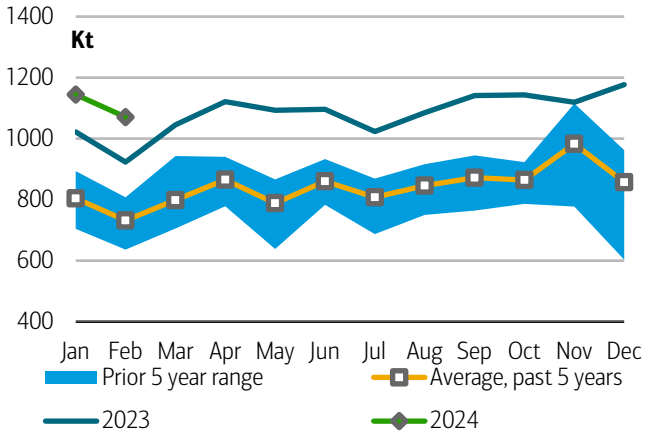
Exhibit 39: China, imports of refined copper and copper products
Copper imports were low in 2023, despite strong copper demand



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 40: China, refined production
China's smelters have maximised copper production

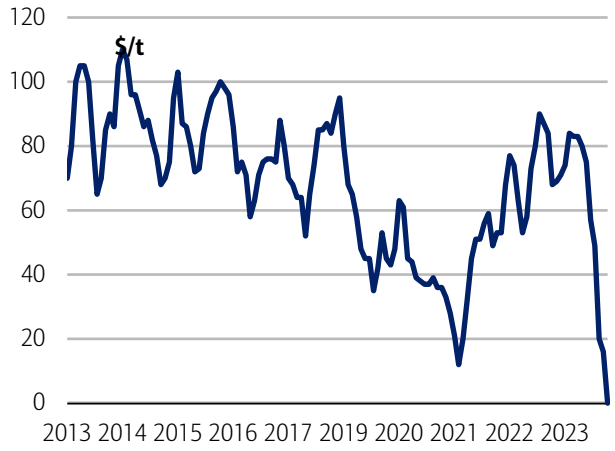


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

This was possible because domestic refined production hit a series of record highs in 2023 (Exhibit 40), on ample mine supply and destocking, with concentrates inventories on site at smelters and in ports now standing at three weeks, down from a high of 4.5 weeks. Concentrates availability has tightened, also because mine supply growth is slowing.

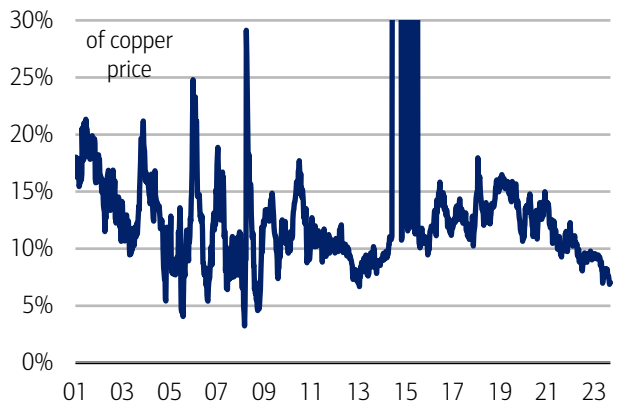
Exhibit 41: Copper, treatment and refining charges (TC/RCs)
TC/RCs have collapsed



Source: Woodmac, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 42: No 2 copper scrap, of refined prices
Scrap has gotten more expensive in recent years



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Treatment and refining charges[3] have fallen to levels that prompt production cuts at smelters/refiners. Smelters and refiners can operate comfortably with TC/RCs at US$50/t and 5c/lb, but many companies are barely profitable at US$30/t and 3c/lb, and only the most efficient producers can scrape by at US$20/t and 2c/lb. More recently, TC/RCs have dropped below US$10/t and 1c/lb.

Hence, China's Smelter Purchasing Team has hosted a few meetings that the market has followed closely. At the most recent gathering, producers decided on joint cuts of 5-10%. Taking January and February's refined production as a reference point, these targets would imply annualised supply of 12.8Mt and 12.2Mt, respectively, a decline of 1.2% YoY and 5.7% YoY from CY23 reported refined production. Refined production cuts are also worth following because they should support refined copper imports, even if demand slows somewhat as grid spending looks to be weaker this year, after the very strong investment in renewables in 2023.

Changing tack slightly, scrap is another feedstock for smelters beyond mine supply, and there has been anecdotal evidence that smelters are bidding more aggressively for secondary volumes. Scrap usually trades at a discount to refined copper, but that price differential has been narrowing for a while now (i.e., scrap has become more expensive), see Exhibit 42. Hence, while scrap supply should increase again, as it tends to do every year, rising copper prices have so far not been enough to bring many more secondary units into the market.

[3] Copper is produced through two production processes: the smelting/refining route accounts for 80% of all copper output, while the SX-EW route accounts for 20%. Smelters receive concentrates from mines and produce anodes. The anodes are then sent to refineries, which process them into cathodes. Smelters/refiners receive a treatment and refining charge (TC/RC) from the miners for their services, while miners retain the copper price less the treatment and refining charge. TC/RCs are an important indicator for constraints: when they fall, concentrates availability is insufficient. There are (at least) two copper market balances: one for concentrates, the other for refined metal.

Nickel: Sino-Indonesia supply dominance caps prices

Overview

Nickel is increasingly driven by geopolitics, with a Sino-Indonesian push to dominate supply chains likely keeping the market well supplied near term. That said, economics ultimately also matter for the South-East Asian producers and less aggressive output increases – or even outright cuts – may ultimately support nickel prices. Notwithstanding, sustained rallies are unlikely because these operators seem to have a clear preference for volume over value.

Exhibit 43: Nickel supply and demand balance
More than enough nickel units to go round. Means enough for everyone

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	3,135	3,396	3,515	3,860	4,111
YoY change	16.3%	10.2%	6.9%	9.9%	10.7%
Global consumption	3,087	3,287	3,468	3,833	4,127
YoY change	0.1%	6.5%	5.5%	8.9%	6.0%
Balance	**48**	**109**	**47**	**27**	**-15**
Weeks of world demand	2.8	3.0	3.5	3.6	3.1
LME price ($/t)	25,707	21,483	17,460	17,625	17,500
LME price (c/lb)	**1,166**	**974**	**792**	**800**	**794**

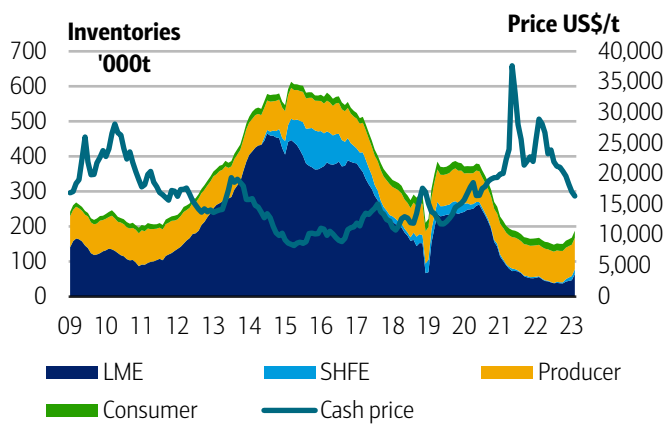
Source: SNL, Woodmac, CRU, Bloomberg, company reports, INSG, BofA Global Research

BofA GLOBAL RESEARCH

Nickel fundamentals are weak, and may stay that way

Nickel has been under pressure in recent months, as fundamentals have softened. Price declines have been accompanied by an increase in inventories.

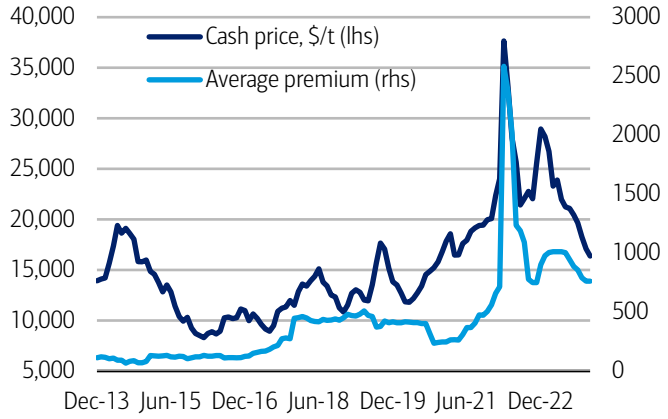
Exhibit 44: Nickel inventories and prices
Nickel prices have fallen as inventories have bottomed out



Source: Bloomberg, CRU, INSG, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 45: Nickel prices and premia
The decline in nickel prices has been accompanied by falling premia



Source: CRU, BofA Global Research

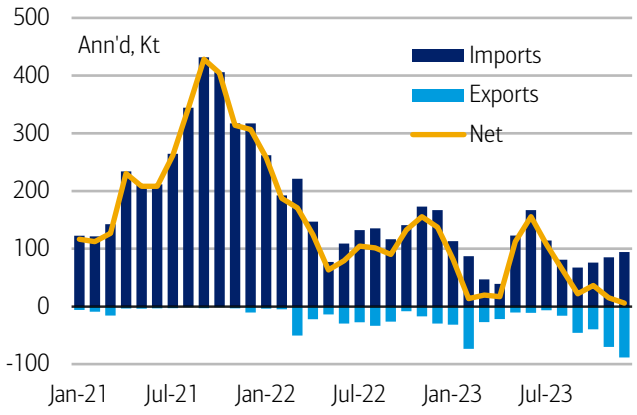
BofA GLOBAL RESEARCH

Not surprisingly, the weaker backdrop has been mirrored by physical premia, which are trading well below the recent highs. Why has this happened? China, together with Indonesia, has boosted nickel supply, initially in nickel pig iron and chemicals[4], but refined nickel output is also increasing. China is now on the verge of becoming a net refined nickel exporter, when barely three years ago, its refined nickel imports accounted

[4] Nickel comes in different qualities. Class 1 is refined nickel traded on LME. Class 2 includes lower-grade ferronickel, but also nickel pig iron, the latter a low-grade alloy that was invented in China as a cheaper alternative to pure nickel and used in the production of stainless steel. Nickel is produced from sulphide and laterite ores. Sulphide ores are typically fire-refined in smelters; laterite ores are often high-pressure acid leached (HPAL) to produce a high purity nickel, but can also be processed in rotary kiln electric furnaces to produce NPI or in smelters to produce ferro-nickel. China's operators have also invested in facilities that convert Class 2 NPI into nickel matte, a precursor material for battery-grade nickel sulphate.

for 14% of total global supply. Unless China and Indonesia decide to cut supply, fundamentals on the nickel market will most likely remain weak.

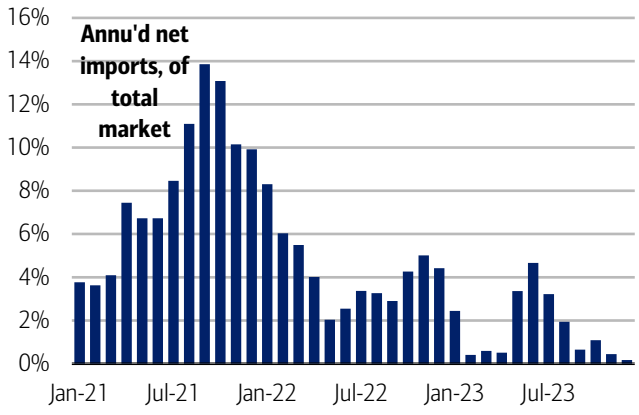
Exhibit 46: China, refined nickel trade
China has become a net nickel exporter



Source Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 47: China, net nickel exports of total market
China's refined imports made up 14% of global supply as recent as Sept-21



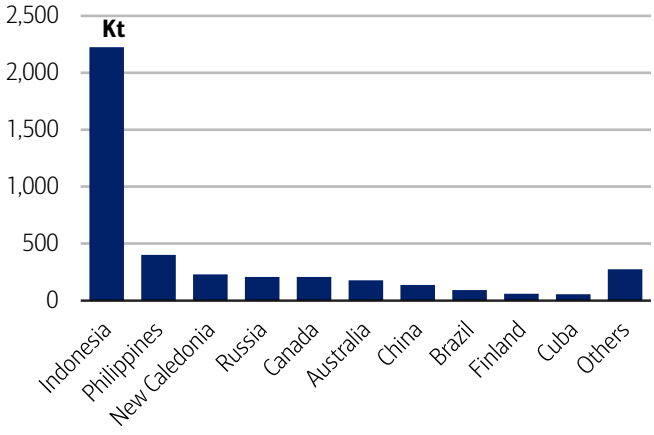
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Sino-Indonesian partnership dominates supply

Geopolitics and strategic interests are increasingly shaping metals markets. Indeed, Indonesia has become the dominant nickel producer, accounting for 55% of global supply, up from 7% in 2015.

Exhibit 48: Nickel supply by country
Indonesia is the largest producer



Source: company reports, Woodmac, CRU, INSG, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 49: Breakdown of nickel production by country
Indonesia accounts for 55% of production

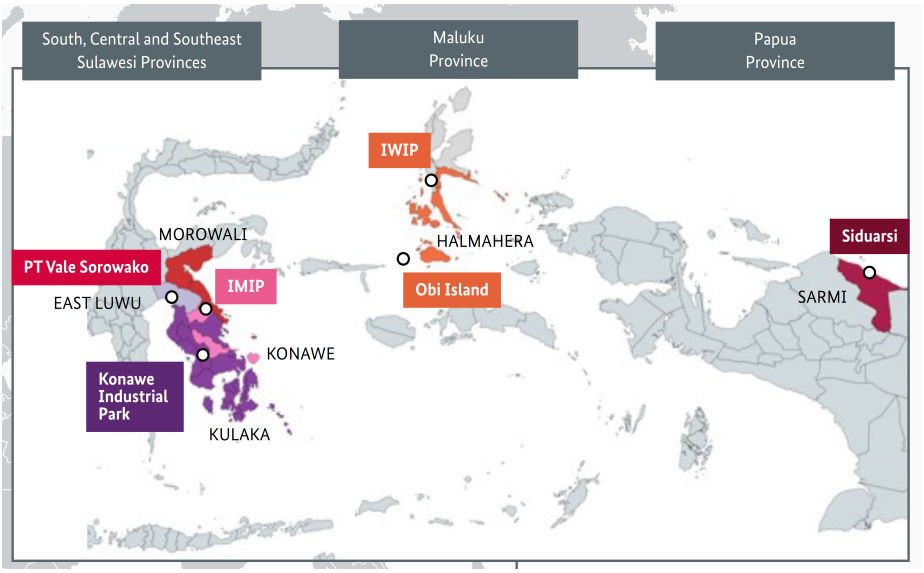
Source: company reports, Woodmac, CRU, INSG, BofA Global Research

BofA GLOBAL RESEARCH

This large expansion has been heavily influenced by Sino-Indonesian investment in industrial parks, with three standing out (Exhibit 50):

- **Indonesia Morowali Industrial Park (IMIP)** in Central Sulawesi;
- **Indonesia Weda Bay Industrial Park (IWIP)** in North Maluku;
- **Konawe Industrial Park.**

Exhibit 50: Map of nickel assets in Indonesia
IMIP and IWIP are key assets



Source: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Nickel for the Energy Transition – A Developmental Perspective
BofA GLOBAL RESEARCH

Highlighting strong government interest, Morowali Industrial Park (IMIP) was signed off at a 2013 summit between China's President Xi Jinping and Susilo Bambang Yudhoyono, the then President of Indonesia. Weda Bay Industrial Park (IWIP) is now ramping up production, bringing the largest nickel mine globally to the market. Indonesia has come a long way from exporting low value-added nickel ores. However, it is not done yet with its "downstreaming" industrial policy and has an eye on the EV battery industry.

Australia feels the heat; upping support for nickel producers

The Sino-Indonesian production ramp-up has impacted Western miners, with BHP taking a US$2.5bn write-down on its Western Australia assets, once seen as a potential "supplier of choice" to the car industry. Anglo American has written down its nickel business to zero. Western governments had adopted a 'hands-off' approach to mined resources, but this is changing. Indeed, Australia placed nickel on its critical material list, giving miners access to funding, Western Australia cut royalties and the federal government is talking to peer countries about the strong ESG credentials of its producers.

US and EU looking at ways to make supply less concentrated

Meanwhile, the EU is looking to rewrite WTO global trade rules on industrial subsidies. It previously launched a trade case against Indonesia. Similarly, the US Department of Energy is investigating ways to make its supply chain less concentrated, but beyond tapping partner countries, it is also focusing on innovation. The risk of deglobalisation, breaking up supply chains and tariff/non-tariff trade barriers, is unlikely to go away any time soon. Beyond that, World ex-China is aware of how concentrated the supply chain is in China's hands, giving an incentive to engineering nickel out of batteries. It is clear that the Sino-Indonesian dominance is meeting increased resistance from consumers in DM.

Is there a saving grace? Economics ultimately also matter for the South-East Asian producers and less aggressive output increases – or even outright cuts – may ultimately support nickel prices. Notwithstanding, sustained rallies are unlikely because these operators seem to have a clear preference for volume over value.

Tin: the forgotten metal

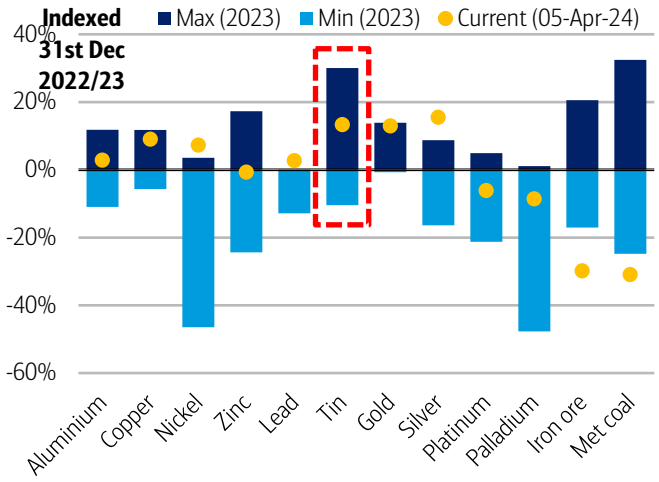
Overview

Tin prices keep trending higher on rising demand and challenged supply. After all, tin is a MIFT (metal important for future technologies), so fundamentals should remain strong despite short-term macro headwinds. As supply from Myanmar, China's largest tin supplier, remains restricted and semiconductor demand keeps expanding, we expect prices to remain supported, averaging ~$28,000/t this year vs ~$26,000/t in 2023.

Why did tin outperform most metals last year?

Tin is an industrial metal that tends to fly under the radar, mostly because the market is small at around 300kt (the copper market is about 25Mt). With prices trending higher in the past two decades, the "forgotten commodity" fared better than most other industrial metals in 2023, too, rallying by up to 30% intra-year to US$32,262/t.

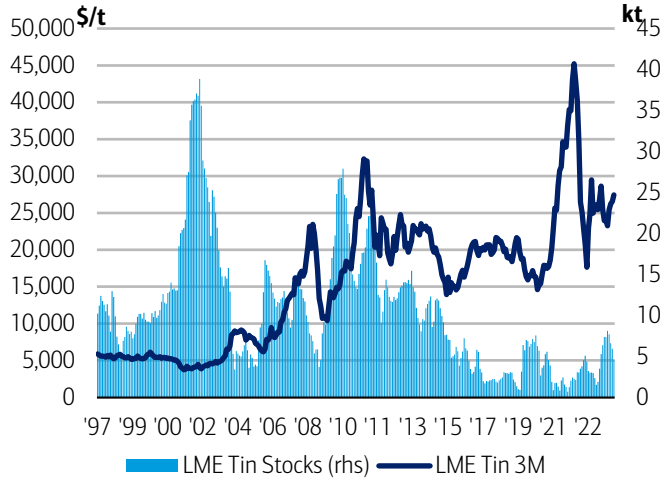
Exhibit 51: Metals and mined commodities performance
Tin fared better than other metals last year



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 52: LME tin price and inventories
Tin prices have been on an upward trend since the early 2000s

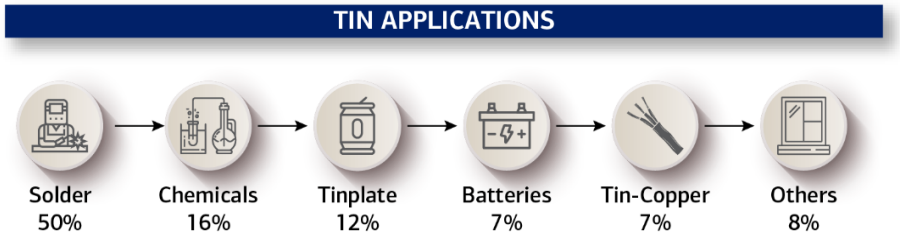


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Support has been influenced by supply, with mine production barely moving above 300kt over the past 20 years. At the same time, as a MIFT, tin should benefit from the energy transition (Exhibit 53).

Exhibit 53: Tin demand, by sector/application
There is a small amount of tin in everything, from electronic devices to food packaging



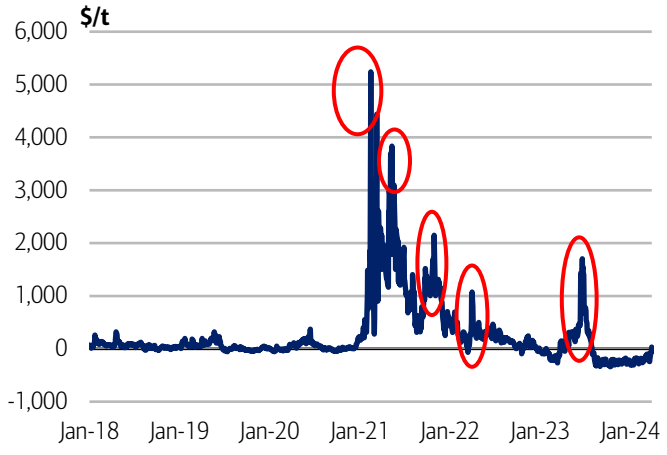
Source: BofA Global Research

BofA GLOBAL RESEARCH

Tin has experienced multiple squeezes in recent years

Tin prices have been on an upward trend since the early 2000s, when the metal was trading just around US$4,000/t. Given the persistent tightness in the market, a new floor seems to have been set around US$25,000/t.

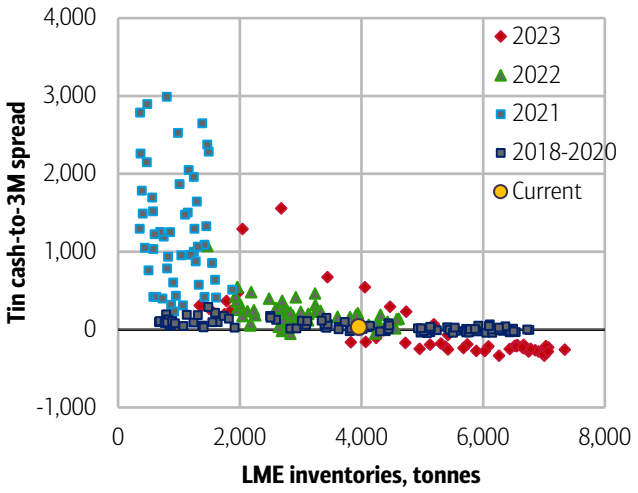
Exhibit 54: Tin cash-to-3M time spreads
Tight supply has increased the likelihood of sharp squeezes



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 55: Tin cash-to-3M time spreads and inventories
Inventory levels in LME warehouses are key to time spreads



Source: Bloomberg, BofA Global Research

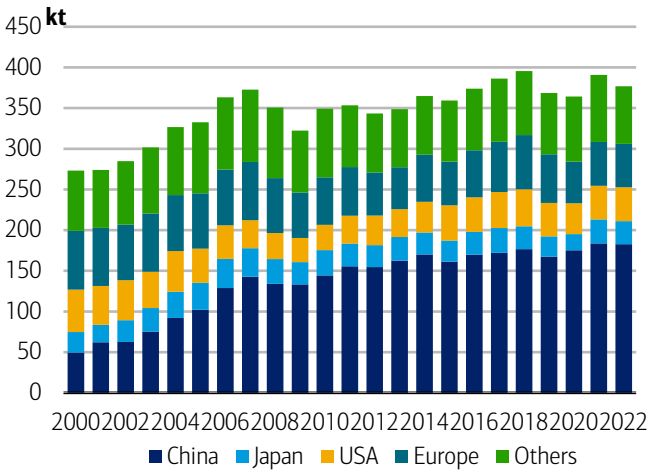
BofA GLOBAL RESEARCH

Low inventories in LME warehouses also made the metal prone to squeezes, with cash-to-3M spreads rising above US$1,000/t multiple times in the past three years. Given the small size of the tin market, investors, which account for only about 5% of trading volumes, can have an outsized impact on prices and spreads. With forward curves increasingly sensitive to inventory levels, market participants should get used to sharp price swings/volatility.

Deficits have eased despite challenged supply

All that said, the tin market has normalised somewhat in the past two years, after constant deficits. Softer balances were mostly driven by slowing demand, particularly from the semiconductor industry during COVID.

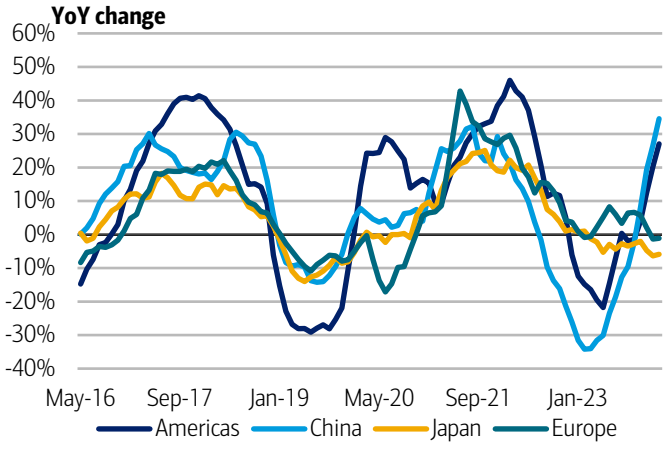
Exhibit 56: Refined tin consumption by country/region
The Chinese tin market has tripled in size in the past two decades



Source: CRU

BofA GLOBAL RESEARCH

Exhibit 57: Semiconductor sales, by region
Semiconductor sales troughed in 1Q23 and have been rapidly recovering



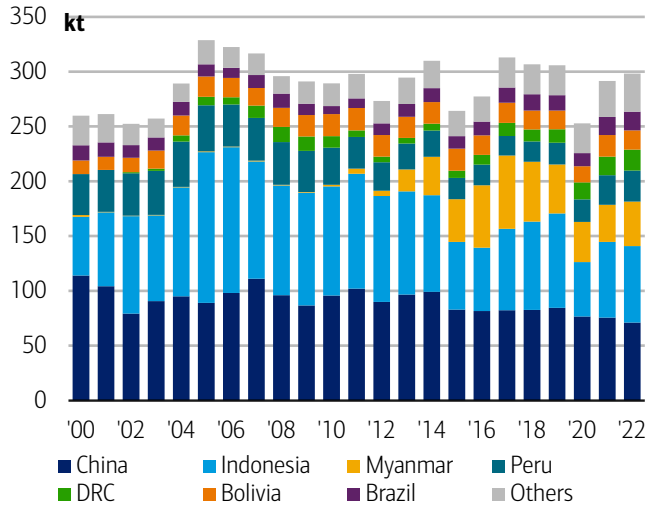
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

This more than offset supply disruptions from key tin producers, including Myanmar. Shipments from this Asian country, China's top supplier, were disrupted last year (-3.6% YoY), as the government in Wa State, a key mining region, imposed a mining ban in August 2023. In February 2024, the authorities in Wa State amended tax policies, requiring producers to pay a universal 30% tax-in-kind on tin concentrate exports,

without mentioning the end of the mining suspension. On this, the International Tin Association (ITA) said that "while local traders had predicted a resumption of mining after Spring Festival, ITA is not aware of any changes to the ongoing mining suspension. The policy change may indicate the government wishes to restore its strategic stockpile, which has been drawn down by the suspension."

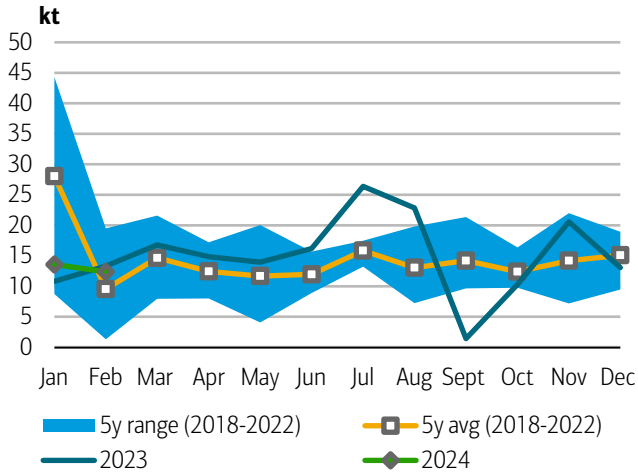
Exhibit 58: Tin-in-concentrate mine production, by country
Mine production has seen little growth over the past two decades



Source: CRU

BofA GLOBAL RESEARCH

Exhibit 59: China tin ore imports from Myanmar
Tin exports from Myanmar, China's top supplier, recovered late last year, thanks to stockpiled ores



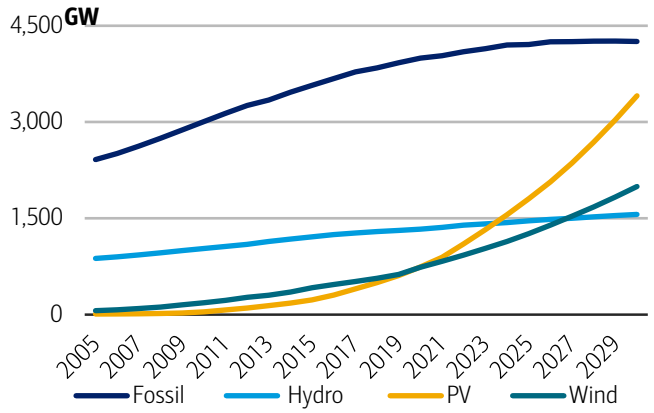
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Strong long-term fundamentals on rising demand from green technologies

Fundamentals look robust longer term on rising demand from solar PV and electric vehicles. Indeed, tin demand from the green sector could more than double by 2030, potentially topping 70ktpa, equivalent to one-fifth of current consumption. Ultimately, this suggests that fundamentals are set to remain strong and the focus will be on the supply side and the extent to which producers will be able to meet this additional demand.

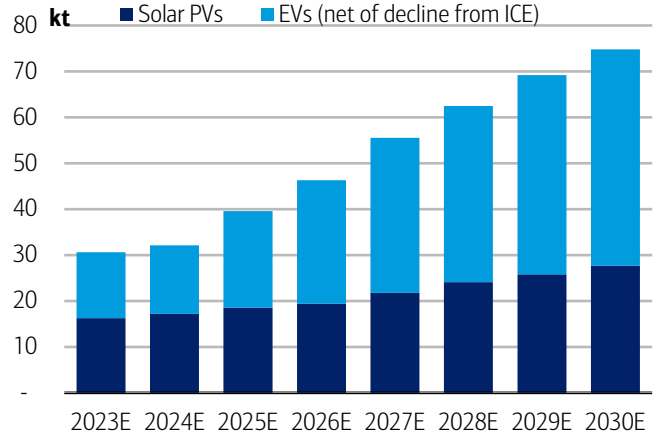
Exhibit 60: World, installed power capacity by source
Solar capacity is set to grow exponentially in the next few years



Source: IEA, BNEF, BofA Global research

BofA GLOBAL RESEARCH

Exhibit 61: Tin demand from the energy transition
Demand from solar PVs and electric vehicles should continue to rise



Source: BofA Global research estimates

BofA GLOBAL RESEARCH

Zinc: likely to trade at marginal cost

Overview

Zinc has long been viewed as the metal with the biggest mine project pipeline. Yet, many of those sites have not come through, so the market has never really moved into sustained surpluses. We expect similar mine supply constraints in the coming months, with falling treatment charges[5] already pointing towards a lack of concentrates surpluses. At the same time, galvanised steel production turned the corner in 2H23, which should help keep the market tight.

Exhibit 62: Zinc supply and demand balance
Production cuts are necessary

	2022	2023	2024E	2025E	2026E
Global production	13,353	13,863	13,900	14,400	14,700
YoY change	-3.9%	3.8%	0.3%	3.6%	2.1%
Global consumption	13,629	13,413	13,946	14,239	14,538
YoY change	-3.1%	-1.6%	4.0%	2.1%	2.1%
Balance	**-276**	**450**	**-46**	**161**	**162**
Market inventories	580	750	705	866	0
Weeks of world demand	2.2	2.9	2.6	3.2	0.0
LME Cash ($/t)	**3,482**	**2,648**	**2,706**	**2,688**	**2,424**
LME Cash (c/lb)	**158**	**120**	**123**	**122**	**110**

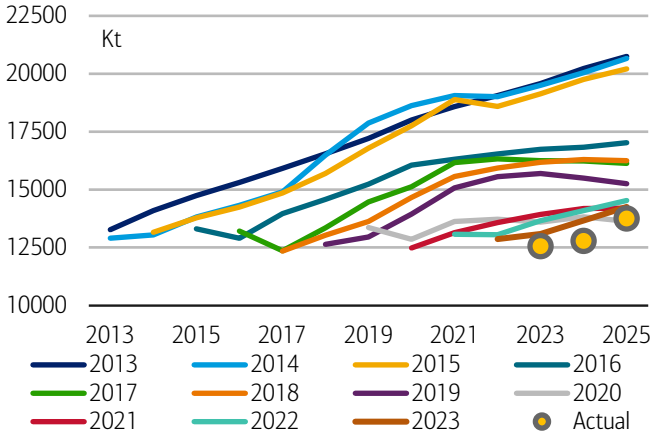
Source: SNL, Woodmac, CRU, Bloomberg, company reports, ILZSG, BofA Global Research

BofA GLOBAL RESEARCH

Zinc mine production at 2010 levels, supporting prices

Metal market participants have held perennially bearish zinc views, on expectations that mine supply increases would push the market into surplus. Granted, zinc has not been particularly tight. But the anticipated glut has so far not materialised, because mined and refined production have consistently underperformed. Zinc mine supply is still running at 2010 levels. Put differently, in 2010, market participants thought that supply could hit 20Mt in 2024. In the end, it may reach just 12.7Mt this year. Mine supply therefore remains the key constraint to zinc, and should continue to support prices, reflected in our average 2024 forecast of US$2,706/t ($1.23/lb).

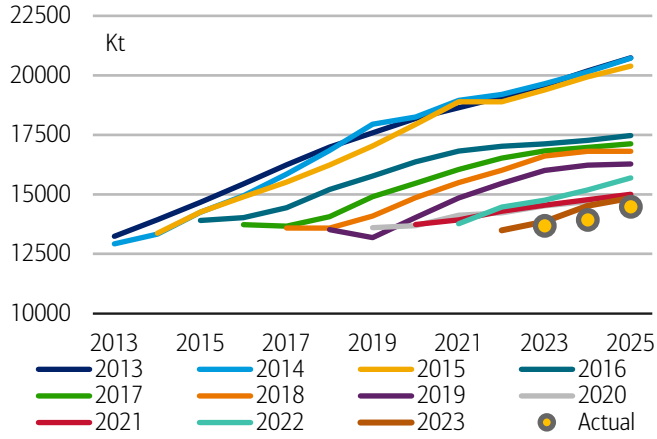
Exhibit 63: Zinc mine production forecasts
The market has overestimated zinc mine production



Source: Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 64: Zinc refined production forecasts
Refined production has tended to come in lower than markets expected



Source: Woodmac, BofA Global Research

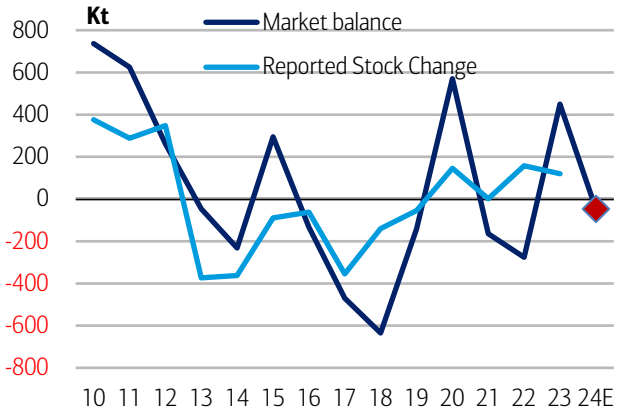
BofA GLOBAL RESEARCH

[5] Mines send zinc concentrates to smelters. Smelters receive a treatment charge (TC) from the miners for their services, while miners retain the zinc price less the treatment charge. TCs are an important indicator for constraints: when they fall, concentrates availability is insufficient. Hence, there are two zinc market balances: one for concentrates, the other for refined metal.

Lack of supply means inventories were never built up

The issues of mine supply are mirrored in the project pipeline. While Newmont's Penasquito mine is set to deliver the biggest output increase of any operation in 2024, this partially reflects resumption of activity after a strike that ended in October.

Exhibit 65: Market balances and inventory changes
The zinc market has still not flipped into sustained surpluses



Source: company reports, Bloomberg, Woodmac, CRU, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 66: Top-10 zinc mine production increases in 2024
Penasquito's increase is partially a recovery of strike-related output losses

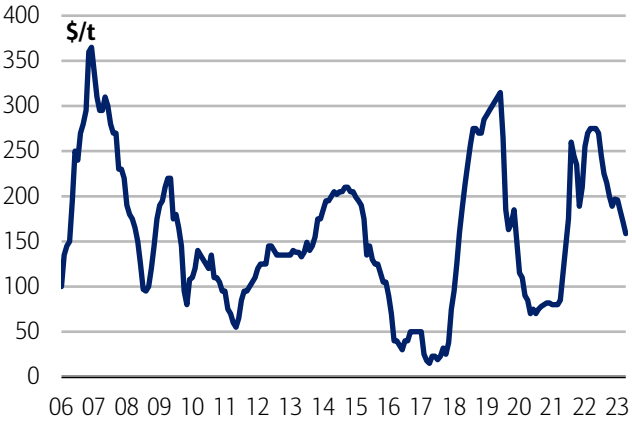
	Production	Change in Production, YoY				
	2023	2024	2025	2026	2027	2028
Penasquito, Mexico	104.3	140.7	-91.5	0.0	-41.6	0.0
Kipushi, DRC	0.0	81.9	133.1	30.7	0.0	0.0
Zhairem, Kazakhstan	95.0	55.0	10.0	0.0	0.0	0.0
Antamina, Peru	407.3	53.9	-25.6	-22.3	-22.3	-22.3
Buenavista, Mexico	0.0	40.0	40.0	65.0	-67.0	52.0
Mount Isa, Australia	287.2	32.8	30.0	-100.0	25.0	25.0
Dugald River, Australia	151.8	30.7	-2.5	0.0	0.0	0.0
Zhugongtang, China	0.0	30.0	50.0	30.0	20.0	0.0
Azulcocha, Peru	5.0	30.0	0.0	0.0	0.0	0.0
Gamsberg, South Africa	179.5	29.6	11.5	24.4	80.0	75.0
China	**1,230**	**525**	**155**	**28**	**-6**	**130**
World	**12,202**	**818**	**465**	**-29**	**-228**	**-161**
Top-10 of total	**10%**	**64%**	**33%**	**-96%**	**2.6%**	**-81%**

Source: company reports, CRU, Woodmac, Bloomberg, Platts Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Reflecting these persistent supply challenges, spot treatment charges have once again fallen, which could curtail activity at smelters. Annual treatment charge contracts have also been settled at US$165/t, a three-year low and down from US$274/t in 2023.

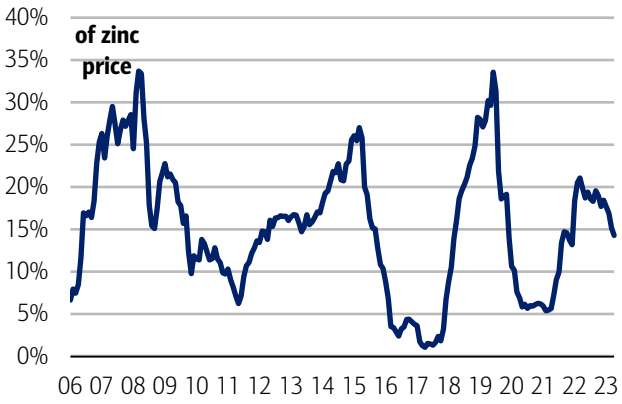
Exhibit 67: Zinc treatment charges
Periods of oversupply have been short-lived



Source: Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 68: Zinc treatment charges as a % of the refined price
On average, smelters received 15% of the zinc price; at the moment, their take stands at 14%

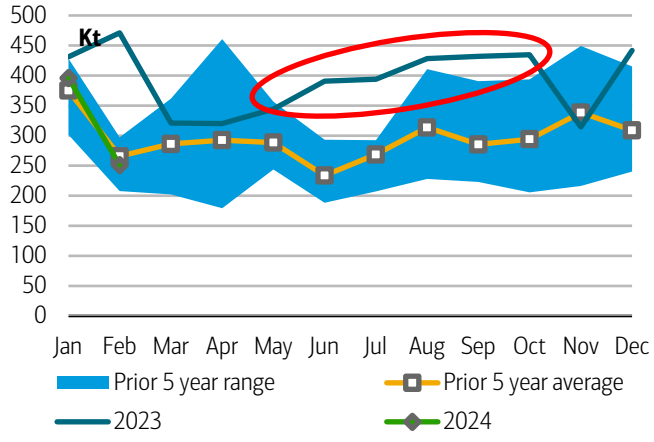


Source: Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Tight mine supply should have a particularly strong impact on China, and may well push up refined imports, after purchases abroad have been hovering around multi-year lows in recent months on record domestic refined output.

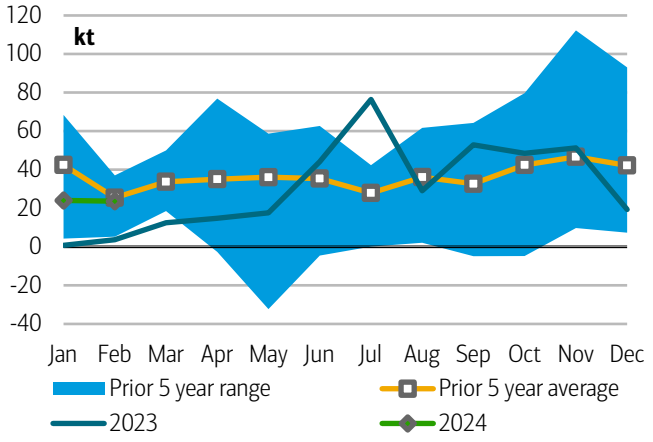
Exhibit 69: China, net concentrates imports
China's smelters boosted concentrates imports substantially



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 70: China, net refined imports
Rising domestic production has meant subdued refined zinc imports



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Sentiment on the mend – US restocking has started

Steel mills account for just over half of zinc demand and galvanised steel production turned the corner late last year (Exhibit 71). Similarly, the latest regional PMI reports show that headline index levels are now pushing higher in the US and China, suggesting that sentiment is on the mend. This matters, for instance, for inventory cycles in DMs, with destocking a persistent drag on metals demand in recent months. Yet, earlier this year, the US PMI report already noted that Fabricated Metal Product manufacturers have started to build stocks. This is worth following, as further restocking can be a powerful amplifier of metals demand.

Exhibit 71: Galvanised steel production
Galvanised steel production turned the corner in most regions in 4Q

	USA	Japan	Europe	Asia ex-Japan, China, India	India	Other	World ex-China	China	World
1Q22	3,927	2,786	6,743	5,907	2,103	5,280	26,746	12,236	38,982
2Q22	3,985	2,519	6,714	5,712	1,910	5,058	25,898	12,662	38,560
3Q22	3,867	2,521	5,756	5,439	1,947	4,897	24,427	13,059	37,486
4Q22	3,605	2,705	5,624	4,620	2,137	4,906	23,597	13,151	36,748
1Q23	3,676	2,441	6,235	5,637	2,137	4,947	25,073	12,560	37,633
2Q23	3,936	2,363	5,853	5,764	2,214	5,349	25,479	13,640	39,119
3Q23	3,862	2,521	5,637	5,875	2,175	5,276	25,346	14,619	39,965
4Q23	3,731	2,817	5,608	5,332	2,134	5,092	24,714	14,822	39,536
YTD YoY	**-1.2%**	**-3.7%**	**-6.1%**	**4.3%**	**7.0%**	**2.6%**	**-0.1%**	**8.9%**	**2.9%**
4Q23 YoY	**3.5%**	**4.1%**	**-0.3%**	**15.4%**	**-0.1%**	**3.8%**	**4.7%**	**12.7%**	**7.6%**

Source: CRU, BofA Global Research

BofA GLOBAL RESEARCH

It is also worth keeping in mind that, even if steel and zinc may not be seen as essential for the energy transition, the latest IEA decarbonisation scenario suggests that zinc consumption could expand by 2% on a sustained basis on the march to Net Zero.

Precious metals

Gold: next leg higher to come when Fed cuts rates

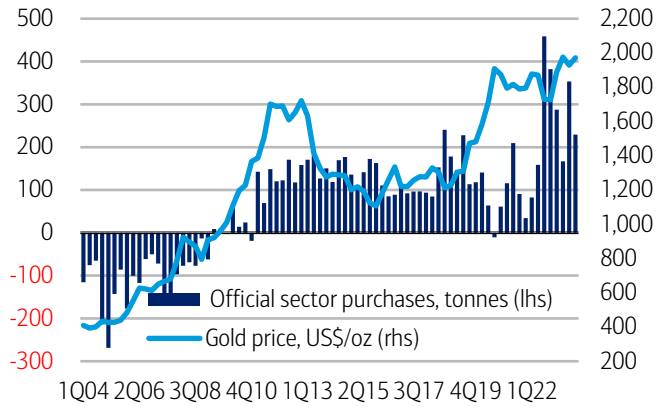
Overview

Gold has pushed higher on large Chinese investment purchases, steady central bank buying and Western investors buying optionality. Yet, more traditional segments, which are important to keep rallies going, have languished: assets under management at physically backed ETFs have been declining, while net non-commercial positions remain range bound. We believe that investors are still waiting for rate cuts; once these come through, gold purchases should broaden, likely pushing the yellow metal higher; Western buying may also be necessary if sentiment in China improves and less investment flows into gold. We believe gold could hit $3,000/oz by next year.

Central banks and China keep buying gold

Gold prices have been remarkably resilient in recent months, notwithstanding central banks around the world tightening monetary policy. Support has come from a few segments where demand has held up particularly well. Indeed, central banks themselves keep adding gold to portfolios.

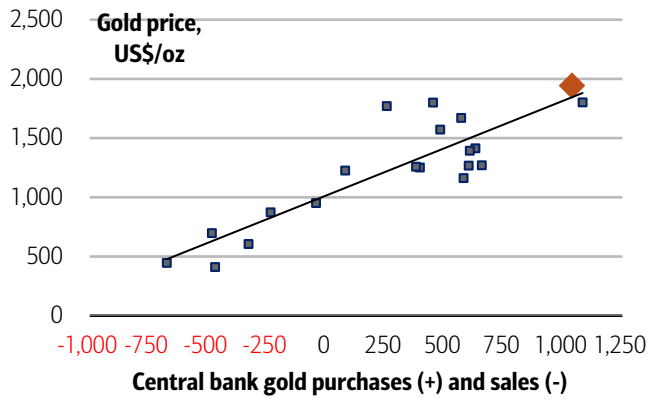
Exhibit 72: Central bank gold purchases and gold prices
Central banks keep adding gold to reserves



Source: World Gold Council, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 73: Central bank gold purchases and gold prices
Current levels of CB purchases justify gold prices at US$2,000/oz

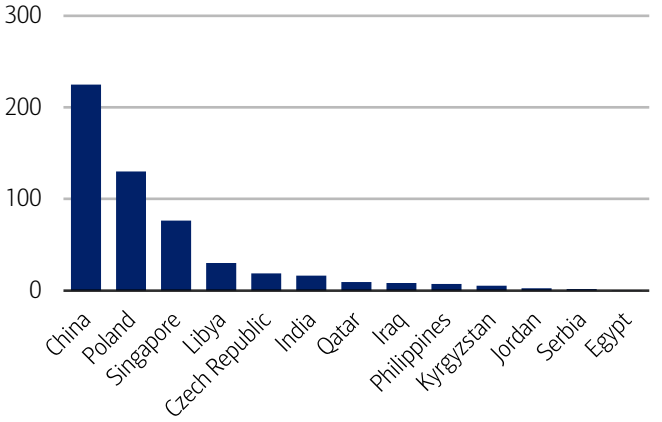


Source: World Gold Council, Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

This has perhaps been most visible in China, where the PBOC has been increasing its exposure to gold.

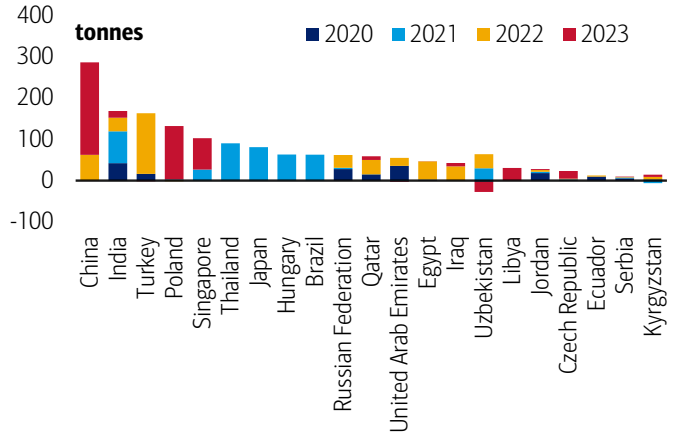
Exhibit 74: Annual central bank reserve gold purchases in 2023
China, Poland and Singapore led central bank gold purchases last year



Source: World Gold Council

BofA GLOBAL RESEARCH

Exhibit 75: Annual changes in central bank gold reserves
Looking back at the past four years, China, India, and Türkiye led net additions

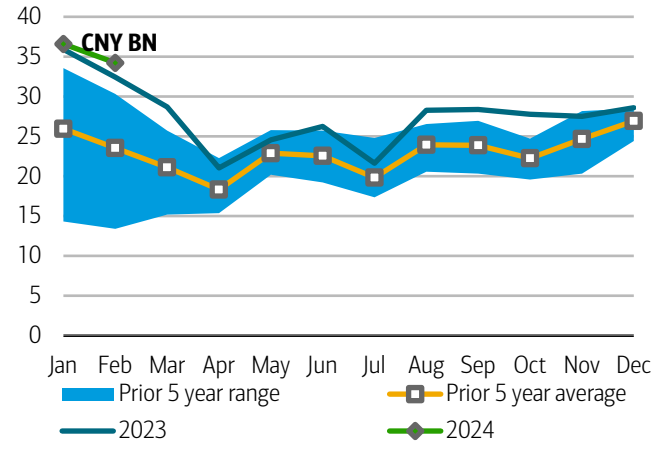


Source: World Gold Council

BofA GLOBAL RESEARCH

That buying is also a reason China's retail market participants have been buying gold, with jewellery sales and non-monetary gold imports hitting record highs earlier this year.

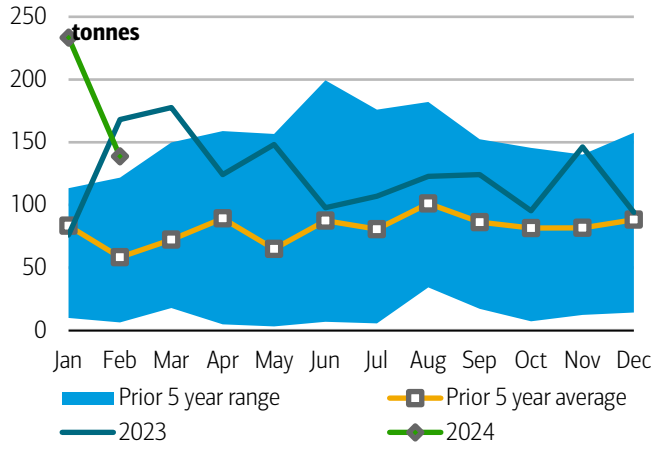
Exhibit 76: China, gold and silver jewellery demand
Jewellery demand in USD has hit a series of record highs



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 77: China, non-monetary gold imports
Non-monetary gold imports have been very strong YTD

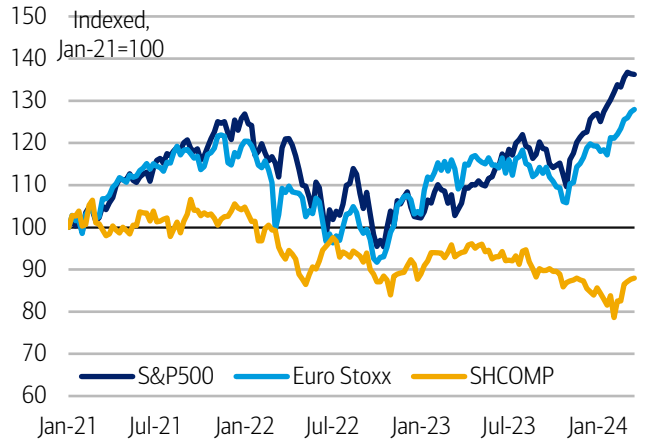


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Beyond PBOC buying, this interest reflects a lack of alternative options for Chinese investors, with equity markets and housing still not particularly appealing (see Global Metals Weekly: Peak capex and peak China).

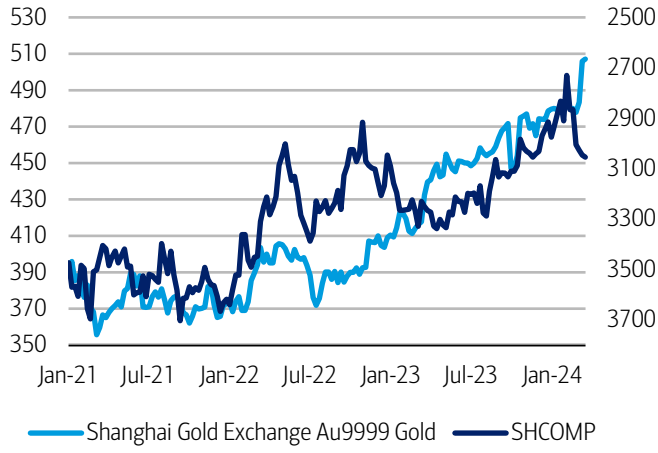
Exhibit 78: Equity markets, indexed to 100
Equities in the US and Europe have rallied; China's market has been under pressure



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 79: China, domestic gold prices and SHCOMP
Gold and Chinese equities have moved in opposite directions



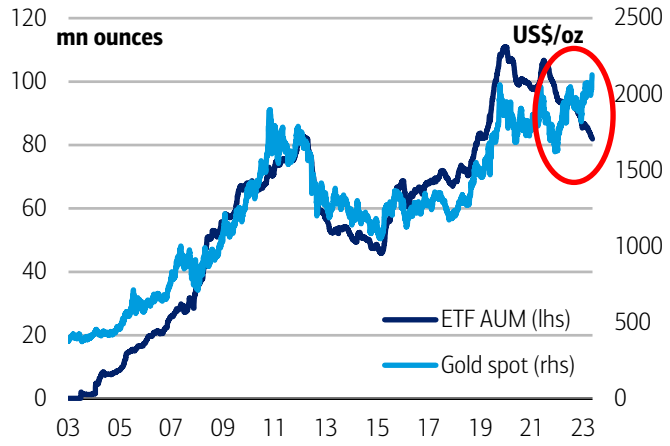
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Long-standing relationships have broken down

While the macro backdrop is supportive for gold (see Gold jumps on known unknown), the ongoing hiking cycle has kept many investors on the sidelines. Indeed, the longstanding positive relationship between gold prices and physically backed ETFs has broken down, with assets under management at these vehicles declining. Taking a closer look into the AUM (assets under management) data, most of the outflows have been driven by liquidations from investment advisors, usually a proxy for retail investors. Similarly, and more on the institutional side, net commercial futures positions have remained well below the highs of recent years.

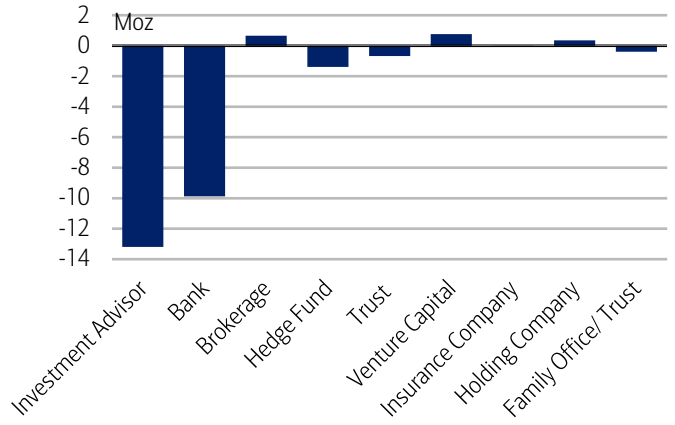
Exhibit 80: Physically backed ETFs and gold prices
AUMs at ETFs have been closely correlated with gold prices during the past 20 years



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 81: ishares GDL, changes in ownership
Investment advisors have liquidated gold holdings



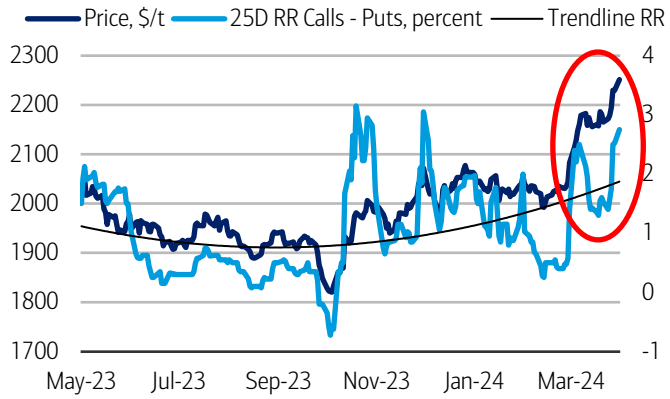
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Low-delta options popular with investors

Does that mean that Western investors have shown a complete lack of interest in gold? No. For example, options have been very popular, with risk reversals rallying sharply (see This time is different for commodities).

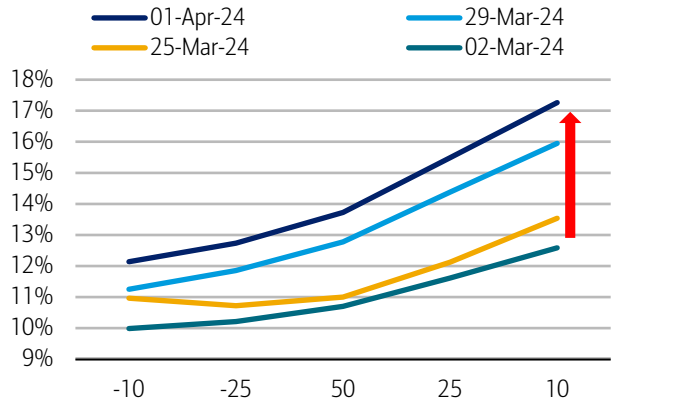
Exhibit 82: Gold prices and risk reversals
Calls have rallied



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 83: Gold prices and put/call vols
Low-delta gold vols have rallied



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Low-delta options have been particularly well bid. In short: traders wanted exposure to the rally, but in the form of optionality, not linear investment. In our view, this is heavily influenced by continued apprehension over the direction of monetary policy. Yet, if the Fed ultimately starts cutting rates, investors should return to the market, also offsetting potentially lower Chinese investment demand as sentiment there improves and the economy accelerates. We had previously proposed a US$2,400/oz price estimate if the Fed cut rates in 1Q24; we now raise that and see gold rallying to US$3,000/oz by 2025.

Silver: prices rising, when industrial demand rebounds

Overview

Silver has underperformed gold as industrial demand has been weak. With the global economy turning a corner, the white metal should start to perform better. Additional support is also coming through as the next generation of solar panels, which are more silver-intensive, are gaining traction. All of this may then also attract more investors to the market, creating a virtuous cycle that pushes prices higher, with $30/oz within reach.

Exhibit 84: Silver supply and demand balance
The silver market has been better supplied this year on ETF outflows

Tonnes	2022	2023	2024E	2025E	2026E
Global production	31,250	31,878	31,465	31,278	28,895
YoY change	0.0%	2.0%	-1.3%	-0.6%	-7.6%
Global consumption	35,427	34,259	35,514	36,735	36,999
YoY change	0	-3.3%	3.7%	3.4%	0.7%
Balance	**-4,177**	**-2,381**	**-4,049**	**-5,457**	**-8,104**
Spot ($/oz)	21.8	23.4	26.5	32.5	35.0

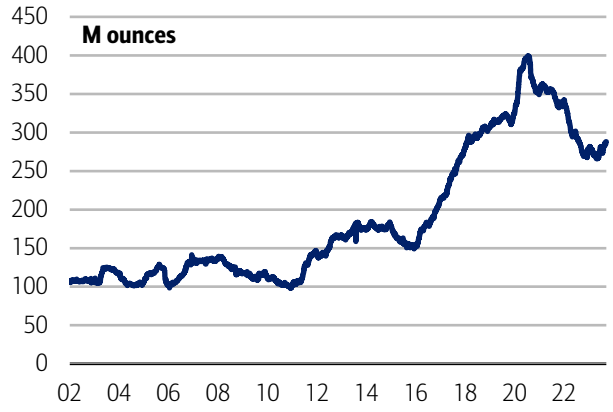
Source: Silver Institute, company reports, BofA Global Research

BofA GLOBAL RESEARCH

Investor demand appears to be lacking

Silver stabilised above US$20/oz post COVID, as the market posted steady deficits. These have been mirrored by falling inventories, with stocks in CME (Chicago Mercantile Exchange) warehouses and in LBMA (London Bullion Market Association) vaults declining.

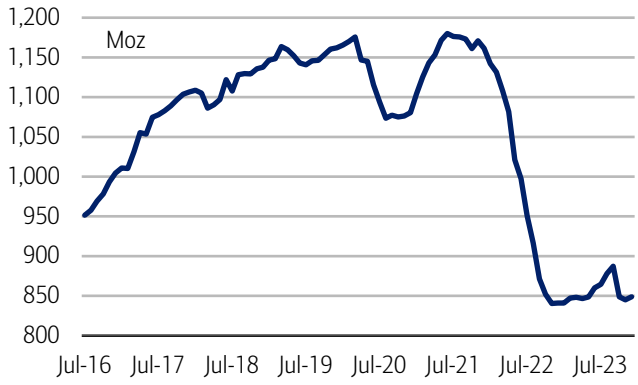
Exhibit 85: Silver, inventories in CME warehouses
Inventories have fallen



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 86: Silver, inventories in LBMA vaults
Silver has left LBMA warehouses

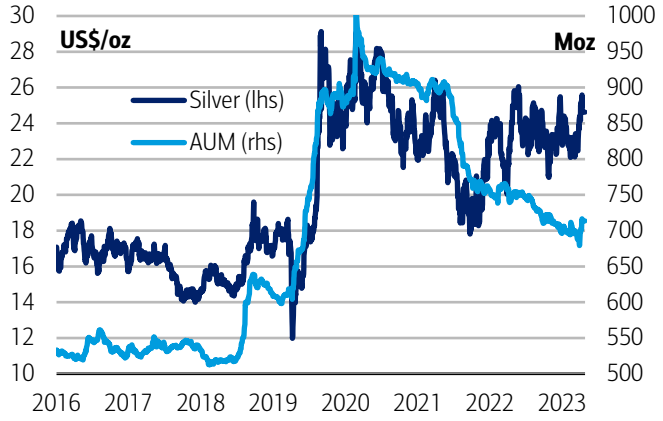


Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

While prices have been maintained, we acknowledge that silver has not made a decisive push higher of late. Why not? Lackluster investor demand is one reason. We are seeing a lack of interest among assets under management at physically backed ETFs. This is also reflected in CME net non-commercial positions, trading volumes on the Shanghai Gold Exchange/Shanghai Futures Exchange and US coin purchases. Yet, we also note encouraging signs in commercial demand, which may ultimately attract investors, reinforcing our constructive view on the metal for 2024.

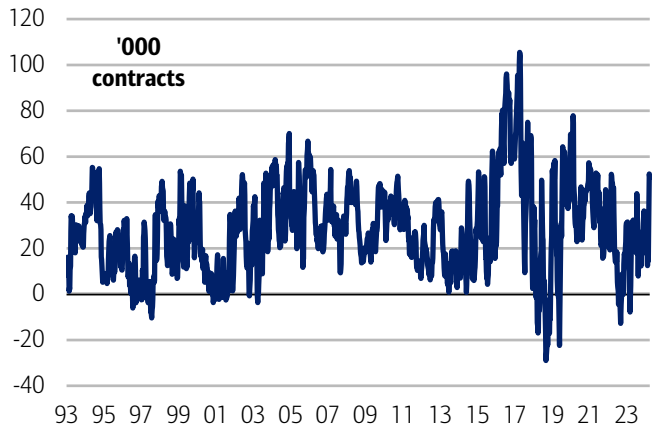
Exhibit 87: Prices and assets under management
Investors kept liquidating ETF positions



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 88: CME, net non-commercial positions
Net long, but positions have been within longer-term ranges



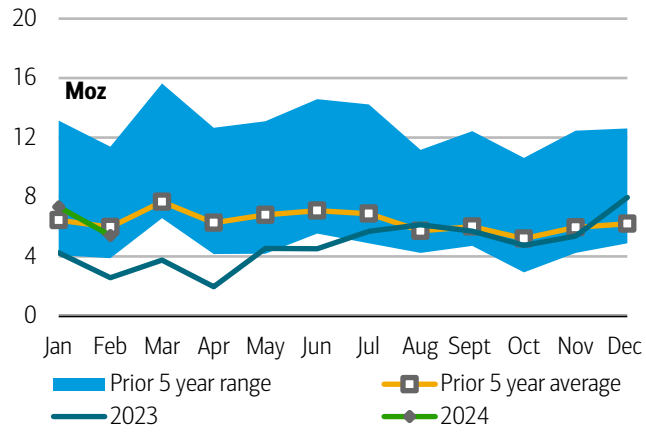
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

China's silver market has been tightening

Why has investor interest been weak? Silver is much more of an industrial metal than gold, so the weakness in industrial demand has been an issue – one reason the gold-silver ratio has risen lately.

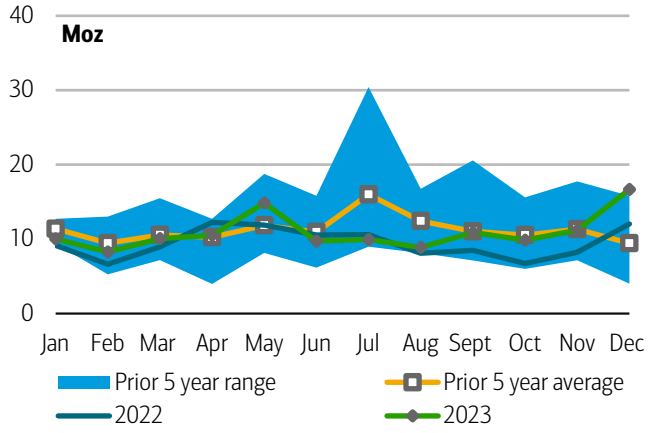
Exhibit 89: Japan silver imports
Imports are off the lows



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 90: US silver imports
Imports are trending higher



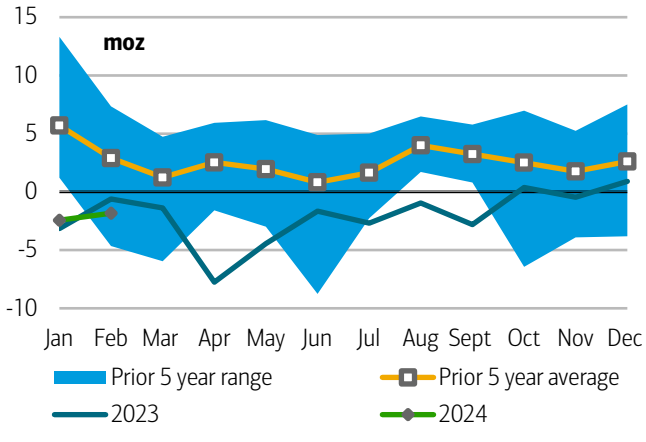
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

A bottoming out of the global economy in the coming months would support the silver market. Silver imports from Japan and the US are already off the lows and could trend higher from here.

Similarly, China was a net exporter of silver early last year, but those shipments had subsided by end-2023 (Exhibit 91). Accompanying this, silver is no longer trading at a discount on China's domestic market (Exhibit 92).

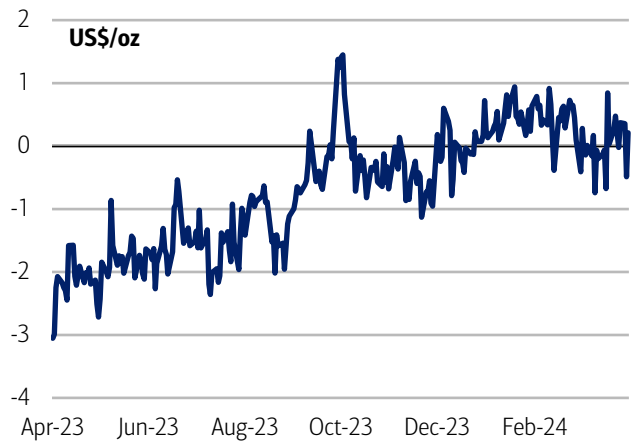
Exhibit 91: China, silver imports
Silver purchases from China abroad



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 92: China, silver premium
Silver is trading at a premium in China



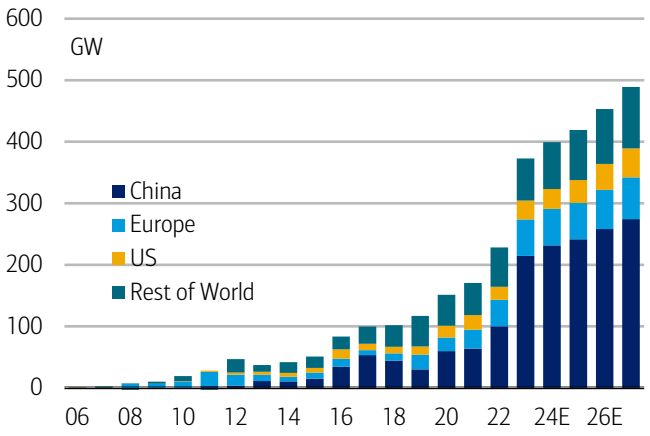
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Solar PV remains a bullish driver

Demand for silver from green technologies is also strong. On the PV side, this is driven by: (1) solar installations; and (2) changes in technology. Global annual renewable capacity increased by almost 50% to nearly 510 gigawatts (GW) in 2023, of which 373GW were solar.

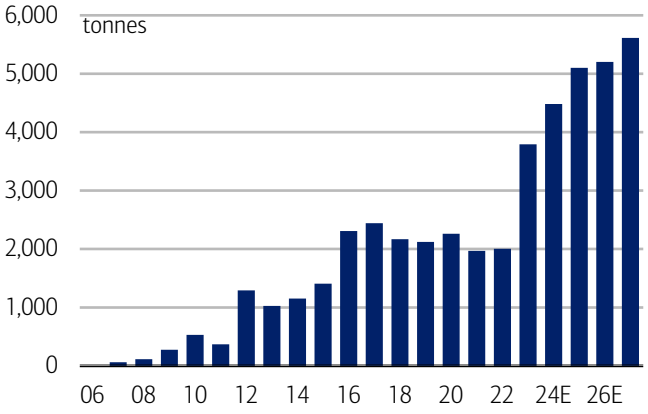
Exhibit 93: New installations solar PV
Installations jumped in China



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 94: Silver demand from PV
Silver demand is trending higher



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

This was the fastest growth rate over the past two decades, according to the IEA. For 2024, solar installations are set to increase by 399GW.

Exhibit 95: Silver content in different c-Si panels
PERC cells have the lowest silver content per W

	PERC	TOPCon	Heterojunction (HJT)
Silver, mg/w	10	13	22
Market share	2022: 91% 2023: 65%	2022: 8% 2023: 26%	2022: 0.6% 2023: 5%

Source: BNEF

BofA GLOBAL RESEARCH

We also assume that TopCon solar PV, which is more silver-intensive than PERC (passivated emitter and rear contact), is gaining market share. Finally, EVs, which use silver in electronics, are becoming more popular too. This should also boost demand.

Platinum group metals: first casualty of energy transition

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Overview

Platinum-group metals (PGMs) fundamentals remain challenged as demand is in structural decline as EVs, which do not contain auto catalysts, gain market share. Miners have been hurting, particularly in North America and South Africa. While cost-cutting measures can improve profitability for some time, production cuts are ultimately needed to rebalance markets. Platinum has stronger fundamentals to start with, so any curtailments would likely mean the metal keeps outperforming palladium. As such, we keep our bearish palladium view.

Exhibit 96: Platinum supply and demand balance
Platinum has stronger fundamentals than palladium

'000 ounces	2022	2023	2024E	2025E	2026E
Global production	6,561	6,711	7,157	7,607	7,706
YoY change	-13.5%	2.3%	6.6%	6.3%	1.3%
Global consumption	6,057	7,231	7,255	7,250	7,255
YoY change	-22.8%	19.4%	0.3%	-0.1%	0.1%
Balance	**504**	**-519**	**-99**	**357**	**451**
Spot ($/oz)	964	967	990	1,000	950

Source: Matthey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 97: Palladium supply and demand balance
Palladium fundamentals are set to remain weak

'000 ounces	2022	2023	2024E	2025E	2026E
Global production	9,314	9,320	9,970	10,572	10,819
YoY change	-5.1%	0.1%	7.0%	6.0%	2.3%
Global consumption	9,829	9,710	8,771	8,434	8,024
YoY change	-3.2%	-1.2%	-9.7%	-3.8%	-4.9%
Balance	**-515**	**-390**	**1,199**	**2,138**	**2,795**
Spot ($/oz)	2,110	1,340	844	600	500

Source: Matthey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

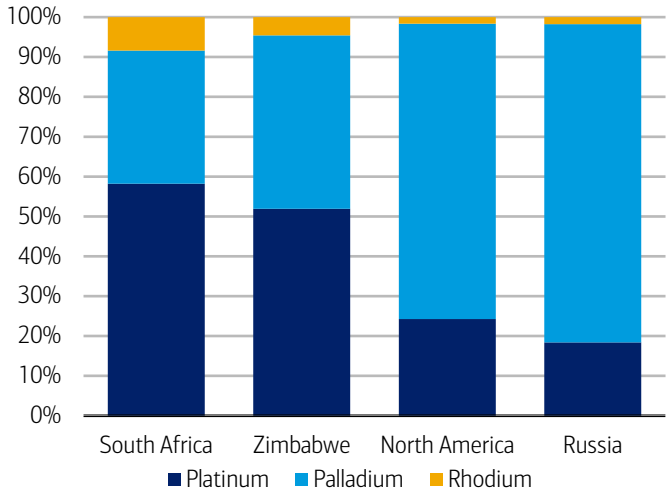
Risk of supply cuts is rising, particularly in North America

The platinum group metals (PGMs) are under pressures as EVs, which do not contain catalysts, gain market share. Palladium, where demand is 90% driven by the auto industry, is particularly exposed. Platinum is somewhat better positioned, although car manufacturers still account for just under half of total metal production.

All PGM mines produce a "basket" of products with the "prill split" showing the relative importance of the individual metals. North American PGM mines, among the highest-cost producers, have more palladium content (Pd 74%, Pt 24%, Rh 2%), whereas South African and Zimbabwean peers are more platinum-rich (Pd 33%, Pt 58%, Rh 8%).

Given the palladium demand headwinds and cost structure, we estimate that margins at North American assets have dropped as low as -$190/oz this year. Of course, South African mines have also been impacted by lower prices and further declines could lead to negative margins there too.

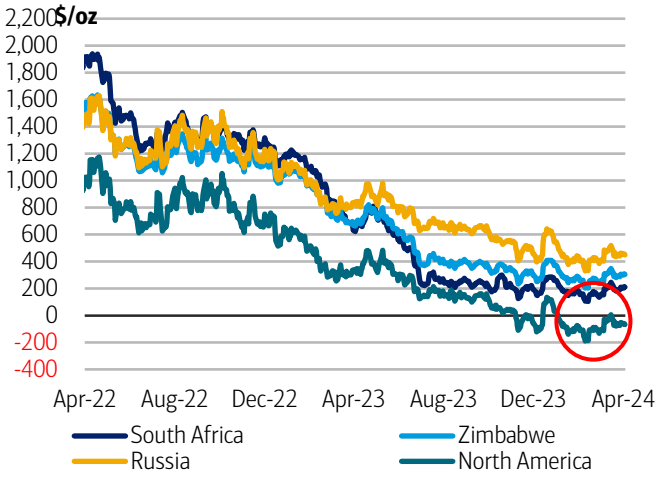
Exhibit 98: Breakdown of PGM production by region
North American assets are palladium-rich and have been affected by the rout in palladium prices



Source: Johnson Matthey, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 99: PGM industry margins, by region
Margins at North American assets have fallen into negative territory, increasing the risk of supply cuts



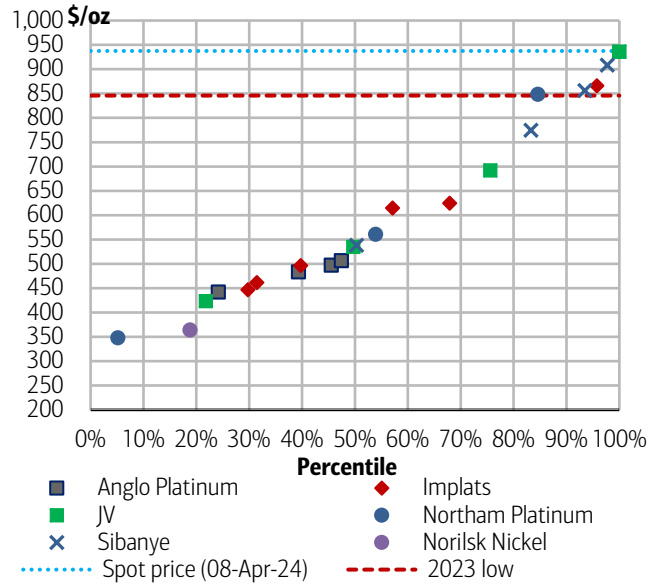
Source: Company reports, Bloomberg, BofA Global Research estimates
Notes: Figures refer to average basket margins (platinum, palladium and rhodium)

BofA GLOBAL RESEARCH

Palladium prices cut deep into the cost curve

Digging a bit deeper into individual operations, Exhibit 100 and Exhibit 101 highlight how the drop in margins has been driven mostly by the rout in palladium prices. Modelling operating expenses on the basis of co-products (i.e., each metal gets its share of production costs) suggests that about 20% of global supply is still deep in the red at current palladium prices. In contrast, nearly all major platinum operations could stay afloat under current platinum quotations.

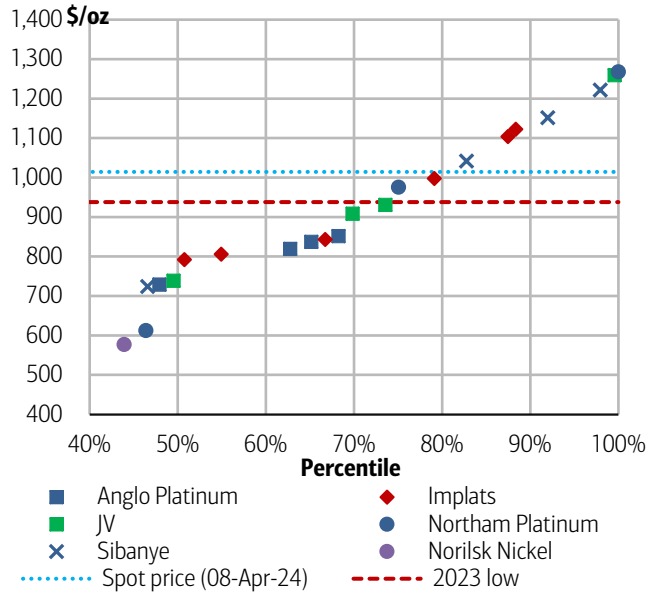
Exhibit 100: Platinum cost curve
Platinum prices cut into the cost curve this year



Source: Company reports, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 101: Palladium cost curve
About a quarter of palladium operations were loss-making this month



Source: Company reports, Bloomberg, BofA Global Research estimates

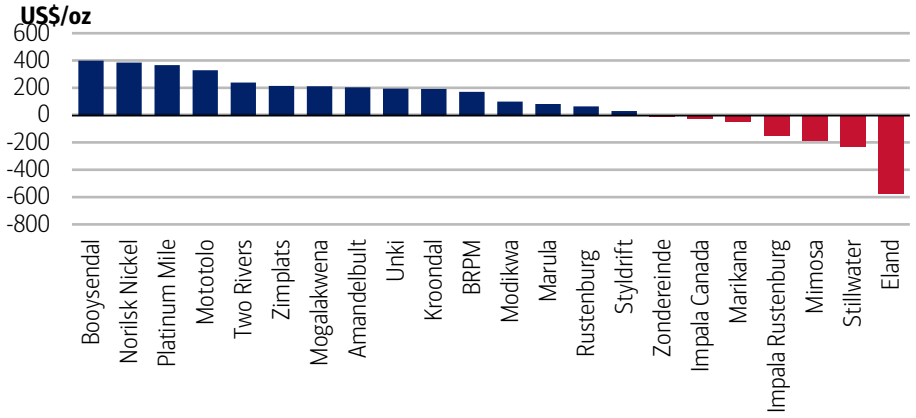
BofA GLOBAL RESEARCH

Deep output cuts would not eliminate palladium surpluses

With PGM fundamentals facing serious demand headwinds as consumers shift away from internal combustion engines that contain auto catalysts and into electric-powered vehicles, we have worked through the impact mine closures would have on the

respective platinum and palladium market balances. Our analysis starts with the most challenged operations, and then looks at the cumulative effect of shuttering the second, third, fourth, and so on (up to the seventh) most loss-making sites.

Exhibit 102: Basket cash profit margin by operation, at lowest 2023 PGM prices
Risk of supply cuts is rising as some key PGM operations have been loss-making

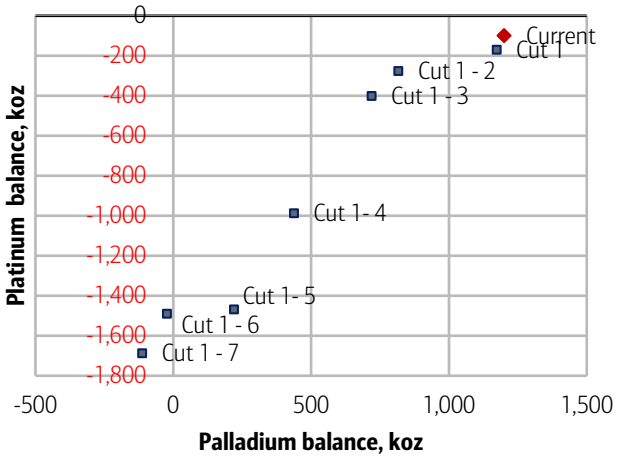


Source: Company reports, Bloomberg, BofA Global Research estimates
Notes: Basket includes platinum, palladium, rhodium

BofA GLOBAL RESEARCH

The bottom line: shutting down the first two loss-making operations would reduce our 2024 palladium surplus by about 400koz to 800koz, but the market would remain oversupplied. Yet, these closures would be enough to push the platinum market into a deficit of about 300koz. If, instead, all unprofitable operations were to go out of business, the entire palladium surplus would be wiped out, pushing platinum into a deeper deficit of 1.7Moz. Hence, the fundamental backdrop is stronger for platinum and it should continue to outperform palladium going forward.

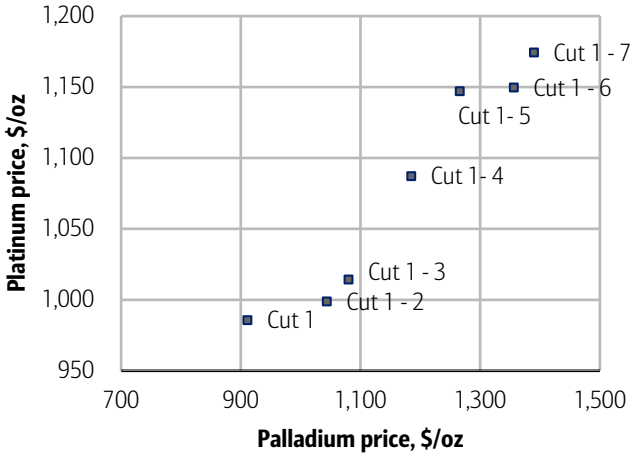
Exhibit 103: Supply cuts impact scenarios on 2024 market balances
Cutting the first two loss-making operations could remove the surplus in the platinum market



Source: Johnson Matthey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 104: Supply cuts impact scenarios on 2024 prices
Supply cuts could push PGM prices back towards US$1,200/oz



Source: Johnson Matthey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Steel and bulk commodities

Steel: prices have fallen on softer fundamentals

Overview

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

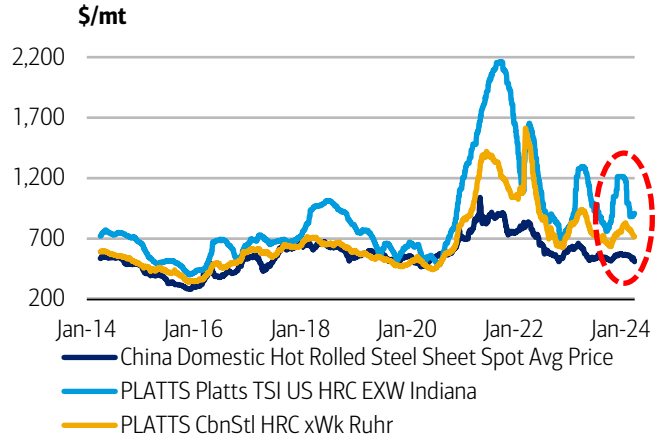
Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Global steel prices rallied in late 2023 before declining again in 1Q24

Steel demand is driven by cyclical sectors, including construction and car production. Hence, prices usually struggle when the economy slows. Notwithstanding, steel rallied in 4Q23 in China, the EU and, most notably, in the US, before declining in 1Q24 on softer fundamentals:

- In **China,** HRC prices rose by 9% to CNY4,093/t (US$571/t) during 4Q23, before consolidating those gains in the new year. The rally faded in the absence of clear signs that demand is recovering, especially from the property sector. This, in turn, prompted an unseasonal production cut in December, pushing 2023 output growth down to 0.6% from 1.8% in Jan-Nov (Exhibit 106).
- In the **EU,** HRC prices rallied by 28% to EUR765/t (US$830/t) between October 2023 and February 2024, supported by production curtailments, which have contributed to another year-on-year decline in crude steel output. Also, lead times to ship raw materials have risen due to logistical issues in the Suez Canal. Notwithstanding, several blast furnaces are now coming back online, so a demand recovery is essential to keep prices supported.
- In the **US,** HRC prices rose by nearly 60% between September and December, topping US$1,200/t. This was driven by a confluence of factors. Most notably, steel demand in the US held up last year on purchases from the automotive industry and a strong non-residential construction sector, accompanied by production discipline from the mills. Prices have since fallen, also because restocking subsided, paving the way for the next push higher as the US economy recovers.

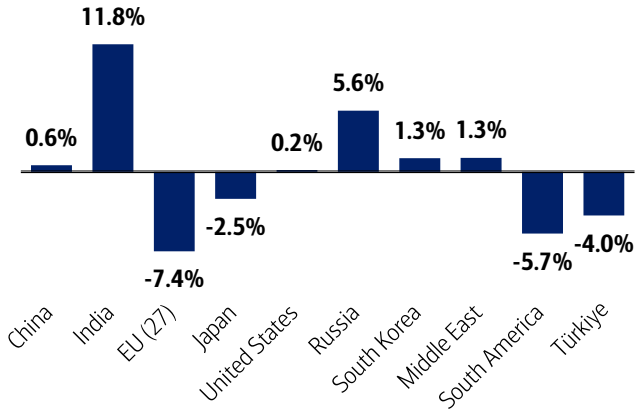
Exhibit 105: Global steel prices
Steel prices rallied late last year on production cuts but softened in the new year



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 106: Crude steel production, by top producers (2023 vs 2022)
Steel production growth has been subdued in most regions



Source: Bloomberg, worldsteel

BofA GLOBAL RESEARCH

India's steel production increases to offset China weakness

While the world's largest steel producer, China, is likely to focus on limiting overcapacity, steel production globally is still set to improve modestly compared to 2023 (Exhibit 107). India should continue expanding output towards 160Mt by the end of 2025, almost entirely offsetting declines in China. Meanwhile, steel production in Europe should start recovering after several facility closures since the 2022 energy crisis, albeit this is dependent on a domestic demand recovery. Finally, in the US, producers should continue to benefit from rising steel demand from infrastructure, as well as continued recovery in automotive production.

Exhibit 107: Crude steel production, by country
Global crude steel production should modestly improve this year

Crude steel production, Mt	2022	2023	2024E	2025E
China	1,013	1,018	1,008	984
Europe	180	169	178	186
US	81	81	84	88
Other NAFTA	30	28	29	29
South America	44	42	42	43
Russia	72	76	76	76
CIS ex. Russia	14	14	15	17
Middle East	45	47	46	48
India	125	140	146	158
Japan	89	87	83	80
South Korea	66	67	68	70
Rest of the world	130	122	126	130
World ex. China	877	873	892	924
World	1,890	1,891	1,900	1,907
YoY change	-3.7%	0.1%	0.5%	0.4%

Source: worldsteel, CRU, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

US

Lawson Winder, CFA >>
Merrill Lynch (Canada)
+1 416 369 7592
lawson.winder@bofa.com

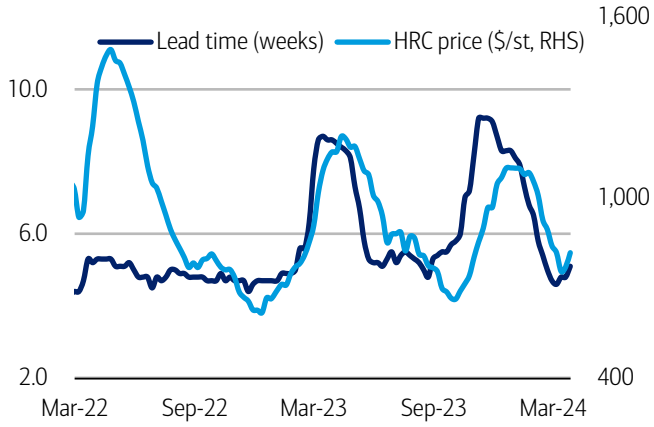
Sathish Kasinathan
BofAS
+1 646 855 2769
sathish.kasinathan@bofa.com

US HRC: mills hike prices, but rally could be short-lived

The price of US hot-rolled coil (HRC) declined by US$344 per short ton (st), or approximately 31% year-to-date and bottomed at US$755/st in mid-March. The pace and magnitude of the correction were greater than our expectation as supply tightness and a restocking cycle eased quicker than anticipated. Domestic mills have now announced two rounds of price hikes, targeting a base HRC price of US$900/st. The hikes appear to have gained some traction (spot currently at US$810-820/st), with lead times extending modestly (albeit likely driven by large, lower-priced orders booked prior to the price rises). With supply expected to be limited by spring maintenance outages, mills could continue to hike prices in the short term. However, we expect the rally to be short-lived given:

1. service center inventories remain relatively high;
2. import arrivals could surge again as arbitrage is beginning to widen;
3. domestic mills will ramp-up production post maintenance outages (expected to be largely completed by the end of April); and
4. the 3 million (m) ton per year Big River Steel 2 project is expected to come online in H2'24, with the owner and operator (US Steel) guiding for 0.75-0.9m st of incremental production, equal to about 3% of US flat-rolled sheet production.

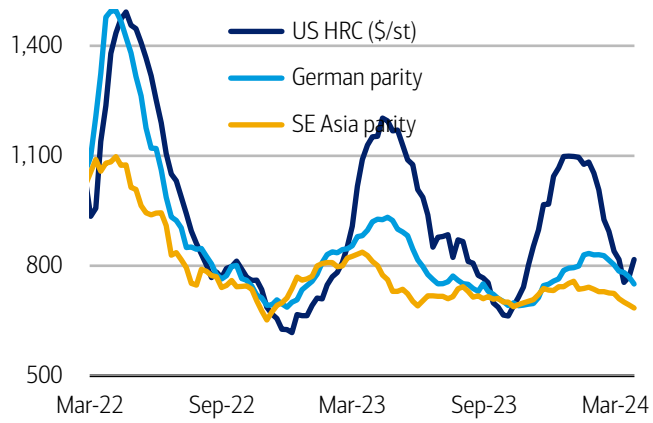
Exhibit 108: US HRC lead times vs. price
HRC lead times declined from ~9 weeks in November 2023 to below 5 weeks by early-March 2024; though they have increased slightly since then



Source: Platts, CRU, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 109: US HRC vs regional import parity price
Import arbitrage has once again started to widen following the recent domestic price hikes



Source: BofA Global Research estimates, CRU, Platts

BofA GLOBAL RESEARCH

We therefore expect HRC pricing to peak in mid-Q2'24, and trend lower in H2'24. For the full year 2024, we now expect HRC to average US$850/st (down 2% from our prior forecast). Upside risks include supply disruptions and/or slower ramp-ups post the maintenance outages, a continued delay in the restart of the privately held AHMSA mill in Mexico, stronger-than-expected underlying demand and/or restocking, and improvements in foreign steel pricing. Downside risks include weaker-than-expected demand (especially further delays in funding for infrastructure projects) and a surge in imports.

For 2025E, we have increased our HRC price forecast by 10% to US$800/st, driven by stronger demand (more meaningful benefit of infrastructure spending), higher-than-previously-assumed cost inflation (including scrap costs), less robust imports (supported by improved foreign steel pricing) and the expectation for somewhat more rational competitive dynamics among domestic mills.

Exhibit 110: Updated US hot-rolled coil (HRC) price forecasts
Modestly lowering 2024E forecast mainly on sharper correction witnessed in Q1. Lifting 2025E forecast by 10%

Product	Unit	2020	2021	2022	Q1'23A	Q2'23A	Q3'23A	Q4'23A	2023A	Q1'24A	Q2'24E	Q3'24E	Q4'24E	2024E	2025E
US Hot Rolled Coil	USD/Short Ton	577	1,580	1,018	859	1,063	790	892	901	929	915	825	730	850	800
Change vs prior	%									-9%	-1%	3%	0%	-2%	10%

Source: BofA Global Research estimates, CRU

BofA GLOBAL RESEARCH

US supply and demand forecasts

US apparent steel demand decreased 4.5% YoY in 2023 (mainly driven by an approximate 24% decline in net imports). Looking ahead, several indicators (Dodge construction starts & spending, the American Road & Transportation Builders Association (ARTBA) contract awards, Portland Cement Association's cement consumption forecast, etc.) point to a stronger spring and summer construction season in 2024, with many projects under the Infrastructure Investment and Jobs Act (IIJA) now entering construction phase. This, coupled with continued recovery in automotive production, should drive higher steel consumption in 2024E and 2025E.

Exhibit 111: US steel supply and demand model
US apparent steel demand decreased 4.5% YoY in 2023; higher construction and auto demand should drive a consumption rebound in 2024E

(in m short tons)	2016	2017	2018	2019	2020	2021	2022	2023	2024E	2025E
Crude steel production	**87**	**90**	**95**	**97**	**80**	**95**	**89**	**90**	**92**	**97**
% change	-0.5%	4.0%	6.1%	1.3%	-17.1%	18.0%	-6.1%	1.1%	3.0%	5.0%
Capacity	123	122	122	121	118	116	115	118	123	130
% change	-1.0%	-0.9%	0.4%	-0.7%	-2.9%	-1.1%	-1.6%	3.1%	3.9%	6.1%
Capacity utilization (AISI/BofAe) (%)	*70.5%*	*74.0%*	*78.2%*	*79.8%*	*68.1%*	*81.2%*	*77.5%*	*76.0%*	*75.3%*	*74.6%*
Steel shipments	86	90	94	96	81	94	89	89	92	97
% change	0.3%	4.8%	4.8%	1.2%	-15.8%	17.1%	-5.8%	-0.2%	3.7%	5.0%
Imports (finished steel)	**26**	**30**	**26**	**21**	**16**	**23**	**25**	**22**	**22**	**21**
% change	-16.4%	12.2%	-13.1%	-18.1%	-23.3%	41.1%	11.0%	-14.1%	0.0%	-3.0%
Exports	9	10	9	7	7	8	8	9	9	9
% change	-6.4%	12.8%	-16.2%	-15.9%	-9.9%	23.5%	1.0%	6.3%	5.0%	2.0%
Net imports	17	19	17	14	10	15	17	13	13	12
% change	-20.9%	11.9%	-11.4%	-19.2%	-30.5%	53.2%	16.5%	-23.9%	-3.4%	-6.7%
Apparent steel use	**104**	**109**	**112**	**110**	**91**	**108**	**106**	**101**	**104**	**108**
% change	-4.4%	4.4%	2.5%	-1.0%	-17.4%	18.0%	-1.5%	-4.5%	3.1%	3.6%
Import market share (%)	*25%*	*27%*	*23%*	*19%*	*18%*	*21%*	*24%*	*21%*	*21%*	*19%*
BofA US HRC ($/short ton)	521	616	830	601	577	1,580	1,018	901	850	800

Source: BofA Global Research estimates, AISI, US Census Bureau, CRU

BofA GLOBAL RESEARCH

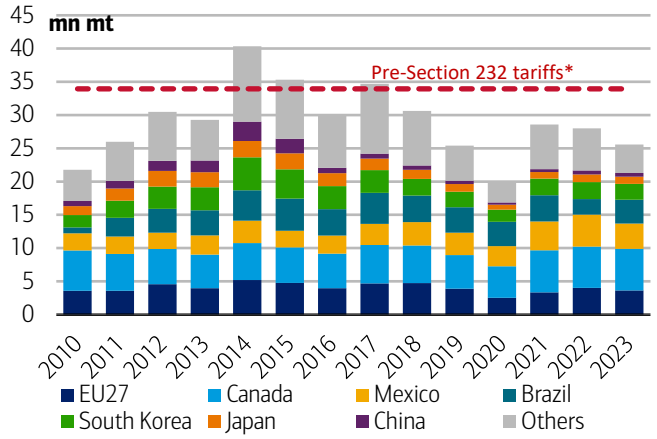
Trade policies do matter. What if Trump wins?

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Rising steel consumption in the US matters in that existing trade restrictions are likely to keep steel prices in the region supported relative to the rest of the world. Indeed, US HRC prices have often outperformed those in Europe and China, but that divergence has become increasingly visible in the past three years.

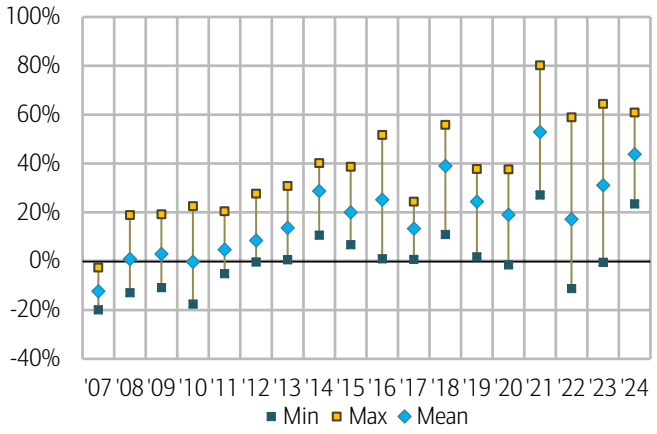
Exhibit 112: US imports of steel mill products
Steel tariffs in the US have curbed inflows of foreign material



Source: US Department of Commerce
Notes: Figures includes flat, semi-finished, pipe and tubes, long, stainless steel products. (*) Average imports between 2013-2017

BofA GLOBAL RESEARCH

Exhibit 113: US HRC price premium to EU HRC
Trade barriers have benefitted US steel producers, with domestic HRC prices trading at elevated premia to the EU



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

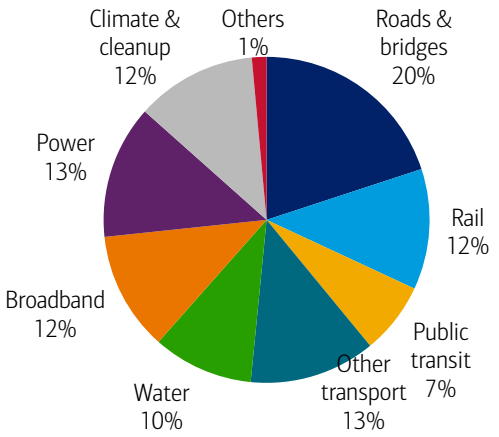
We believe protectionist measures (i.e., trade restrictions) and public infrastructure spending have played a pivotal role. With governments looking to rebuild and fortify domestic supply chains, there is a key message in this: **siloing markets gives producers pricing power, and consumers have to pay more**. Of course, this is what trade protectionism is designed to do. Consumers should be diligent in protecting against upside risk every time prices pull back. Back in March 2018, the Trump

administration imposed a 25% tariff on steel imports under Section 232, citing national security concerns (steel is used in critical infrastructure such as power plants and bridges). This boosted US producers' pricing power, and HRC has since been trading at a premium of up to 80% to quotations in Europe. Domestically, US steel prices averaged just under US$600/t before Trump fired the first restriction salvo; since then, they have averaged US$930/t, a 55% premium. While trade barriers have been relaxed somewhat since President Biden took office, a second Trump administration could reverse some of those measures. There have been discussions about a potential minimum tariff on steel imports should Trump be re-elected.

Spending from the infrastructure bill saved the day

US steel prices have not just been supported by trade restrictions, but also by Biden's infrastructure bill (the Bipartisan Infrastructure Law), enacted in 2021.

Exhibit 114: New spending under the infrastructure bill
Transportation (roads, rail, public, river, airport etc) = >50% of total



Source: BofA Global Research, company reports

BofA GLOBAL RESEARCH

Exhibit 115: Announced Bipartisan Infrastructure Law (BIL) funding
So far the majority of funding has been allocated to steel-consuming sectors

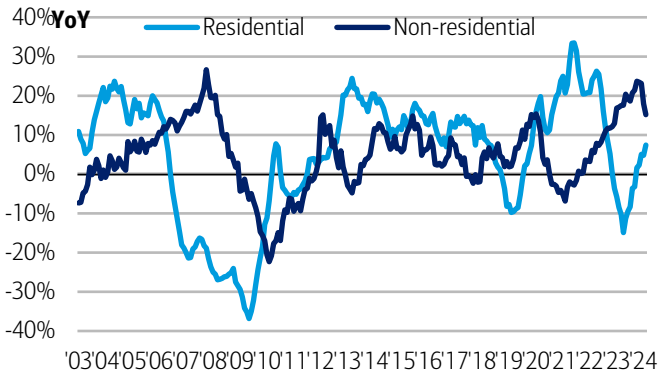
Category	Funding (US$ bn)	% total
Transportation	**252**	**70%**
Airports and Federal Aviation Administration Facilities	8	2%
Electric Vehicles, Buses and Ferries	3	1%
Passenger and Freight Rail	14	4%
Ports and Waterways	6	2%
Public Transportation	34	9%
Roads, Bridges and Major Projects	175	48%
Safety	12	3%
Climate, Energy, and the Environment	**61**	**17%**
Clean Energy and Power	17	5%
Environmental Remediation	4	1%
Resilience	17	5%
Water	24	7%
Broadband	**47**	**13%**
Other	**1**	**0%**
Total	**361**	**100%**

Source: Invest.gov (2023)
Notes: Data as of November 22nd, 2023

BofA GLOBAL RESEARCH

Indeed, while tighter monetary policy hit rates-sensitive residential construction, non-residential building activity has held up, growing uninterrupted for three years now. Steel demand in the US should also remain robust on growing renewables and EVs.

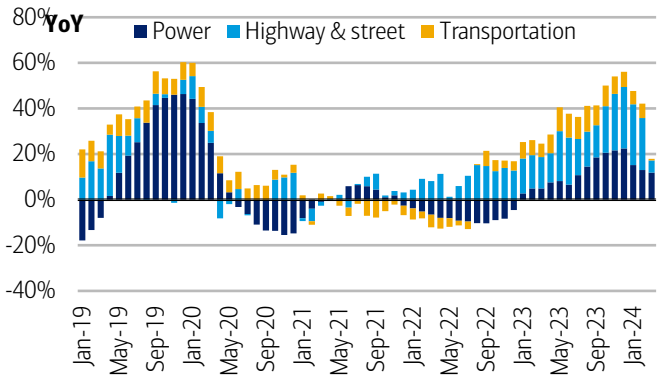
Exhibit 116: US construction spending
Residential construction has underperformed in the US, but non-residential construction spending grew by as much as 25% YoY in 2023



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 117: US non-residential construction spending
Non-residential construction growth was driven by spending on roads and highways, which has been expanding for 31 consecutive months



Source: Bloomberg

BofA GLOBAL RESEARCH

Rising protectionism will be an issue for China

Beyond the US, protectionist measures have also become more of a focus in other countries, with Chinese steel pushing into domestic markets. For instance, several producers in Brazil were forced to cut production or temporarily idle plants last year. The Brazilian steel industry has been urging the government to raise import tariffs to 25%, from 9.6-12.8%, a request that was partially accommodated earlier this month. Rising protectionism is an issue for Chinese steelmakers, and could force them to slow activity, unless domestic demand picks up.

Iron ore: no catalyst near-term

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Overview

Record low inventories in China and resilient steel production pushed iron ore prices above US$140/t in January, before they came off sharply. As a result, margins at Chinese steel mills have improved significantly, but we see limited room for this to be sustained, unless domestic demand picks up, with the property sector a key headwind. The market looks well supplied this year and the next; hence, we see softer prices from here, averaging US$107/t in 2024 and US$90/t in 2025. Changes in sentiment (e.g., more fiscal stimulus, normalisation of the property market) and an end to El Niño (which reduces rainfall), potentially in June, are upside risks.

Exhibit 118: Iron ore supply and demand balance
Iron ore to be better supplied

Wet Mt	2022	2023	2024E	2025E	2026E
Global production	2,363	2,375	2,422	2,504	2,544
YoY change	2.2%	0.5%	2.0%	3.4%	1.6%
Global consumption	2,301	2,361	2,358	2,342	2,338
YoY change	-5.0%	2.6%	-0.1%	-0.7%	-0.2%
Balance	**62**	**14**	**63**	**161**	**206**
Iron ore price (US$/t)	**120**	**120**	**107**	**90**	**90**

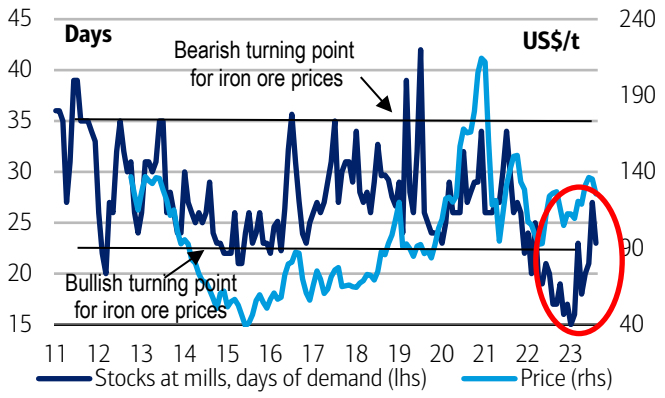
Source: Company reports, CRU, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Prices rallied above US$140/t on restocking before falling again

Iron ore prices were very resilient coming into the new year, topping US$140/t in January. This was despite the limited impact of weather disruptions that seasonally affect shipments from Australia and Brazil. The strength in prices was supported by record low inventories at Chinese steel mills and ports (Exhibit 119 and Exhibit 120), along sustained utilisation rates at blast furnaces. As stocks improved and steel producers slowed down activities on weak domestic demand, iron ore prices retreated.

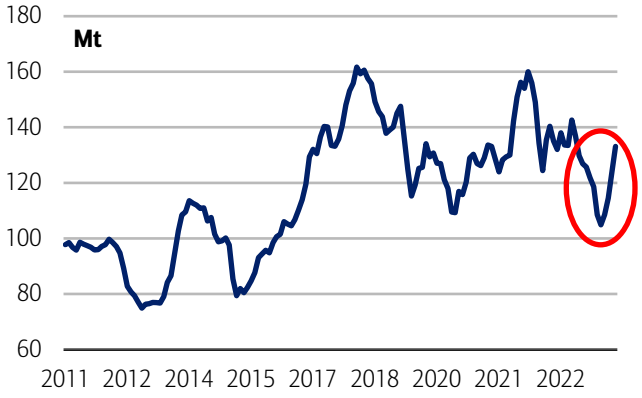
Exhibit 119: Iron ore prices and inventories at Chinese steel mills
Chinese steel mills restocked, pushing iron ore prices above US$140/t



Source: Bloomberg, Mysteel, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 120: Iron ore inventories at Chinese ports
Stocks at ports have recovered after dropping to multi-year lows



Source: Bloomberg

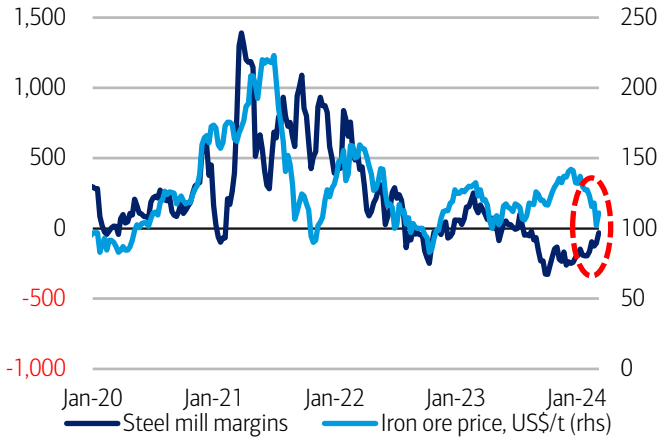
BofA GLOBAL RESEARCH

Steel mill margins have improved but demand is still an issue

Why were Chinese steel mills running empty? Margins have been a headache as domestic steel prices remained subdued (Exhibit 121). Nonetheless, falling raw materials prices in the first quarter have helped to restore profitability, with spot margins at blast

furnaces turning positive in recent weeks. That said, for this to be sustained, steel demand needs to normalise, a dynamic that has not unfolded yet. Indeed, we estimate that steel consumption is running at about -5% YoY, again mostly driven by the property market still contracting by -30% YoY (Exhibit 122).

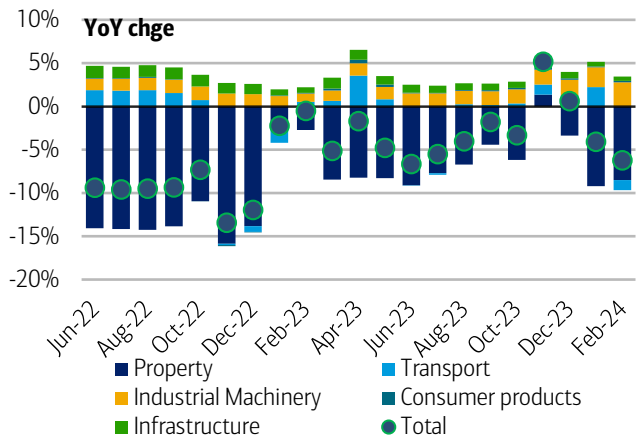
Exhibit 121: China margins at steel mills (BOF) and iron ore prices
Falling raw material prices have helped to restore profitability, but domestic steel prices need to recover for this to be sustained



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 122: China steel demand by sector
There is no sign of steel demand picking up in China so far, as the property market remains the key drag



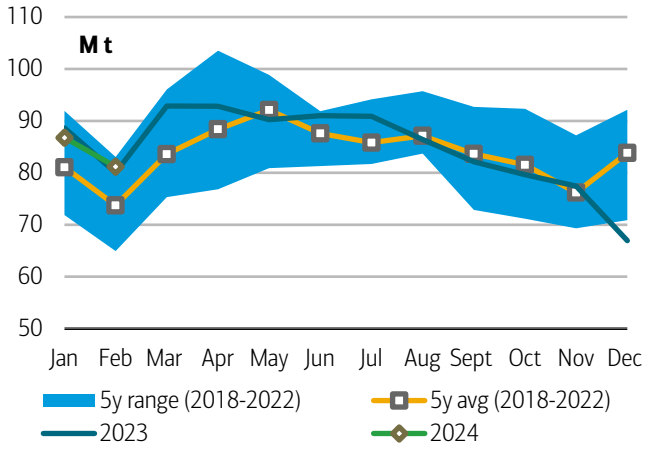
Source: Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Producers are cutting production, but not by enough to balance the market

The upside for Chinese steel prices near-term looks limited, as production is still running high (Exhibit 123). Crude steel production in the first two months of the year dropped by just 0.4% YoY, reversing the unseasonal cut in December. Reflecting an oversupplied domestic steel market, exports have climbed again (Exhibit 124), by 31% YoY YTD to 95Mt annualised (vs 91Mt in 2023).

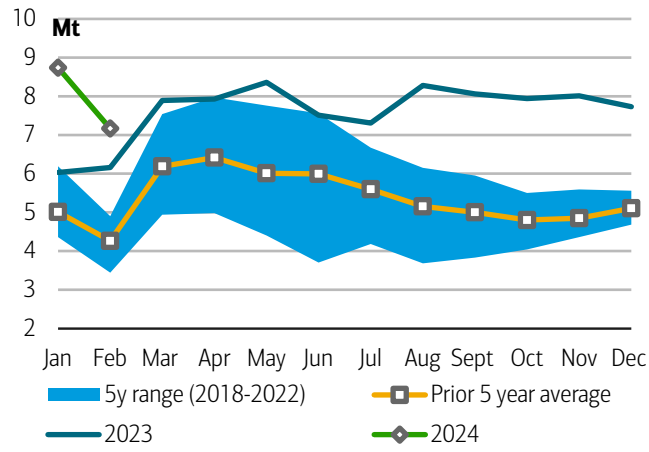
Exhibit 123: China crude steel production
Chinese steel prices are likely to remain subdued near-term as steel production is still elevated



Source: Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 124: China steel exports
Steel exports keep rising as the Chinese market remains oversupplied



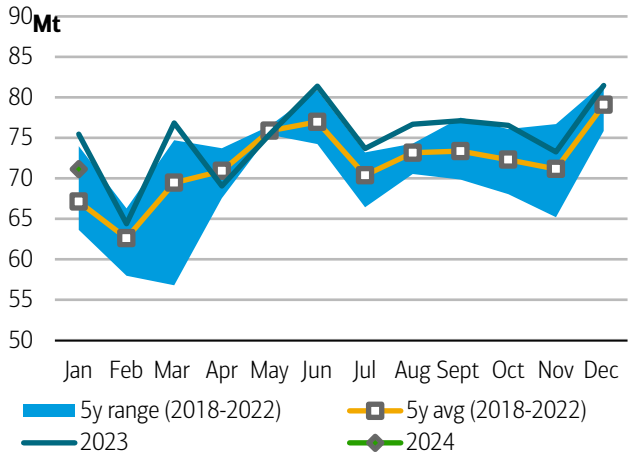
Source: Bloomberg

BofA GLOBAL RESEARCH

The market is well supplied as Australia and Brazil keep expanding production

Beyond demand headwinds, the iron ore market looks softer as supply is set to continue expanding. Last year, shipments from the world's two largest exporters, Australia and Brazil, outperformed remarkably, rising by 1.5% YoY to 901Mt and 9.9% YoY to 378Mt, respectively (Exhibit 125 and Exhibit 126). Exports are still holding up this year, running above historical averages.

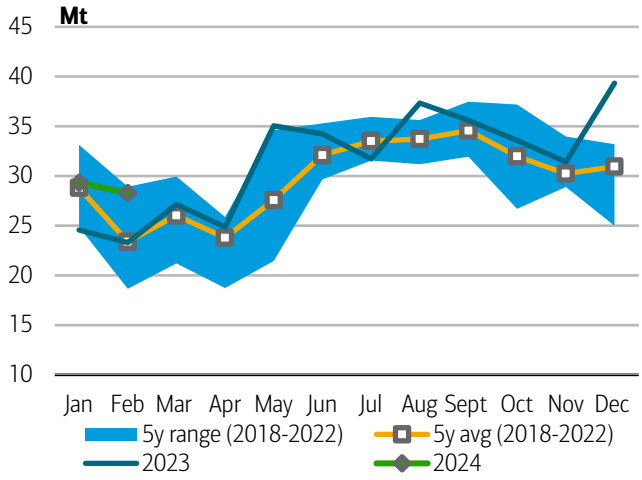
Exhibit 125: Australia iron ore exports
Shipments from Australia were resilient last year and are still holding up this year, hovering above historical averages



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 126: Brazil iron ore exports
Brazilian exports have outperformed, rising by about 10% last year

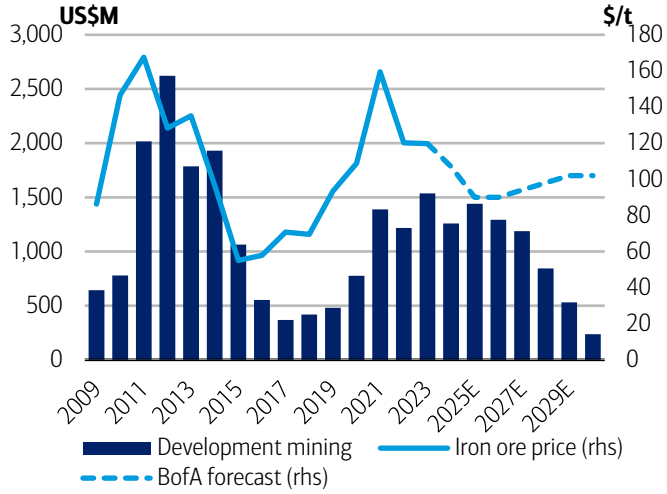


Source: Bloomberg

BofA GLOBAL RESEARCH

This trend has been driven largely by rising investments in new mines (Exhibit 127). Capex has risen 4x since the 2017 lows and should remain stable at least until 2027. Reflecting this, we expect volumes to increase steadily, with the four majors (Rio Tinto, Vale, BHP, FMG (Fortescue)) on track to add more than 160Mt of iron ore supply by 2030, or about 7% of global production currently. (Exhibit 128). Hence, we see softer prices from here, averaging US$107/t in 2024 and US$90/t in 2025.

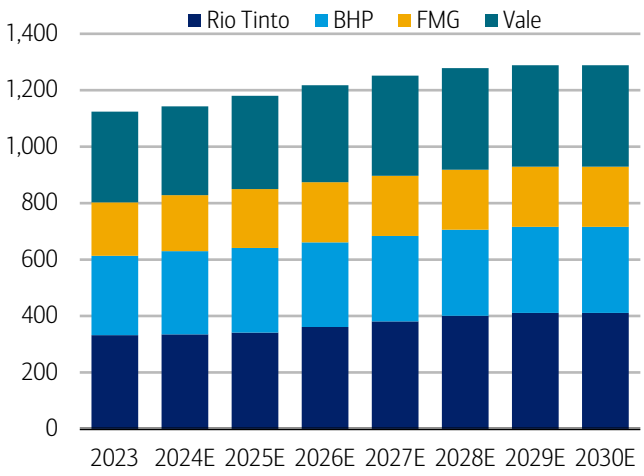
Exhibit 127: Iron ore development capital
Investments into new projects have been rising since 2017



Source: Woodmac, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 128: Iron ore production from majors
The market looks well supplied, with all majors ramping up production



Source: company reports, BofA Global Research estimates
Notes: Figures are 100% basis. Rio Tinto production includes Simandou

BofA GLOBAL RESEARCH

Thermal coal: remain constructive vs current fwd curves

Francisco Blanch
Commodity & Deriv Strategist
BofA Europe (Madrid)
+34 91 514 3070
francisco.blanch@bofa.com

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

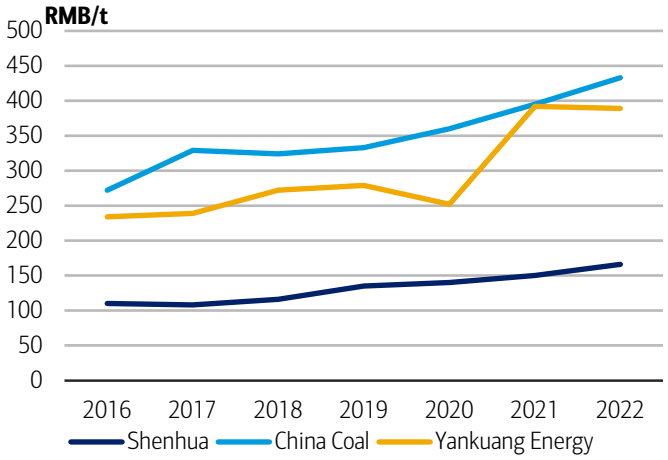
Overview

Newcastle thermal coal prices have stabilised after high volatility despite a collapse in both US and EU gas, and tumbling EUAs (European Union Allowances). Most EMs should keep burning coal as DMs cut back, but limited output increases outside Indonesia should support prices. We reiterate our forecast of Newcastle prices averaging US$145/t in 2024 and US$125/t in 2025 vs fwd prices of US$133/t and US$140/t, respectively.

Thermal coal prices have stabilised on China output cuts

In line with our expectations, Newcastle thermal coal prices have stabilised after high volatility despite a collapse in both US and European gas, as well as tumbling European Emission Allowances. As we have previously noted, China and Saudi have set a floor for energy prices via rising domestic coal production costs and higher government spending needs.

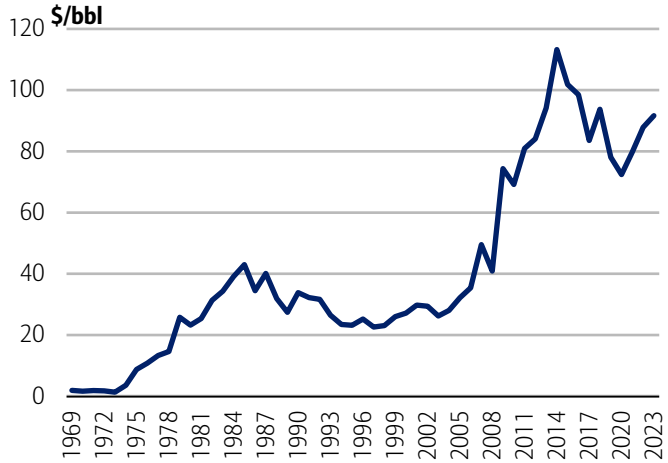
Exhibit 129: China, unit production costs (major producers)
The steep increases in Chinese domestic coal production have quickly pushed local miners up the marginal cost curve, making energy more expensive in China



Source: Company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 130: Saudi breakeven oil price
In a similar vein, a sharp increase in government spending plans to meet Saudi Vision 2030 has elevated the oil budget break-evens for the world's swing oil exporter

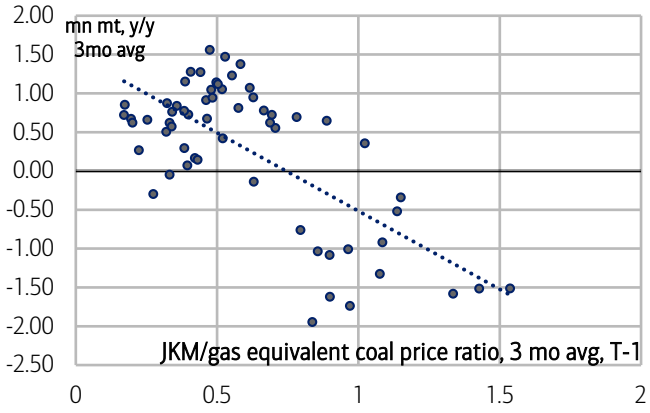


Source: Haver, Saudi Central Bank (SAMA), Ministry of Finance, BofA Global Research

BofA GLOBAL RESEARCH

Expensive Chinese coal is likely helping JKM natural gas to find a floor, just as calorific coal value differentials have stabilised at a high level. Looking into 2024, we see China cutting back output, but still needing imports for power generation. China's clean energy shift will hit oil first, coal second. In contrast, India coal supply should expand rapidly on increased investments, although demand growth rates could at times exceed them, as the subcontinent continues to rely heavily on coal.

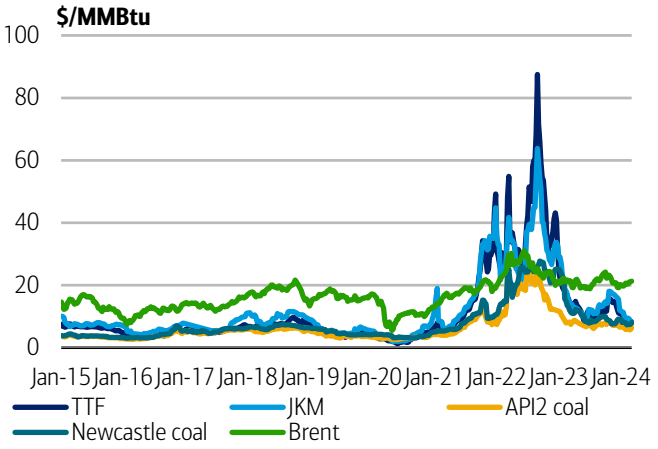
Exhibit 131: JKM/gas equivalent coal price ratio versus Y/Y Chinese LNG import change
There is a strong linkage between the relative prices of thermal coal and natural gas, and Chinese liquid natural gas import volumes



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 132: Gas and gas equivalent prices of coal and oil
With thermal coal prices in Asia holding firm, Asian JKM natural gas prices have also found a floor and are in turn supporting European TTF prices



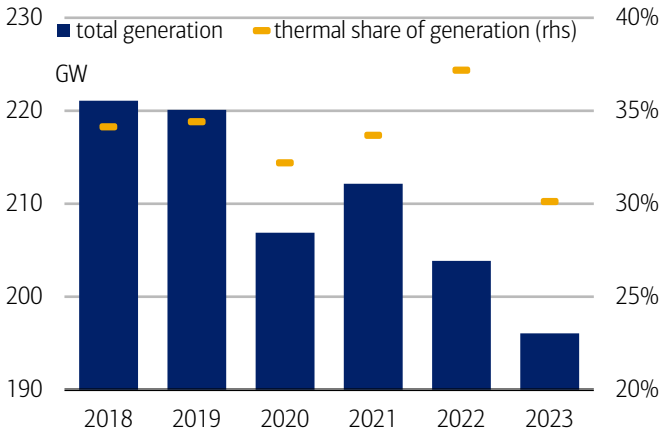
Source: Bloomberg

BofA GLOBAL RESEARCH

Limited exports (besides Indonesia) offset weak demand

Broadly, EMs like India, Indonesia, China or South East Asia will keep burning coal as DMs cut back on a recovery in nuclear and renewable generation capacity and broad-based power demand destruction in Europe. Japan and South Korea coal demand should continue to cool off, as lower LNG (liquefied natural gas) prices are poised to keep displacing coal.

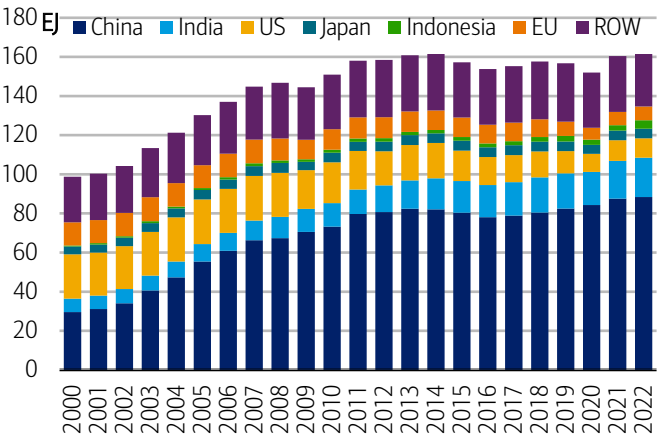
Exhibit 133: NWE generation and thermal's share
European power generation came off sharply in 2023, driving down the use of thermal fuels in the electricity mix



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 134: Global coal consumption
Looking out, we expect DM demand for thermal coal to continue to decline structurally while EM consumption across key players increases

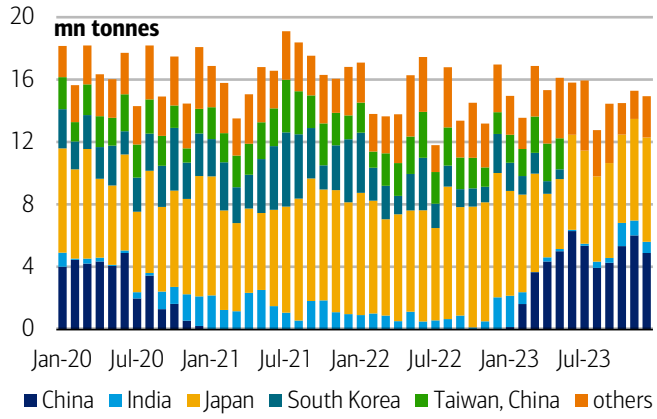


Source: Energy Institute

BofA GLOBAL RESEARCH

On supply, the world's leader, Indonesia, should expand exports as other suppliers such as Australia or the US retrench. Similarly, South Africa or Colombia could struggle to expand output for different reasons. It is also worth noting that Russian coal exports are down significantly on US/EU sanctions and we see little upside to volumes at this point. Thus, while a stagnant global thermal coal demand picture on the back of Net Zero commitments should be bad news for coal, this long list of supply challenges is unlikely to go away, supporting prices.

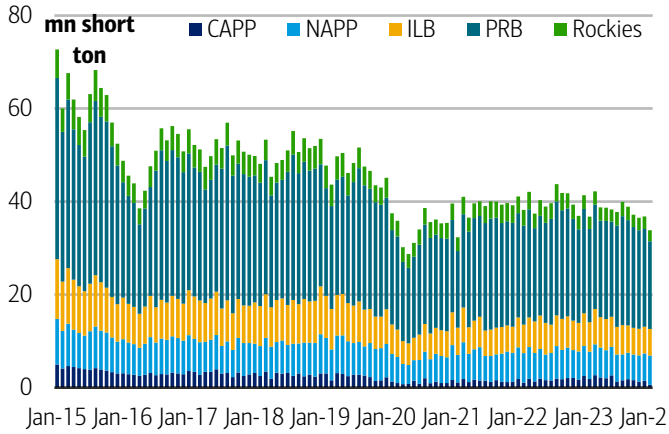
Exhibit 135: Australia exports by country
Australian thermal exports have been coming down for several years for a variety of reasons, and we do not see a big uplift ahead



Source: McCloskey

BofA GLOBAL RESEARCH

Exhibit 136: United States coal production
Similarly, American thermal coal production is rolling off again with prices coming down from the elevated levels of prior years



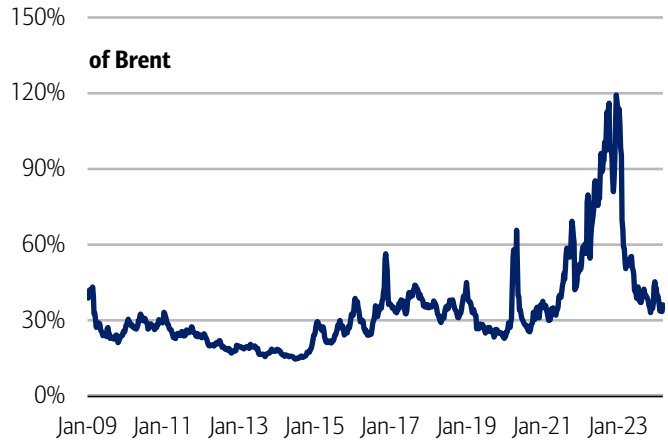
Source: McCloskey

BofA GLOBAL RESEARCH

Newcastle coal prices should hold firm this year and next

With thermal coal prices now back to their 10y average relationship to Brent, the downside seems limited to us unless a global recession unfolds in the quarters ahead. Thus, we remain constructive and expect Newcastle prices to average US$145/t in 2024 and US$125/t in 2025 compared to forward prices of US$133/t and US$140/t, respectively. Beyond climate pressures curbing output among key suppliers, cash costs have also increased in recent years due to incremental safety regulations and a lack of mine developments. Some exporters are now facing coal production hurdles of US$100+/t. Meanwhile, shipping rates and distances have risen as a result of disruptions in both the Panama and Suez Canals. With global manufacturing PMIs poised to turn increasingly positive around the world on lower Fed and ECB interest rates, an upturn in energy demand should create a more supportive demand environment for thermal coal prices.

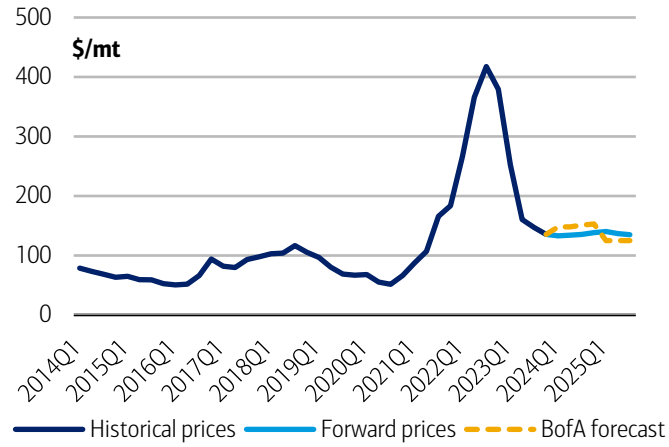
Exhibit 137: Newcastle coal prices as a % of Brent crude oil prices
Newcastle prices spiked dramatically in 2022 in both absolute and relative terms as a % of Brent, but prices are back to the 10y average



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 138: Newcastle coal prices and forecasts
We project Newcastle prices to average US$145/t in 2024 and US$125/t in 2025



Source: Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Metallurgical coal: prices look for a floor, recovery in 2H

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Overview

Prices rallied coming into the new year but have come off sharply since January on a confluence of factors. We see prices stabilising above US$200/t as cost support kicks in, before rebounding later in the year. The coking coal market remains structurally tight on limited supply growth from Australia and buoyant demand in India and Southeast Asia.

Exhibit 139: Met coal supply and demand balance
We expect the met coal market to remain in deficit this year

Mt	2022	2023E	2024E	2025E	2026E
Global production	902	921	941	966	975
YoY change	-0.8%	2.1%	2.2%	2.6%	1.0%
Global consumption	932	947	964	960	966
YoY change	-0.7%	1.6%	1.8%	-0.4%	0.6%
Balance	-31	-27	-23	6	9
Met coal price (US$/t)	365	296	280	230	220

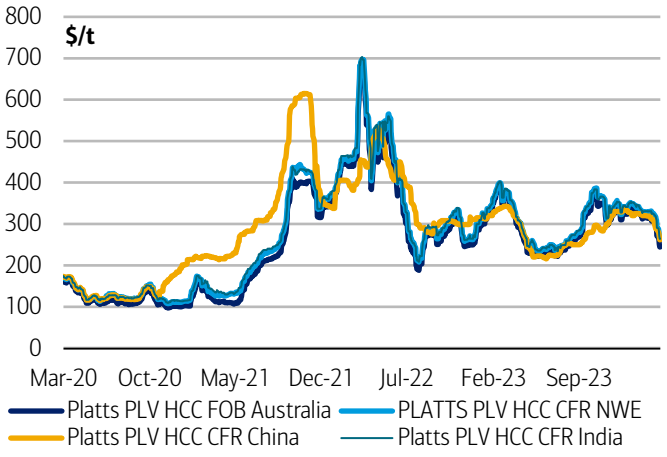
Source: Woodmac, McCloskey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Met coal prices have declined but should eventually stabilise

Coming into 2024, benchmark hard coking coal (HCC) prices rallied by 14% from the November lows, reaching US$338/t in January (Exhibit 140).

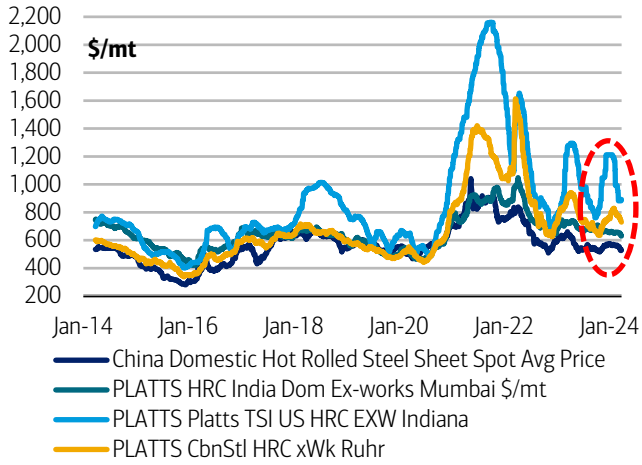
Exhibit 140: Global metallurgical coal prices
Met coal prices rallied coming into the new year but have since declined on softening steel fundamentals globally



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 141: Global steel prices
Steel prices rallied late last year on production cuts, but weak demand across major markets has pushed them back down again



Source: Bloomberg

BofA GLOBAL RESEARCH

Yet, market tightness has eased since, with spot supply improving due to: (1) falling steel prices across most regions (Exhibit 141), including India, where the domestic market has been flooded with excess units from China's mills; (2) weaker steel production in China, prompting producers to resell met coal cargoes from long-term contracts into the spot market; and (3) lower supply disruptions, as Cyclone Kirrily had a weaker impact on shipments from Australia than originally expected. All in, market sentiment suggests a shift towards a buyer's market. We see prices stabilising around US$240-250/t; if steel fundamentals weaken further, they could fall towards US$200/t.

Lack of capex and cost inflation have lifted the price floor

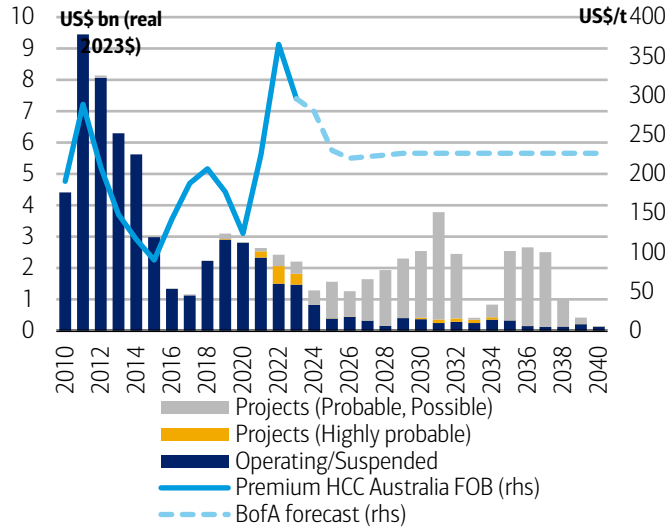
Capex is at a multi-year low

That said, coking coal prices remain elevated, and the floor has reset higher after years of underinvestment. Indeed, expansion capex has declined steadily from a 2011 peak of US$9.5bn to US$1.5bn in 2023, partially because of ESG concerns (Exhibit 142). Looking farther out, the capex trajectory looks unlikely to change, which should support prices (we lifted our long-term price for Australian HCC to US$226/t in November 2023; see our Year Ahead 2024: Metals and Mining Outlook report).

Production costs have risen

Cost inflation has also been an issue, with marginal costs (i.e., the 90th percentile of the cost curve) rising by about 30% to US$155/t over the past five years. By region, US miners remain the swing producers and are challenged when prices fall below US$200/t. (Exhibit 143).

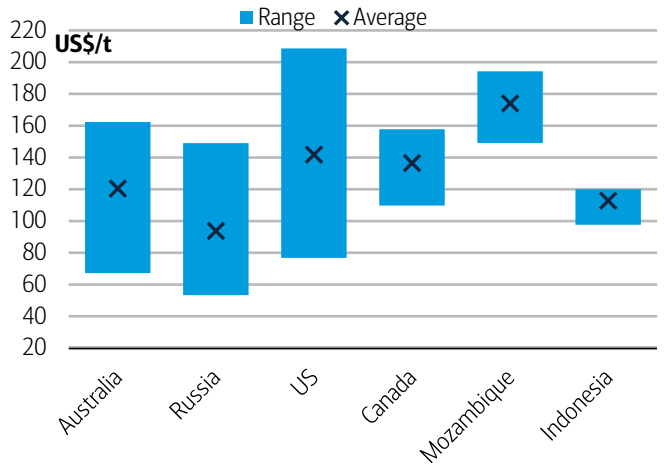
Exhibit 142: Global seaborne metallurgical coal development capital
Producers have been underinvesting in new mines



Source: Woodmac, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 143: Metallurgical coal total cash cost, by country
Miners start hurting once prices fall below US$200/t



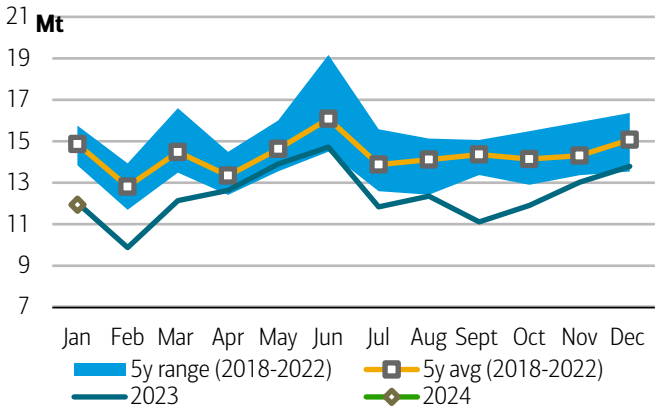
Source: Woodmac

BofA GLOBAL RESEARCH

Upside price risk on tight Australian supply

The lack of investment in new and existing coking coal mines led to a steady decline in shipments from Australia, often exacerbated by seasonal weather disruptions. Exports in 2023 fell by 5.9% YoY to 149Mt, the fourth consecutive year of decline (Exhibit 144). Australia is the dominant seaborne supplier, accounting for about half of global trade. Hence, the impact of lower baseline supply was magnified by unexpected supply losses. This also meant that prices have become increasingly volatile. Indeed, an end to El Niño (which reduces rainfall), potentially in June, and recurring operational disruptions could well mean that price risks are skewed to the upside in the latter part of 2024.

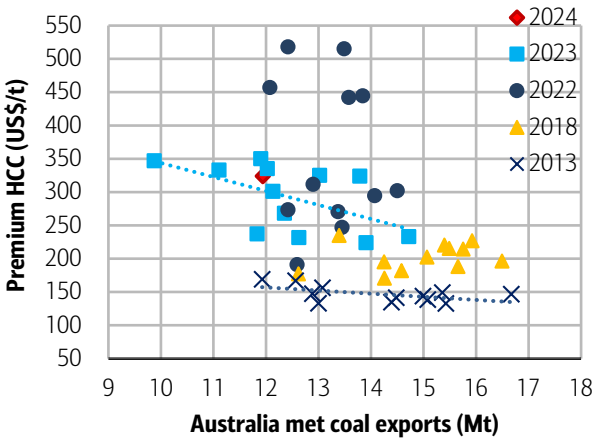
Exhibit 144: Australia coking coal exports
Coking coal exports from Australia have fallen by another 5.9% YoY in 2023, the fourth consecutive year of decline



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 145: Sensitivity of met coal prices to Australian exports
Coking coal prices have become increasingly sensitive to supply disruptions



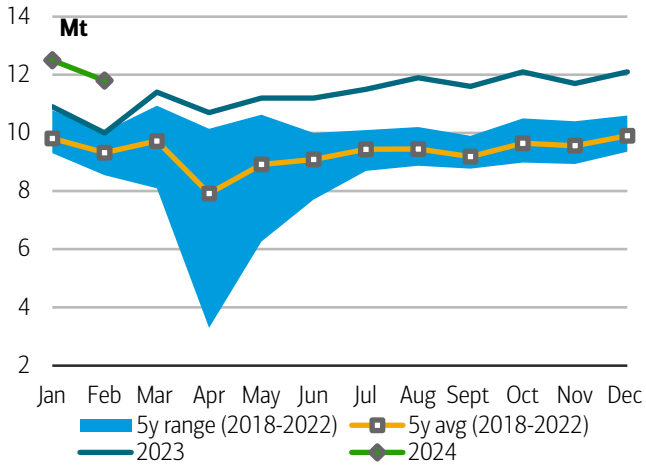
Source: Bloomberg

BofA GLOBAL RESEARCH

The Indian steel industry is showing no signs of slowing down

India's steel industry is still flourishing, with production increasing by 18% YoY in February. We see this trend continuing out to 2030, as the nation works towards its capacity target of 300Mtpa (see Ferrous - India: Road to 300 MTPA crude steel capacity #1 – Further consolidation on the cards, 14 December 2023). We note that steel has increasingly become a key pillar of the Indian industrial landscape, outperforming other core sectors last year. While urbanisation in India is still ~20 years behind China, the room for growth in the residential and infrastructure sectors is noteworthy – a bullish demand factor for key construction materials such as steel.

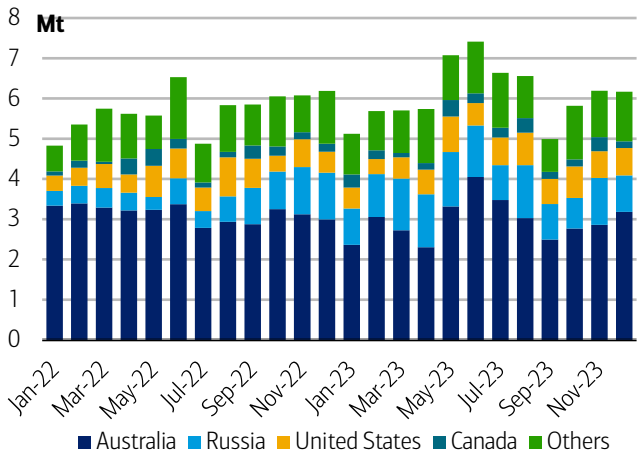
Exhibit 146: India crude steel production
The Indian steel industry continues to expand, with production up 18% YoY in February



Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 147: India coking coal imports, by origin
Coking coal imports rose by 7% in India in 2023, with Australia remaining the key supplier



Source: McCloskey

BofA GLOBAL RESEARCH

MIFTs

Lithium: geopolitics blows up lithium

Overview

The lithium market remains oversupplied as producers in China and World ex-China are unwilling to curtail production against a backdrop of persistent demand increases as EVs keep gaining market share. That said, spodumene prices have rallied recently as margins at converters had been positive (spodumene prices had fallen faster than chemicals quotations). Yet, unless chemicals prices rally, which is not our base case, the spodumene rally should be capped. Production discipline is still the name of the game. Once the necessary cuts are made, prices could rally quickly.

Exhibit 148: Lithium supply and demand balance
We have surpluses building

tonnes	2022	2023	2024E	2025E	2026E
Global production	657,337	897,532	1,245,682	1,704,066	1,986,158
YoY change	-2.5%	36.5%	38.8%	36.8%	16.6%
Global consumption	688,335	869,496	1,120,566	1,410,128	1,778,390
YoY change	48.5%	26.3%	28.9%	25.8%	26.1%
Balance	**-30,998**	**28,036**	**125,115**	**293,938**	**207,768**
Spot ($/t)	71,531	45,980	14,135	16,313	18,000

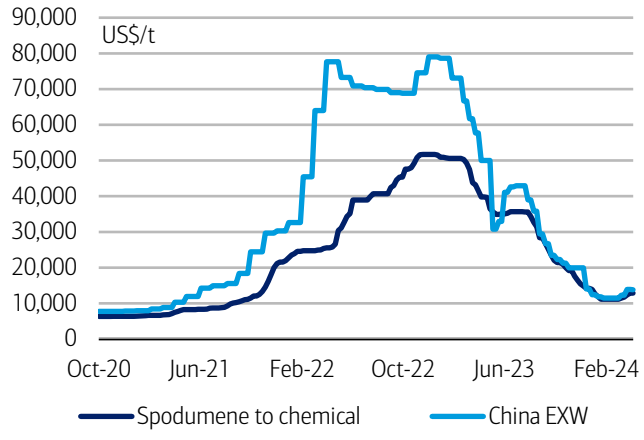
Source: Company reports, Woodmac, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

No lithium cost support

Lithium prices have been under pressure, as the market has flipped from deficit into surplus. The move lower was led by spodumene. Yet, prices of the feedstock have rallied recently as margins at converters had remained positive (spodumene prices had fallen faster than chemicals quotations). That gap has now closed, so unless chemicals prices rally, which is not our base case, the spodumene rally should be capped (Exhibit 149). In fact, operators have overall been reluctant to curtail production, the project pipeline is well filled and we continue to expect very high surpluses – this should cap prices for now.

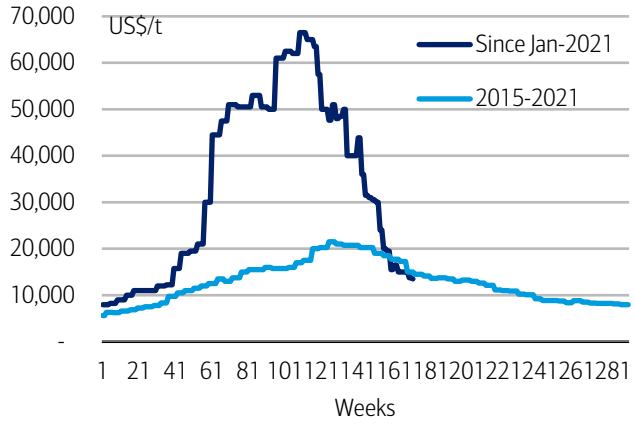
Exhibit 149: Lithium hydroxide prices and production costs
Spodumene prices led the move lower, but converters have bit up the feedstock again



Note: "spodumene to chemical" estimates the cost to produce chemicals versus actual chemicals price**s. Source:** Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 150: Lithium carbonate prices in different cycles
The current cycle has been much shorter than previous ones



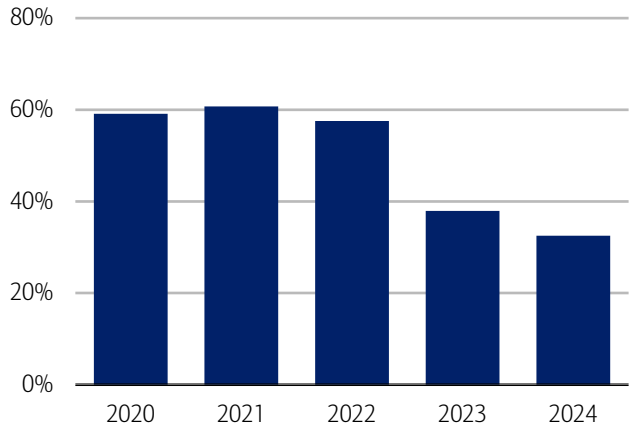
Source: Bloomberg, BofA Global Research

BofA GLOBAL RESEARCH

Ultimately, the supply overhang is driven by upstream production – one reason why mined spodumene had underperformed the downstream chemicals. Factoring in the lack of production discipline so far, we remain cautious on lithium, up to the point when miners start exiting the market – the timing of which is somewhat uncertain.

It is worth keeping in mind that junior and mid-sized miners are also pushing into lithium, a recurring issue after every rally. This reduces the incentive for the incumbents, especially those with lower cost, to reduce output, which would facilitate supply increases from competitors.

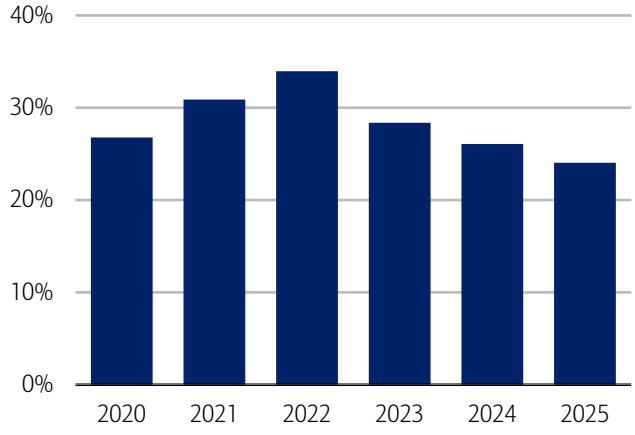
Exhibit 151: Market share of top-3 lithium miners
Industry consolidation is falling



Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 152: Market share of top-3 lithium processors
New entrants are pushing into lithium processing



Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Geopolitics overrides margin pressure

Incentive prices, used to value projects, suggest that most integrated operations in the pipeline are not profitable at current quotations. Yet, lithium is a strategic industry in China, limiting the appetite to reduce output there.

Exhibit 153: Lithium projects, incentive prices and capex intensities
Downstream producers are barely profitable at present

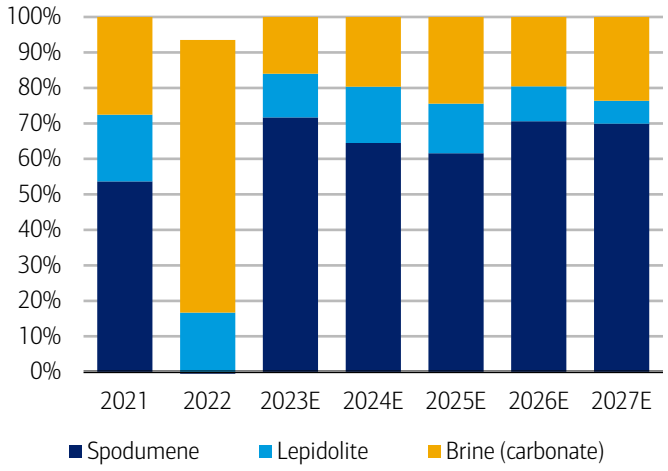
	Production, tonnes	Incentive price	Capex intensity
Spodumene			
Greenbushes, CGP 3 and 4	1,000,000	$450	$764
Grota do Cirilo	270,000	$650	$484
Goulamina	726,000	$450	$448
Whabouchi	235,000	$700	$1,702
Ewoyaa	365,000	$1,650	$432
Kathleen Valley	658,000	$650	$954
Chemicals			
Mount Holland	50,000	$11,000	$25,000
Centenario-Ratones	24,000	$13,000	$33,333
Rincon	30,000	$16,500	$42,167
Pastos Grandes	24,000	$16,500	$18,667
Pozuelos-Pastos Grandes	20,000	$7,500	$16,900
Sal de Vida - 2	30,000	$8,500	$22,500
Tres Quebradas	20,000	$5,750	$15,950
Upper Rhine Valley	39,400	$13,000	$48,579
Keliber Oy	15,000	$14,000	$39,453
Thacker Pass	40,000	$16,000	$73,250

Source: company reports, BofA Global Research

BofA GLOBAL RESEARCH

Meanwhile, Western producers keep pushing ahead on expectations that lithium demand will expand thanks to policies including the Inflation Reduction Act. Furthermore, Australia's government is now thinking about extending tax incentives to producers. The threat of further trade restrictions, this time non-tariff, is also rearing its head again; this ultimately means just one thing: it protects the industry for now, but in the longer term, consumers will have to pay more. Changing tack slightly, industry consolidation is also declining, a usual feature after bull markets, limiting the incentive to reduce output, especially for lower-cost incumbents.

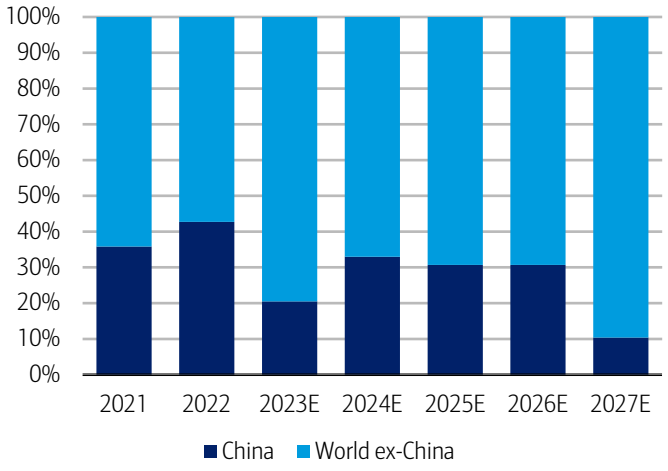
Exhibit 154: Breakdown of production increases
Production increases are led by spodumene



Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 155: Breakdown of production increases by region
Most upstream supply is coming from World ex-China



Source: company reports, Woodmac, BofA Global Research

BofA GLOBAL RESEARCH

Slower EV penetration = lower lithium demand growth

Meanwhile, on the demand side, we reduce EV penetration assumptions for the first time since we started covering lithium a few years back, partly because several governments have revisited their financial support to the industry. Our US auto team notes that sentiment on EVs soured in late 2023. Commentary from dealers and OEMs coincided with stalling velocity of EV sales. On further investigation, it seems there is a dichotomy in the EV market: the premium market has moved towards electrification while mass-market adoption lags.

Exhibit 156: Changes in EV subsidies
Governments are adjusting EV subsidies

Country	Announcement	Effective	Category	Type	Subsidy value	Description
Germany	Dec-23		Subsidy	Cut	Up to EUR4,500/vehicle	The German government has abruptly ended its electric car subsidy programme in the wake of the political parties' agreement on savings to overcome the budget crisis. The economy and climate ministry (BMWK) said that applications for the subsidy of up to 4,500 euros for the purchase of a battery-electric car are no longer possible.
US	Dec-23	Jan-24	Tax credit	Tighter eligibility rules		Many electric vehicles lost eligibility for tax credits of up to US$7,500 after new battery sourcing rules took effect in January, including the Nissan Leaf, Tesla Cybertruck All-Wheel Drive, some Tesla Model 3s and Chevrolet Blazer EV. The Treasury issued guidelines in December detailing new battery sourcing requirements aimed at weaning the U.S. electric vehicle supply chain away from China. The number of EV models qualifying for U.S. EV tax credits fell from 43 to 19. Those figures include different versions of the same vehicle type. Treasury said some manufacturers have yet to submit information on eligible vehicles, which could lead to changes in the list.
India		Jun-23	Subsidy	Cut	$121/E2W	India lowered the subsidy for electric two-wheelers (E2W) from June 1 to 10,000 rupees ($121) per kilowatt-hour of battery capacity from 15,000 rupees, raising concerns over the future of the subsidy program and E2W sales. The subsidy program is due to end in March 2024.

Source: Reuters, BNEF, Clean Energy Wire, BofA Global Research

BofA GLOBAL RESEARCH

Don't get us wrong: EV production keeps expanding, albeit at a slower pace, and in the end, it will not make a difference to lithium until markets rebalance. Eventual announcements of lithium production cuts will be key to a price rebound.

Uranium: prices near 15-year high

Lawson Winder, CFA >>
Research Analyst
Merrill Lynch (Canada)
+1 416 369 7592
lawson.winder@bofa.com

Harmen Puri >>
Research Analyst
Merrill Lynch (Canada)
harmen.puri@bofa.com

Overview

We are constructive on uranium (U_3O_8) prices as the spot and terms markets remain undersupplied with several years of inventory drawdowns now compounding. Uranium is currently trading near a 15-year high at just under US$90/lb U_3O_8. We expect the market to remain in a deficit position until 2029E. This is a material change from our last update just one quarter ago, when we saw markets coming into balance sometime in 2025E. Significant delays in ramping up production in Kazakhstan are a key driver of the change in outlook. Many sources of primary mined supply remain constrained following a decade of underinvestment. On the demand side, utilities are facing significant long-term security of supply risk after Russia's invasion of Ukraine.

With this as context, we increase our U_3O_8 price forecasts to US$120/lb (+4%) in 2025E and US$135/lb (+59%) in 2025E. Driven by cost inflation, we raise our long-term U_3O_8 price forecast (2029E) to US$60/lb.

Exhibit 157: BofAe annual U_3O_8 price forecasts
We increase our price forecasts to US$105/lb (+34%) in 2024 and US$115/lb (+53%) in 2025

	US$/lb	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E(LT)
Old	U_3O_8	49.54	60.17	105.00	115.00	85.00	75.00	65.00	55.00
Current	U_3O_8	49.55	60.20	105.00	120.00	135.00	110.00	85.00	60.00
% change	U_3O_8	0.0%	0.1%	0.0%	4.3%	58.8%	46.7%	30.8%	9.1%

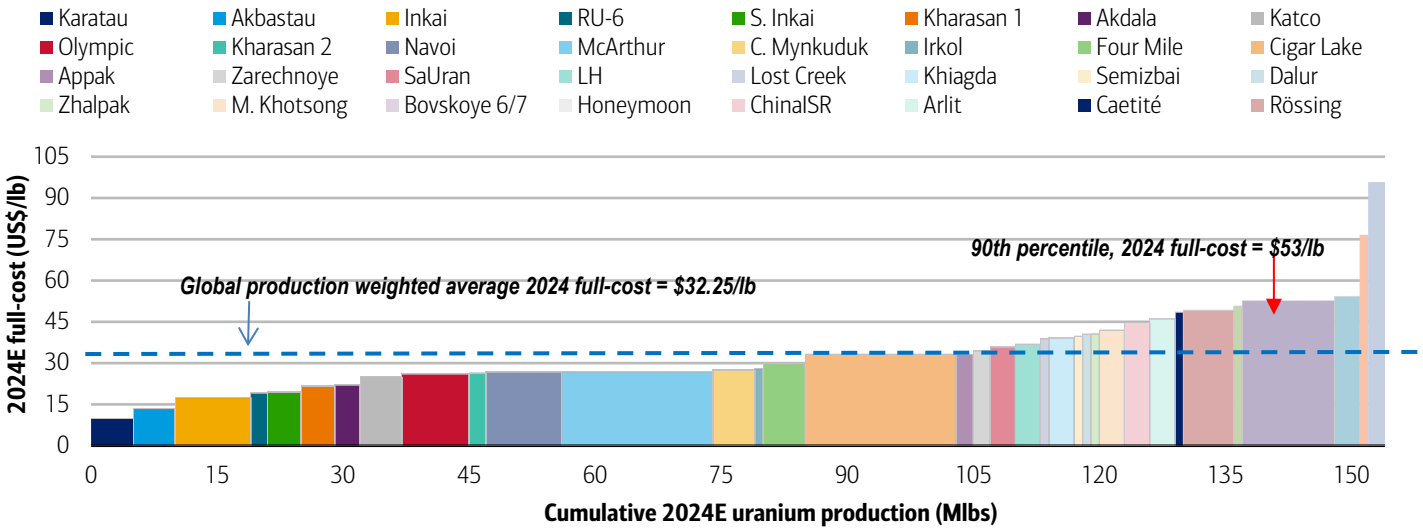
Source: BofA Global Research; UxC, LLC

BofA GLOBAL RESEARCH

Cost curve shifts up for 2024E

Based on our 2024E all-in cost of production curve for the global uranium mining industry, we estimate a 90th percentile cost of US$43/lb. In 2029E money, this is US$60/lb.

Exhibit 158: 2024E all-in uranium cost curve, based on expected production
We use a cost-curve approach to derive our long-term uranium price, setting at the 2024E 90th percentile, inflated to 2029E



Source: BofA Global Research, Company reports, UxC, LLC

BofA GLOBAL RESEARCH

Uranium (U_3O_8) market prices

While the spot price of uranium (U_3O_8) has been improving steadily since late 2017, when Cameco idled its McArthur River uranium mine, it has been quite volatile.

Exhibit 159: Daily price of uranium (U_3O_8) in US$/lb
U_3O_8 has been strengthening steadily since Cameco idled its McArthur River mine in late 2017...

Source: UxC, LLC

BofA GLOBAL RESEARCH

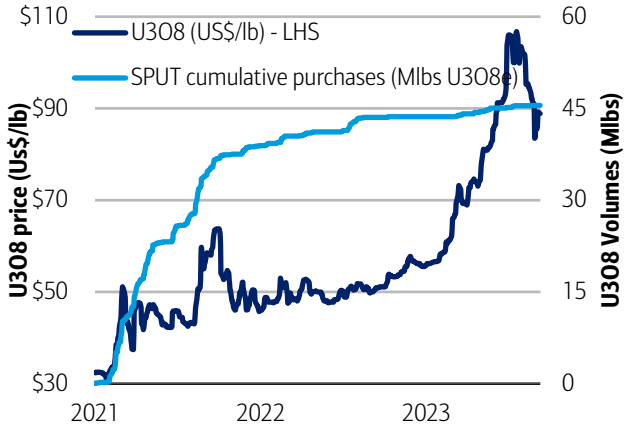
Exhibit 160: Monthly price of uranium (U_3O_8) in US$/lb
...yet U_3O_8 prices are still well below long-term peak reached in 2007

Source: UxC, LLC

BofA GLOBAL RESEARCH

The Sprott Physical Uranium Trust (SPUT) has become an important driver of spot pricing since its inception in July 2021. But more recently, it's been less active in the market as it has more frequently traded at a discount to its net asset value (NAV). In our view, the rising uranium price has been driven more by end-use (nuclear utility) demand.

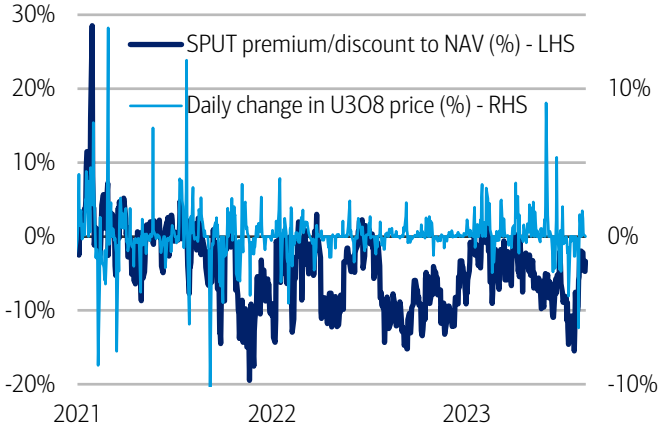
Exhibit 161: UxC daily spot price vs. cumulative SPUT purchases of U_3O_8
Slow SPUT purchasing did not slow the increase in the U_3O_8 price



Source: UxC, LLC; Sprott Physical Uranium Trust website

BofA GLOBAL RESEARCH

Exhibit 162: SPUT price premium to NAV vs. daily U_3O_8 price changes
When priced at a discount to NAV, SPUT U_3O_8 purchases slow



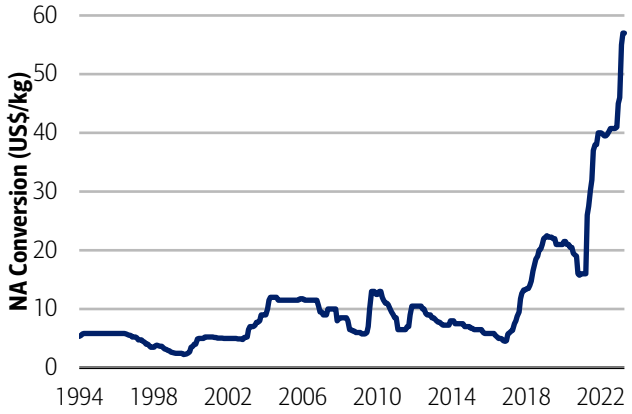
Source: UxC, LLC; Sprott Physical Uranium Trust website

BofA GLOBAL RESEARCH

Conversion market prices

Conversion pricing in North America and the European Union is at all-time highs and could remain robust given reports of continued tight supply. While several facilities are now ramping-up in the West, which could provide some relief over the longer term, continued tightness in the near term seems likely, suggesting a building of pent-up demand for natural uranium (U_3O_8).

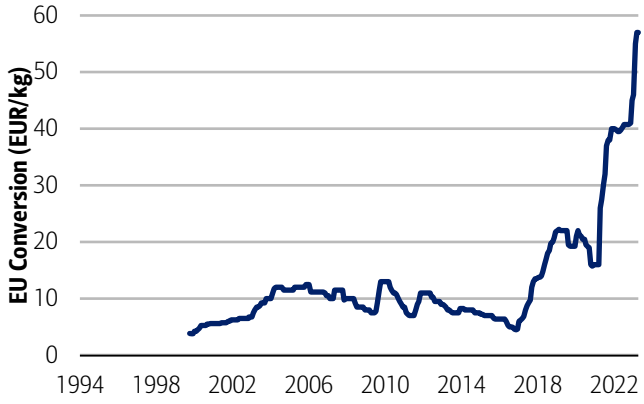
Exhibit 163: North American (NA) conversion pricing (US$ / KgU)
Conversion pricing is at all-time highs



Source: UxC, LLC

BofA GLOBAL RESEARCH

Exhibit 164: European Union (EU) conversion pricing (EUR / KgU)
Conversion pricing is at all-time highs



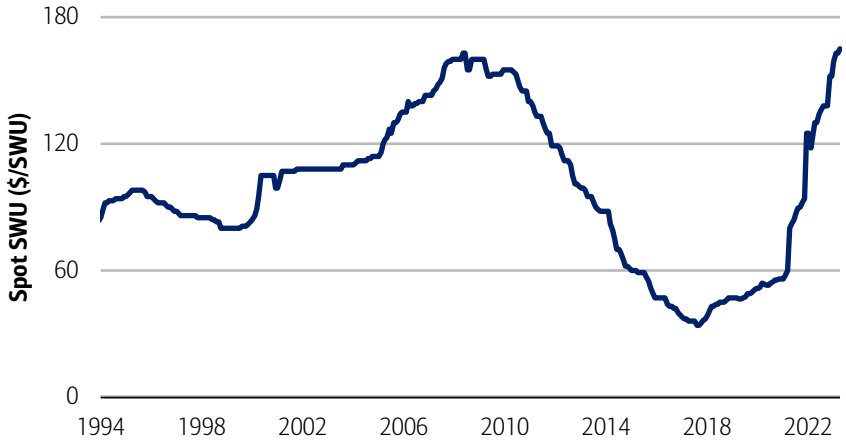
Source: UxC, LLC

BofA GLOBAL RESEARCH

Enrichment market prices

Global enrichment markets are tightening rapidly, which should lead to increasing demand for U_3O_8 through a rising rate of overfeeding. We think it is feasible that the uranium price also reaches an all-time high.

Exhibit 165: Enrichment prices as measure in USD per separative work unit (SWU)
SWU pricing has strengthened substantially since Russia's invasion of Ukraine, to an all-time high



Source: UxC, LLC

BofA GLOBAL RESEARCH

Uranium global supply & demand

Exhibit 166: Demand for uranium (thousands of pounds (klbs) of uranium / yellowcake / tri-uranium octoxide (U_3O_8))

The forecast 23% growth in power reactor consumption demand through to 2030E vs. 2023 is driven by China, as well as South Korea and Japan

URANIUM DEMAND	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	2034E	2035E
Country																
Canada	4,218	3,927	5,188	5,188	5,188	4,411	4,022	4,022	4,022	4,022	4,824	5,299	5,473	7,108	5,296	5,127
% y/y	*-7%*	*-7%*	*32%*	*0%*	*0%*	*-15%*	*-9%*	*0%*	*0%*	*0%*	*20%*	*10%*	*3%*	*30%*	*-25%*	*-3%*
China	21,185	25,988	22,750	26,457	30,795	34,863	37,238	37,803	47,081	50,482	63,154	57,181	58,842	67,324	71,600	74,862
% y/y	*5%*	*23%*	*-12%*	*16%*	*16%*	*13%*	*7%*	*2%*	*25%*	*7%*	*25%*	*-9%*	*3%*	*14%*	*6%*	*5%*
France	15,574	22,849	23,119	24,371	23,465	23,465	23,465	23,465	23,465	17,420	25,915	25,131	19,966	23,086	26,495	26,200
% y/y	*0%*	*47%*	*1%*	*5%*	*-4%*	*0%*	*0%*	*0%*	*0%*	*-26%*	*49%*	*-3%*	*-21%*	*16%*	*15%*	*-1%*
Japan	3,134	3,342	6,891	6,373	8,000	7,992	8,272	12,931	11,292	11,068	11,552	9,505	10,122	11,027	10,804	10,060
% y/y	*46%*	*7%*	*106%*	*-8%*	*26%*	*0%*	*4%*	*56%*	*-13%*	*-2%*	*4%*	*-18%*	*6%*	*9%*	*-2%*	*-7%*
Russia	5,718	8,432	12,902	13,019	13,787	12,745	13,548	12,739	13,010	9,506	12,538	14,622	10,164	11,639	11,699	8,429
% y/y	*-33%*	*47%*	*53%*	*1%*	*6%*	*-8%*	*6%*	*-6%*	*2%*	*-27%*	*32%*	*17%*	*-30%*	*15%*	*1%*	*-28%*
South Korea	11,690	12,315	11,928	12,358	12,863	12,371	12,196	12,196	12,196	13,554	14,667	16,582	13,507	15,017	15,859	14,601
% y/y	*23%*	*5%*	*-3%*	*4%*	*4%*	*-4%*	*-1%*	*0%*	*0%*	*11%*	*8%*	*13%*	*-19%*	*11%*	*6%*	*-8%*
United States	43,477	45,567	49,167	49,821	49,135	49,298	49,298	49,298	49,298	50,032	44,107	52,647	46,765	46,101	48,887	48,137
% y/y	*-9%*	*5%*	*8%*	*1%*	*-1%*	*0%*	*0%*	*0%*	*0%*	*1%*	*-12%*	*19%*	*-11%*	*-1%*	*6%*	*-2%*
Other	55,805	31,265	44,429	41,483	39,965	40,447	37,964	43,203	41,738	40,628	42,720	36,139	41,645	45,970	38,130	48,504
% y/y	*-1%*	*-44%*	*42%*	*-7%*	*-4%*	*1%*	*-6%*	*14%*	*-3%*	*-3%*	*5%*	*-15%*	*15%*	*10%*	*-17%*	*27%*
Power Requirements	**160,800**	**153,685**	**176,373**	**179,069**	**183,199**	**185,591**	**186,005**	**195,658**	**202,103**	**196,713**	**219,478**	**217,107**	**206,483**	**227,272**	**228,770**	**235,920**
% y/y	*-2.3%*	*-4.4%*	*14.8%*	*1.5%*	*2.3%*	*1.3%*	*0.2%*	*5.2%*	*3.3%*	*-2.7%*	*11.6%*	*-1.1%*	*-4.9%*	*10.1%*	*0.7%*	*3.1%*
Total inventory build	**20,100**	**66,171**	**20,500**	**15,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**9,000**	**10,000**	**9,000**	**9,000**
% y/y	*8%*	*229%*	*-69%*	*-27%*	*-33%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*-10%*	*11%*	*-10%*	*0%*
Total Underlying Demand	**180,900**	**219,856**	**196,873**	**194,069**	**193,199**	**195,591**	**196,005**	**205,658**	**212,103**	**206,713**	**229,478**	**227,107**	**215,483**	**237,272**	**237,770**	**244,920**

Source: BofA Global Research, UxC LLC

BofA GLOBAL RESEARCH

Exhibit 167: Supply for uranium and market balances (thousand pounds (klbs) of uranium / yellowcake / triuranium octoxide (U_3O_8))

Before accounting for uranium inventory drawdowns, years 2024E-2028E are expected to experience deficits

URANIUM SUPPLY	2020	2021	2022	2023	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	2034E	2035E
Mine Supply																
Africa	19,118	20,656	20,219	21,284	24,000	25,400	25,170	26,600	28,950	30,440	31,210	32,875	30,720	28,975	27,670	27,310
% y/y	*-3%*	*8%*	*-2%*	*5%*	*13%*	*6%*	*-1%*	*6%*	*9%*	*5%*	*3%*	*5%*	*-7%*	*-6%*	*-5%*	*-1%*
Australia	16,025	9,721	12,163	13,221	14,700	15,225	15,900	15,825	15,300	14,700	9,700	9,700	9,550	9,250	9,250	8,900
% y/y	*-6%*	*-39%*	*25%*	*9%*	*11%*	*4%*	*4%*	*0%*	*-3%*	*-4%*	*-34%*	*0%*	*-2%*	*-3%*	*0%*	*-4%*
Canada	10,070	12,200	19,160	28,499	36,000	36,000	37,300	38,000	41,000	46,000	63,000	63,000	63,000	72,000	72,000	47,200
% y/y	*-44%*	*21%*	*57%*	*49%*	*26%*	*0%*	*4%*	*2%*	*8%*	*12%*	*37%*	*0%*	*0%*	*14%*	*0%*	*-34%*
Kazakhstan	50,641	56,811	55,193	54,879	56,728	60,336	63,642	73,430	76,290	75,250	74,912	74,299	70,793	70,793	67,543	57,611
% y/y	*-15%*	*12%*	*-3%*	*-1%*	*3%*	*6%*	*5%*	*15%*	*4%*	*-1%*	*0%*	*-1%*	*-5%*	*0%*	*-5%*	*-15%*
Russia	7,400	7,360	6,521	6,973	6,760	6,760	7,160	7,760	8,360	8,960	9,360	9,360	9,360	9,360	9,360	9,360
% y/y	*-2%*	*-1%*	*-11%*	*7%*	*-3%*	*0%*	*6%*	*8%*	*8%*	*7%*	*4%*	*0%*	*0%*	*0%*	*0%*	*0%*
Ukraine	1,182	752	125	884	750	750	1,000	1,500	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
% y/y	*-43%*	*-36%*	*-83%*	*607%*	*-15%*	*0%*	*33%*	*50%*	*33%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
United States	213	0	194	26	1,400	3,485	4,240	4,600	4,350	4,000	4,000	3,900	3,060	2,010	1,250	800
% y/y	*22%*	*-100%*	*nm*	*-87%*	*5285%*	*149%*	*22%*	*8%*	*-5%*	*-8%*	*0%*	*-3%*	*-22%*	*-34%*	*-38%*	*-36%*
Uzbekistan	8,800	8,800	9,259	10,530	10,400	10,400	10,400	10,400	10,400	10,400	10,400	10,400	10,400	10,400	10,400	10,400
% y/y	*-3%*	*0%*	*5%*	*14%*	*-1%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
Other	5,837	6,330	6,323	7,270	7,457	8,172	9,055	9,501	10,080	10,870	10,870	10,870	10,870	10,870	10,870	10,870
% y/y	*3%*	*8%*	*0%*	*15%*	*3%*	*10%*	*11%*	*5%*	*6%*	*8%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
Total mine production	**119,286**	**122,630**	**129,157**	**143,566**	**158,195**	**166,529**	**173,867**	**187,616**	**196,730**	**202,620**	**215,452**	**216,404**	**209,753**	**215,658**	**210,343**	**174,451**
% y/y	*-14%*	*3%*	*5%*	*11%*	*10%*	*5%*	*4%*	*8%*	*5%*	*3%*	*6%*	*0%*	*-3%*	*3%*	*-2%*	*-17%*
Secondary Supply																
Russian Govt Stocks	4,000	4,000	4,000	4,000	4,000	4,000	3,000	3,000	2,500	2,500	2,000	2,000	1,500	1,500	1,200	1,200
Russia Reenrichment/underfeed	12,000	11,200	7,500	8,500	7,500	5,000	4,500	4,500	4,500	4,000	3,000	3,000	2,500	2,000	1,500	1,500
Western enricher Sales	8,150	8,860	7,340	4,540	1,725	0	0	0	0	0	0	0	0	0	0	0
Commercial inventory	29,500	36,300	40,000	36,000	13,211	11,214	5,276	189	610	-9,446	1,096	-1,725	-8,120	4,719	13,831	56,318
US Gov't stocks (US DOE + TVA)	3,042	828	888	1,895	1,798	2,014	2,511	3,413	959	928	1,887	1,659	4,200	7,659	6,700	6,700
MOX + Reprocessed	8,371	7,392	6,969	6,633	6,770	6,834	6,850	6,940	6,804	6,111	6,042	5,769	5,650	5,736	4,196	4,751
Total secondary supply	**65,063**	**68,580**	**66,697**	**61,568**	**35,004**	**29,062**	**22,137**	**18,042**	**15,373**	**4,093**	**14,025**	**10,703**	**5,730**	**21,614**	**27,427**	**70,469**
Total Supply	**184,349**	**191,210**	**195,854**	**205,134**	**193,199**	**195,591**	**196,005**	**205,658**	**212,103**	**206,713**	**229,478**	**227,107**	**215,483**	**237,272**	**237,770**	**244,920**
% y/y	*-7%*	*4%*	*2%*	*5%*	*-6%*	*1%*	*0%*	*5%*	*3%*	*-3%*	*11%*	*-1%*	*-5%*	*10%*	*0%*	*3%*
Surplus (Deficit) bef. com. Inv.	**-26,051**	**-64,946**	**-41,019**	**-24,935**	**-13,211**	**-11,214**	**-5,276**	**-189**	**-610**	**9,446**	**-1,096**	**1,725**	**8,120**	**-4,719**	**-13,831**	**-56,318**
surplus/(deficit) % bef. inv.	*-14%*	*-30%*	*-21%*	*-13%*	*-7%*	*-6%*	*-3%*	*0%*	*0%*	*5%*	*0%*	*1%*	*4%*	*-2%*	*-6%*	*-23%*
Surplus (Deficit) bef Com. Inv.	-5,951	1,225	-20,519	-9,935	-3,211	-1,214	4,724	9,811	9,390	19,446	8,904	11,725	17,120	5,281	-4,831	-47,318
surplus/(deficit) % of rctr req.	*-4%*	*1%*	*-12%*	*-6%*	*-2%*	*-1%*	*3%*	*5%*	*5%*	*10%*	*4%*	*5%*	*8%*	*2%*	*-2%*	*-20%*
Surplus (Deficit) after inv.	3,449	-28,646	-1,019	11,065	0	0	0	0	0	0	0	0	0	0	0	0

Source: BofA Global Research estimates: UxC LLC

BofA GLOBAL RESEARCH

Rare earths elements: more cautious

Chen Jiang >>
Research Analyst
Merrill Lynch (Australia)
+61 2 9226 5771
chen_jiang@bofa.com

Lawson Winder, CFA >>
Research Analyst
Merrill Lynch (Canada)
+1 416 369 7592
lawson.winder@bofa.com

Overview

We recently lowered our 2024-27 NdPr price forecast by an average 23% (see full note: Global Rare Earths: Lowering rare earths price forecasts, yet 2024 appears the year of recovery 12 March 2024) driven by softer-than-expected demand growth from wind turbines and EVs, as well as industrial products, such as air-conditioners, elevators, and consumer electronics in China.

Exhibit 168: NdPr price change forecast US$/kg
We now forecast NdPr price in 2024 to average at US$66/kg from US$110/kg prior, and US$83/kg in 2025 from US$120/kg prior

	Spot	2016A	2017A	2018A	2019A	2020A	2021A	2022A	2023A	2024E	2025E	2026E	2027E	2028E	2029E (LT Nominal)
Old	50	38	52	50	45	45	92	124	75	110	120	110	110	85	85
New	50	38	52	50	45	45	92	124	75	66	83	95	100	100	85
% chg		0%	0%	0%	0%	0%	0%	0%	0%	-40%	-31%	-14%	-9%	18%	0%
Spot		50	50	50	50	50	50	50	50	50	50	50	50	50	55
LT (nominal)		85	85	85	85	85	85	85	85	85	85	85	85	85	85

Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

We now forecast NdPr prices to average at US$66/kg (vs US$110/kg prior) in 2024, and US$83/kg in 2025 (vs US$120/kg prior). We believe rare earth prices bottomed in 1Q24E at US$55/kg and demand looks set to recover from here. We still find the long-term trajectory of rare earth materials attractive, driven by the growth of EV and wind turbines. Our long-term NdPr price is unchanged at US$85/kg (nominal).

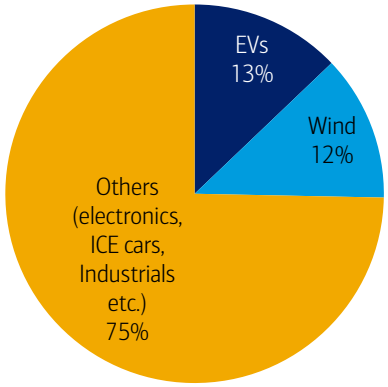
Exhibit 169: Global NdPr supply and demand (2021-2030F)
We believe NdPr prices in the near and medium term will continue to be determined by China's rare earths supply and demand. However, in the long term, the price will be driven fundamentally by global supply and demand

		2021	2022	2023	2024F	2025F	2026F	2027F	2028F	2029F	2030F
NdPr Supply											
Lynas (Ex-China)	kt	6.3	6	6.0	7.8	11.0	12.2	12.0	12.0	12.0	12.0
MP Materials (incl export to China)	kt	6.7	6.8	6.8	6.4	6.0	6.1	7.5	8.8	8.7	8.2
ILU	kt	0	0	0	0	0	1.7	3.3	4.2	4.9	4.9
China (Quota only)	kt	32	35	43	47	51	54	59	63	69	74
Myanmar (Export to China)	kt	3	4	6	4	3	3	3	3	3	2
Scrap (Recycling)	kt	22	24	20	22	24	24	24	25	25	25
Other	kt	0	0	0	0	0	0	0	0	0	0
Total	kt	70.2	74.6	82.5	87.0	94.5	101.6	108.9	116.4	122.1	127.1
NdPr demand											
EVs	kt	5.6	8.6	10.4	14.4	17.9	21.2	24.6	28.4	31.3	34.3
	YoY%	*92%*	*52%*	*21%*	*39%*	*24%*	*18%*	*16%*	*16%*	*10%*	*9%*
	%total	*8%*	*11%*	*13%*	*16%*	*18%*	*20%*	*22%*	*24%*	*25%*	*26%*
Wind	kt	9.0	7.1	10.0	13.5	16.9	17.3	18.6	21.1	22.4	23.7
	YoY%	*30%*	*-21%*	*41%*	*35%*	*25%*	*3%*	*7%*	*13%*	*6%*	*6%*
	%total	*12%*	*9%*	*12%*	*15%*	*17%*	*17%*	*17%*	*18%*	*18%*	*18%*
Others (electronics, ICE cars, Industrials etc.)	kt	60	63	60	61	63	65	68	70	73	75
	YoY%	*4%*	*4%*	*-4%*	*2%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*	*3.5%*
	%total	*80%*	*80%*	*75%*	*69%*	*65%*	*63%*	*61%*	*59%*	*57%*	*56%*
Total	kt	75.0	78.4	80.6	89.1	98.1	104.0	111.0	119.7	126.3	133.2
Surplus/deficit	kt	-4.8	-3.8	1.8	-2.1	-3.6	-2.4	-2.1	-3.3	-4.2	-6.1
Growth of NdPr	%	10%	5%	3%	10%	10%	6%	7%	8%	6%	5%
NdPr price forecast	*$US/kg*	*92*	*126*	*75*	*66*	*83*	*95*	*100*	*100*	*85*	*87*

Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

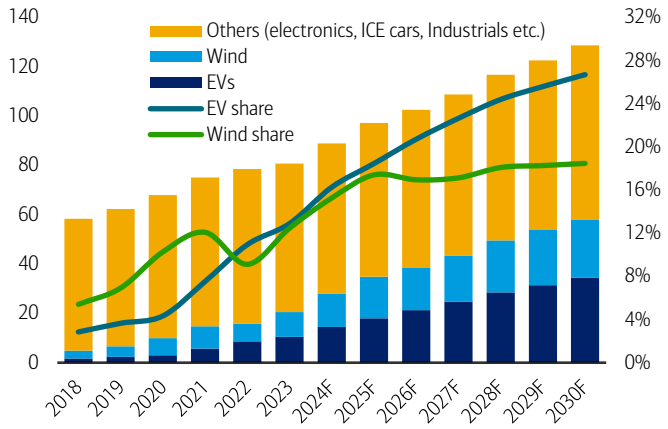
Exhibit 170: 2023 NdPr demand by segment
We estimate c.75% of 2023 NdPr demand was from other segments, incl. electronics, industrials, and ICE cars, with 13% from EV and 12% from wind



Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 171: NdPr demand growth LHS (kt) and RHS (%) EV and wind's share
However, we forecast EV's share to increase to 26% and wind's to grow to 18% of total demand in 2030



Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

Spot NdPr price 20% below 10-year average

The NdPr price declined by 40% in 2023 from US$101/kg in early January to US$62/kg in late December. The weakness in prices was due to a continued surplus in the China rare earths market. A 21% increase in the 2023 China refining quota and a significant rise in rare earth concentrate imports led to an 11% YoY increase in the country's NdPr production that year. Weak demand from industrial products and wind turbines moved the market into a surplus. Prices continued to decline in 1Q24, with spot of US$49/kg 20% below 10-year average of US$61/kg. The spot price is also below the US$50/kg cash cost of the world's largest integrated NdPr producer, China Northern Rare Earths. We believe spot has bottomed and will recover from here given cost support and demand recovery.

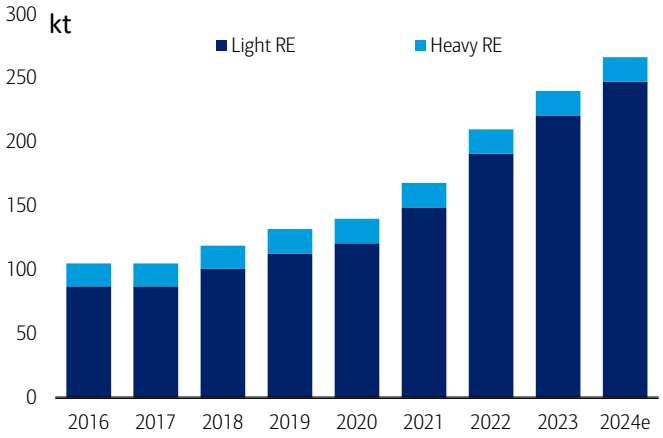
Wind turbines and EV remain the key growth drivers

Growth in EV and wind turbines should continue to drive rare earths demand at a CAGR of 7.4% from 2023 to 2030. We estimate a NdPr demand CAGR of 19.0% from EVs between 2023 (10.4kt) and 2030 (34kt), and a CAGR of 13% from wind turbines (from 10kt to 24kt) driven by new wind capacity growth and continued penetration of direct-drive wind turbines. We estimate that EVs made up only 13% of 2023 NdPr demand and wind 12%, while the remaining 75% came from other segments, including electronics, industrials, and ICE (internal combustion engine) cars. However, we see EVs and wind increasing their share to 26% and 18%, respectively, by 2030.

China's rare earths monopoly expected to continue

We believe China will retain the monopoly in the global rare earths industry. We expect supply from China to continue to grow through increased mining and refining quotas coupled with further expansions in downstream capacity.

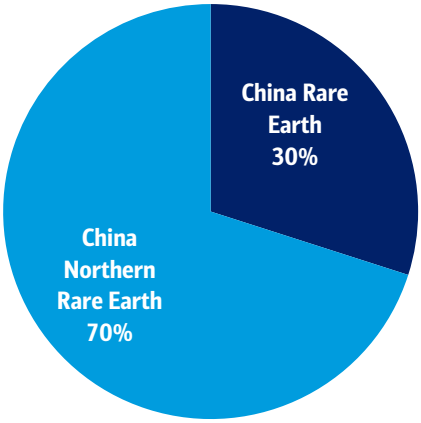
Exhibit 172: China RE mining quota
China's RE mining quota more than doubled over the past five years from 105kt of REO in 2017 to 240ktpa in 2023. In 1HCY24 China guided quota is 135kt, which is annualised to 270ktpa



Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 173: China's RE quota allocated to two RE producers in 1HCY24
70% of the quota allocated to China Northern Rare Earths, 30% to China Rare Earths



Source: BofA Global Research

BofA GLOBAL RESEARCH

China produces 90% of global NdPr, with the remaining 10% from Lynas Rare Earths. MP Materials will gradually ramp up its production from 2024 after the completion of its light rare earths separation facility in 2023. Combining MP and Lynas' NdPr production of 19ktpa in 2026, we expect China's dominance to reduce to 80%. We expect the price to remain largely influenced by supply and demand in China.

Exhibit 174: Global rare earths integrated producers
LYC is the only integrated RE producer outside of China from mined products to separated products, i.e., selling NdPr

Source: Wood Mackenzie

BofA GLOBAL RESEARCH

Exotic commodities

Diamonds: the end of the destock

Jason Fairclough >>
MLI (UK)
jason.fairclough@bofa.com

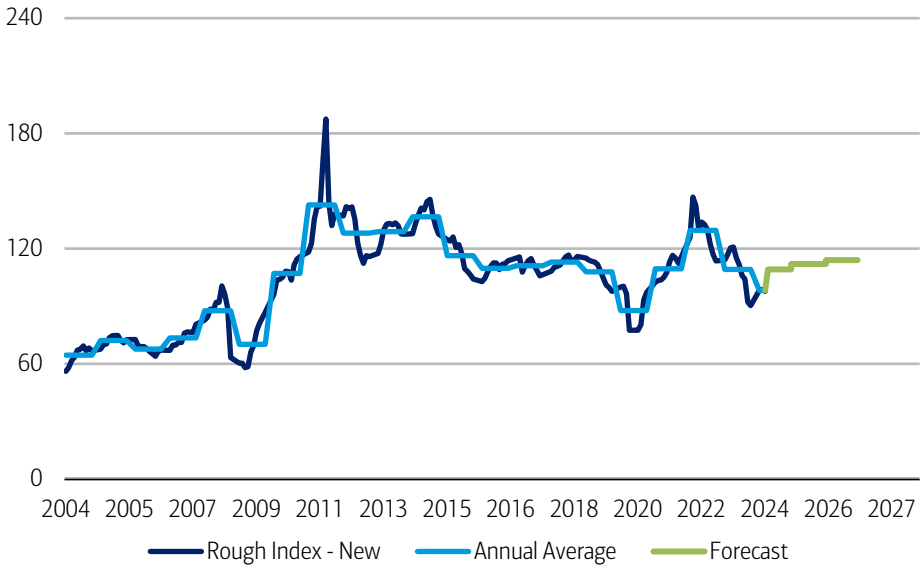
Paul Kirjanovs >>
MLI (UK)
paul.kirjanovs@bofa.com

Overview

The rough diamond index troughed on destocking in late 2023. From the lows we see diamond prices moving up to average a full year average similar to 2023A. We note that with c. two-thirds of the diamond market controlled by two key companies (DeBeers & Alrosa), destocking cycles are often fairly short and sharp.

That said, we, and we think the market, are aware of the significant surplus diamond inventories being carried right now by DeBeers (c. $1 bn worth), which could prevent too much of a surge in pricing as the market switches from destocking to restocking. We also consider margins for polished diamond producers and inventories of polished diamonds, which also appear high vs. history.

Exhibit 175: Rough diamond price index
The index troughed on destocking in late 2023, from the lows we see diamond prices up returning to average a full year average similar to 2023A



Source: WWW diamond consultants, BofA Global Research estimates

BofA GLOBAL RESEARCH

Diamonds = NOT a normal commodity

The key complication with diamonds is that they are not a standard product like say copper or gold. Pricing for rough diamonds is dependent on three of the four Cs: carat, colour and clarity (the cut comes later). As such, we model / forecast on the basis a change in an index or basket of prices. Key price forecasts:

- 2024E +0% YoY. (was +5%);
- 2025E +3% YoY (was +4%);
- 2026E +2% YoY (was +2.5%).

Diamond supply-demand

Exhibit 176: Diamond supply demand model
These are our latest supply and demand forecasts based on a "basket" of rough diamond products

Rough Production Mct	2016A	2017A	2018A	2019A	2020A	2021A	2022A	2023A	2024E	2025E	2026E
Angola	9.4	10.1	10.2	10.2	7.2	7.6	8.3	8.6	9.6	12.6	12.6
Australia	14.0	17.1	14.1	13.0	10.9	0.0	0.0	0.0	0.0	0.0	0.0
Botswana	20.9	22.9	24.5	23.7	16.9	22.7	24.5	25.2	25.1	25.2	25.4
Canada	13.8	23.0	23.5	18.6	14.8	16.9	16.1	15.6	12.6	12.1	12.6
D.R. Congo	18.4	19.9	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Lesotho	0.3	1.8	1.3	1.1	0.5	0.4	0.6	1.1	1.1	1.1	1.1
Namibia	1.6	1.8	2.0	1.7	1.5	1.6	2.1	2.3	2.4	2.4	2.4
Russia	43.8	46.2	32.6	33.9	26.5	27.5	30.5	30.1	30.2	30.0	30.0
S. Africa	8.3	9.4	9.1	5.8	7.3	8.7	8.4	4.7	5.1	5.5	6.0
West Africa	1.7	1.5	1.5	1.5	0.4	1.1	1.4	1.4	1.4	1.4	1.4
Zimbabwe	2.2	2.6	3.2	3.9	2.6	2.2	3.6	4.4	4.4	4.4	4.4
Other	0.9	1.1	1.2	1.2	0.8	0.9	1.1	0.9	1.1	1.1	1.1
Supply	**135.3**	**157.4**	**140.2**	**131.6**	**106.4**	**106.6**	**113.6**	**111.3**	**110.0**	**112.8**	**114.0**
% Chg	9%	16%	-11%	-6%	-19%	0%	7%	-2%	-1%	3%	1%
Rough Availability Mct	111.5	144.2	143.2	131.4	106.2	110.3	113.5	111.2	110.0	112.8	114.0
Dollar Value US$ bn	14.9	16.1	16.4	14.3	9	13.1	16.3	13.6	13.5	14.2	14.7
Implied US$/ct	134	112	115	109	85	119	144	122	123	126	129
% Chg	-19%	-16%	3%	-5%	-22%	40%	21%	-15%	0%	3%	2%
Polished Eq	19.2	23.4	23.7	22.0	17.4	17.5	21.9	18.2	18.0	18.5	18.7
Yield Rough to Polished	17%	16%	17%	17%	16%	16%	19%	16%	16%	16%	16%
Polished/Rough	8.8x	9.1x	8.9x	10.4x	15.5x	11.9x	8.1x	12.0x			
Polished in jewellery US$ m - at the wholesale level											
US	9,198	9,447	9,560	9,863	9,285	10,243	11,230	11,460	11,689	12,040	12,401
	3.3%	2.7%	1.2%	3.2%	-5.9%	10.3%	9.6%	2.0%	2.0%	3.0%	3.0%
Europe	2,277	2,474	2,436	2,288	2,036	2,075	1,944	2,300	2,323	2,369	2,417
	3.6%	8.7%	-1.5%	-6.1%	-11.0%	1.9%	-6.3%	18.3%	1.0%	2.0%	2.0%
Japan	1,634	1,420	1,470	1,518	1,306	1,262	993	1,052	1,063	1,084	1,105
	30.4%	-13.1%	3.5%	3.3%	-14.0%	-3.4%	-21.3%	5.9%	1.0%	2.0%	2.0%
Asia	7,327	8,220	8,473	8,947	8,227	9,025	9,212	9,624	9,816	10,111	10,515
	7.7%	12.2%	3.1%	5.6%	-8.0%	9.7%	2.1%	4.5%	2.0%	3.0%	4.0%
RoW	2,149	2,270	2,201	2,213	1,980	2,031	2,200	2,236	2,258	2,304	2,350
	3.8%	5.6%	-3.0%	0.5%	-10.5%	2.6%	8.3%	1.6%	1.0%	2.0%	2.0%
Total Dollar Value - Demand	**22585**	**23831**	**24140**	**24829**	**22834**	**24636**	**25579**	**26672**	**27150**	**27908**	**28788**
% change	**6.4%**	**5.5%**	**1.3%**	**2.9%**	**-8.0%**	**7.9%**	**3.8%**	**4.3%**	**1.8%**	**2.8%**	**3.2%**
Implied $/ct Polished	1176	1018	1019	1129	1312	1408	1168	1465	1508	1512	1543
% Chg	-7%	-13%	0%	11%	16%	7%	-17%	25%	3%	0%	2%
Assume Polished/Rough value	8.8x	9.1x	8.9x	10.4x	15.5x	11.9x	8.1x	12.0x	12.3x	12.0x	12.0x
Forecasts											
Avg Dollar Value/ct - Rough	134	112	115	109	85	119	144	122	123	126	129
Implied % Chg in Rough Index	-19%	-16%	3%	-5%	-22%	40%	21%	-15%	0.2%	2.7%	2.1%
Modelled % Chg in Rough Index								-14.8%	0.0%	3.0%	2.0%

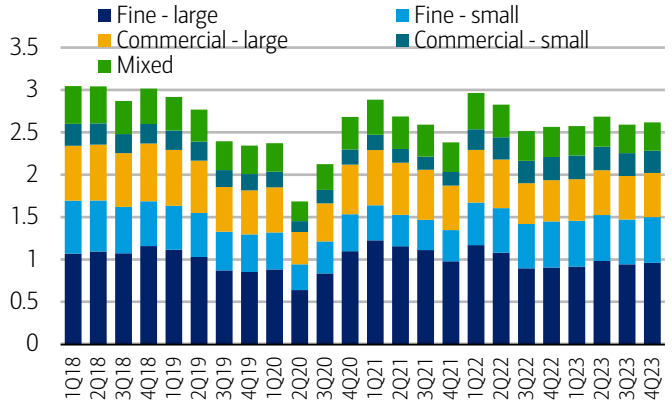
Source: BofA Global Research estimates, WWW Diamond Forecasts

BofA GLOBAL RESEARCH

Inventories: Destocking has run its course

For most metals & mined commodities, China is c. 50% of demand. Unusually, for diamonds, it is the US that dominates at c. 45% of global demand. Rough diamond demand is (typically) highly seasonal but can also be distorted by restocking & destocking cycles, which may be exacerbated by financing pressures. Following 2022 price highs and strong mid-stream purchasing, US and Chinese end demand weakened, meaning inventories for fine diamonds were high, leading to weaker rough demand and lower prices in 2023. We think that the 2023 destocking cycle is largely finished now and from here, we see a path to a gradual recovery in rough diamond sales.

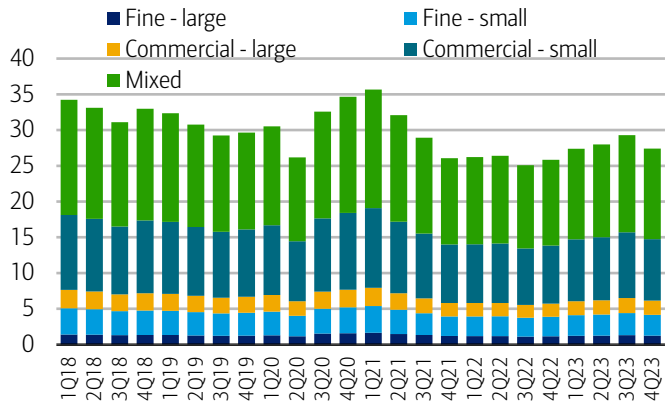
Exhibit 177: Rough inventories (US$bn)
Total rough inventories remained relatively unchanged 4Q23 vs. 3Q23 for both fine and commercial diamonds



Source: BofA Global Research, WWW Diamond Forecasts

BofA GLOBAL RESEARCH

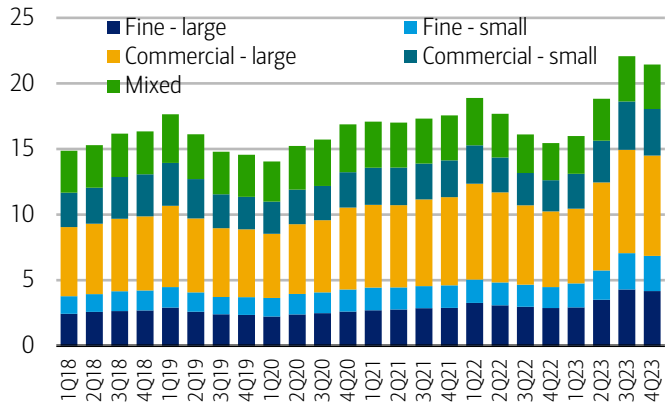
Exhibit 178: Rough inventories (MCt)
Total number rough inventory has decreased QoQ in carat terms



Source: BofA Global Research, WWW Diamond Forecasts

BofA GLOBAL RESEARCH

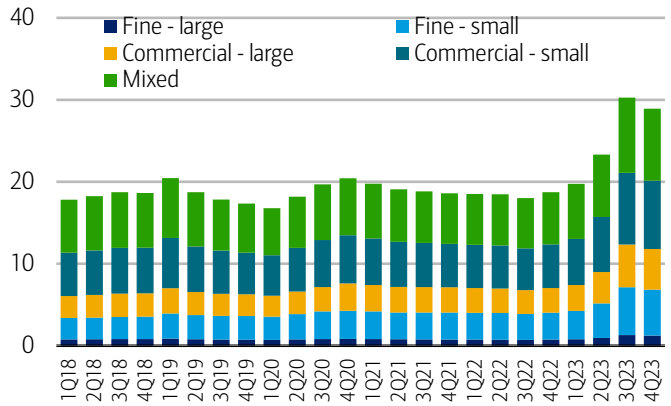
Exhibit 179: Total polished inventories (US$bn)
The total dollar value of inventories is above 2021/22 highs



Source: BofA Global Research, WWW Diamond Forecasts

BofA GLOBAL RESEARCH

Exhibit 180: Total polished inventories (MCt)
Total inventories of polished stones remain high



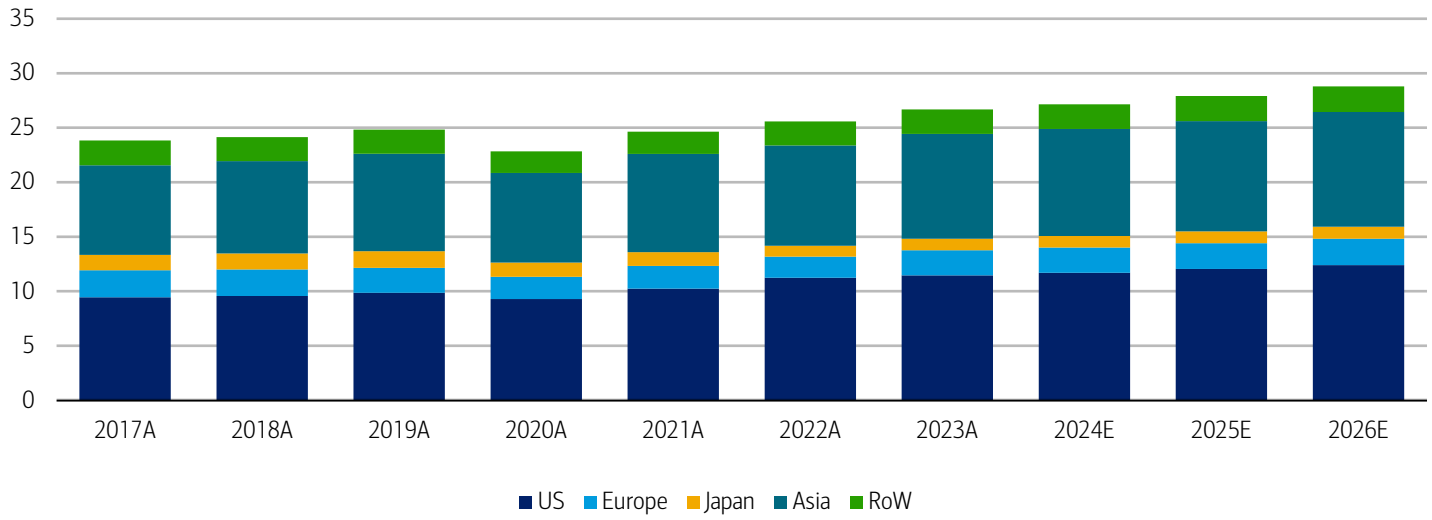
Source: BofA Global Research, WWW Diamond Forecasts

BofA GLOBAL RESEARCH

Demand: Recession in the US? No.

Our US economists have revised their expectations and now expect faster growth in 2024, supported by supply-side resilience; their base case is growth frontloaded into 2024, followed by slower trend in 2025 (see report: Supplying disinflation). Our US economists expect GDP growth of 2.7% in 2024, slowing to 1.7% in 2025. Given the US is c. 45% of global diamond demand, we think that diamond demand will follow a similar trajectory. Higher growth = stronger discretionary spending, all else equal. As such, we expect reasonable US demand in 2024E. Globally we model US$ demand for diamonds +1.8% in 2024E improving to +2.8% in 2025E.

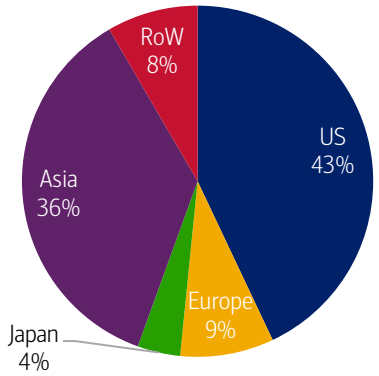
Exhibit 181: Polished jewelry US$mn – wholesale level
We expect total demand to improve slightly in 2024E, with steady growth in 2025E and 2026E



Source: BofA Global Research estimates, WWW diamond forecasts

BofA GLOBAL RESEARCH

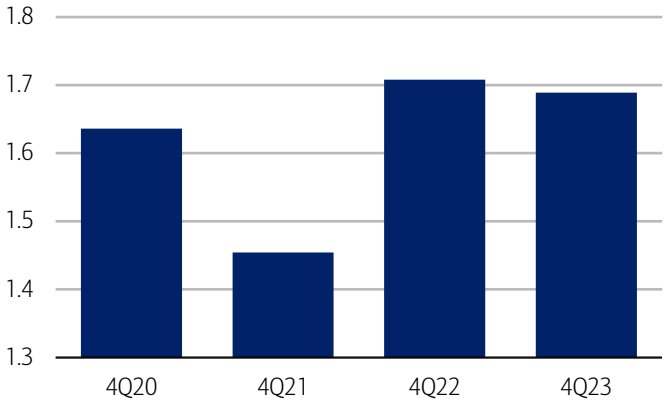
Exhibit 182: Total dollar demand by country (%), 2023A
The US is 44% of total dollar diamond demand



Source: BofA Global Research, WWW diamond forecasts

BofA GLOBAL RESEARCH

Exhibit 183: Total Indian rough stocks (US$bn)
India = major mid-stream cutter and polisher for diamonds. Rough stocks remain (relatively) high vs historic levels, particularly in light of generally weaker prices vs. 2022



Source: BofA Global Research, WWW Diamond Forecasts

BofA GLOBAL RESEARCH

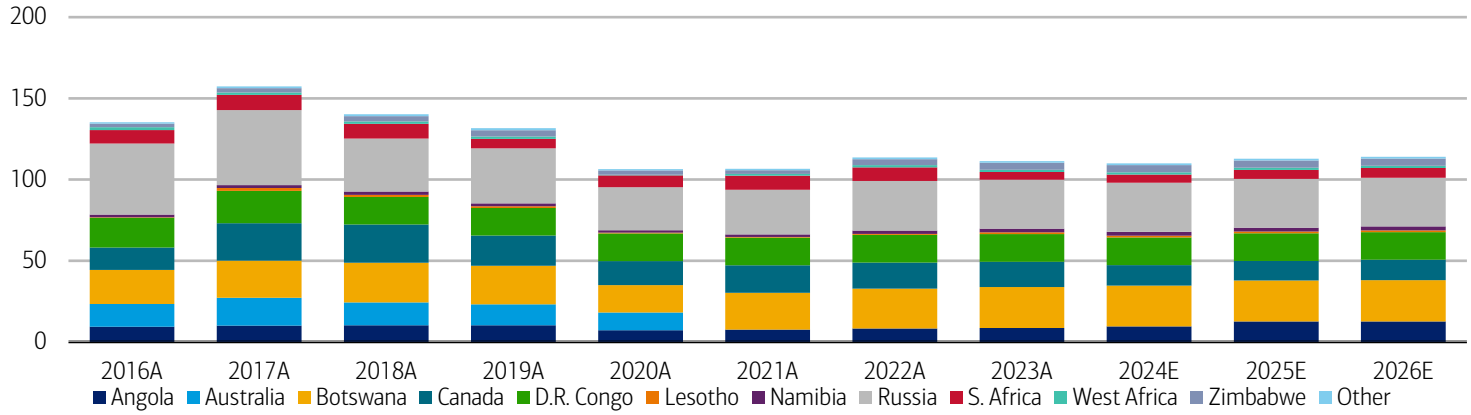
Supply: Lab-grown diamonds "in focus"

In 2009, the mined diamond industry produced 104Mcts. Supply lagged for several years, before growing steadily to 157Mcts in 2017. Since then, depletion and mine closures (such as Rio Tinto closing the Argyle mine, Australia) reduced global supply to c. 107 Mct in 2021. There is a perception that lab grown diamonds have eaten into the engagement / bridal market. Anglo American (through De Beers) launched Lightbox, a lab-grown diamond offering with (very) transparent pricing at levels well below those of mined diamonds, we think with a view to clearly differentiating between lab-grown and mined diamonds.

Russia is an important supplier of mined diamonds

We believe that perceived lack of supply chain transparency in the diamond market has become something of an important issue following the Russia-Ukraine conflict (Russia c. 27% of global mined supply). We think lab-grown product could be part of the solution; we note that tracing mined product through to end market is very challenging given fragmentation in the diamond value chain. As such, we think the continued growth of lab grown product demand could continue to put pressure on rough product prices.

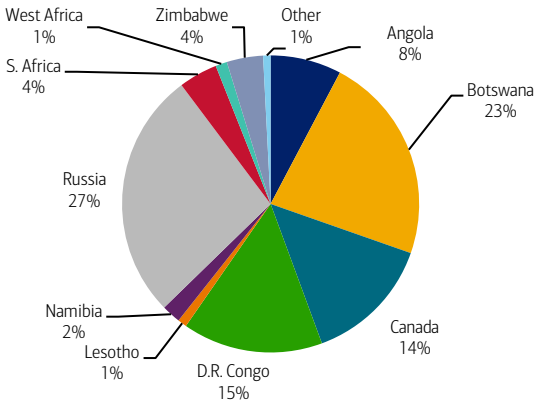
Exhibit 184: Total global supply (MCt)
Supply remains well below 2016-2017 levels, partly driven by mine closures in Australia (Argyle).



Source: BofA Global Research estimates, WWW diamond forecasts

BofA GLOBAL RESEARCH

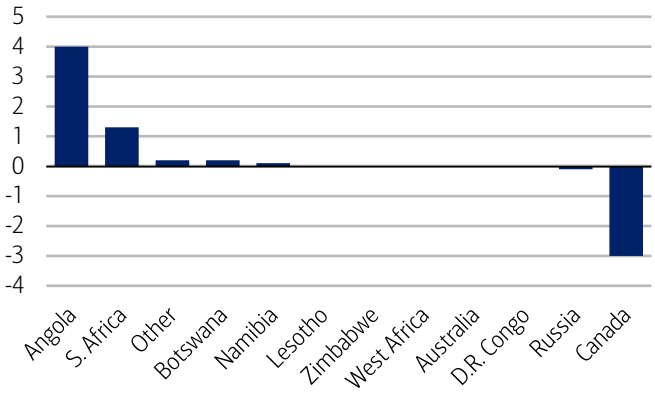
Exhibit 185: Supply by country, 2023A (%)
Russia is c. 27% of total rough production



Source: BofA Global Research, WWW diamond forecasts

BofA GLOBAL RESEARCH

Exhibit 186: Supply growth, 2023A-2026E (MCt)
We expect supply growth in Angola to be partly offset by declines in production in Canada



Source: BofA Global Research, WWW diamond forecasts

BofA GLOBAL RESEARCH

Pricing: The "four Cs"

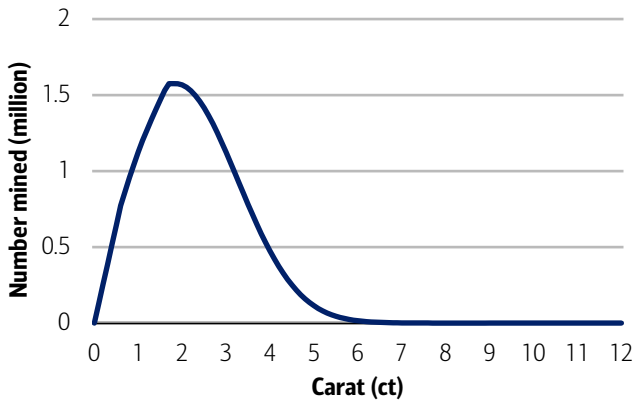
Diamantaires refer to the "four Cs" to discuss diamond pricing dynamics. These are: carat weight, clarity, colour & cut. Of course, only the first three are important for rough diamond pricing. "Cut" is added afterwards.

Carat

The carat is a metric weight = 200mg. A heavier diamond = more expensive, all other things being equal. Due to the distribution of diamond sizes mined (shown below), there is carat pricing premium for "rarer" sized diamonds. Larger diamonds, say 6ct, are much rarer than typical diamonds in consumer jewellery, say 1ct. Some degree of normal distribution arises, giving rise to a non-linear pricing mechanism. For example, a 1ct

diamond may cost US$1000, but a 4ct diamond will be priced far in excess of a pro-rated US$4000. We price our diamond estimates based on an "average" basket of diamonds, that is, a weighted-average value based upon typical carat sizes mined.

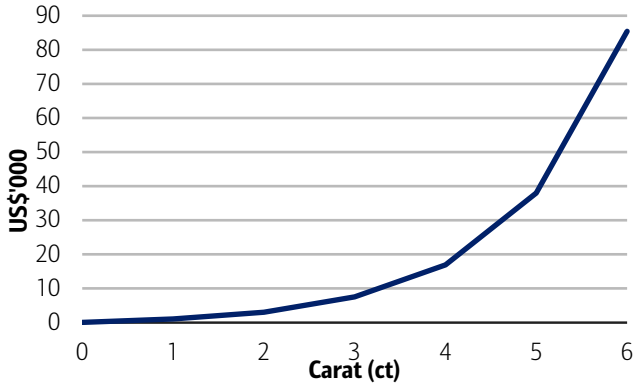
Exhibit 187: Illustrative. Number of diamonds mined (millions) vs. carat
Illustrative. Due to a high number of diamonds mined at the c. 1ct value, but very few large diamonds at e.g., 6 carat, non-linear pricing arises



Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 188: Illustrative. Diamond price US$'000 vs. diamond weight (ct)
Illustrative. Non-linear pricing arises due to distribution of carat sizes (left). As the diamond carat increases, the price increases exponentially



Source: BofA Global Research

BofA GLOBAL RESEARCH

Clarity

Exposing the diamond to pressure and heat while in the ground can cause blemishes/inclusions on/in the stone. Imperfections impact the value of the stone and its desirability for consumer use, meaning higher clarity rating = higher price.

Colour

In general, a colourless diamond is the most desirable with exceptions for "fancy" stones which may be blue, pink or (rarely) other colours. The most highly valued stones are the so called Type IIA which have the highest purity and the "least" colour. Lower quality stones may have a brown / beige tone, particularly in their rough form.

Cut

Broadly, the cut determines how light interacts with the facets, which varies depending on the shape of the stone. The cut ultimately determines the "sparkle" of the stone, which influences desirability in the consumer market (think jewellery). In 'cut', we also include the diameter, thickness and polish, which impact the durability of the stone. More durable = higher price. Again, this comes after the mining stage where the cutter/polisher adds value to the rough stone. When thinking about cut, we also need to consider yield, i.e., ultimately some of the weight of the rough stone is lost / used up in the course of cutting it. That said, we observe a general trend towards higher yields over the last several years as the mid-stream improves its cutting techniques to use more of the rough stone.

Small diamonds

Rio Tinto was previously one of the major global suppliers of small diamonds at its Argyle mine, Kimberley East, Australia. Argyle was c. 10% of the global market (by volume, much less by value). The mine was closed in 2020. The diamonds were cut in India, where low labour costs allowed the small diamonds to be cut for profit. In jewellery, small diamonds are mostly used for watches rather than rings and necklaces due to size requirements on the watch face. Following the closure of Argyle and the loss of these large volumes of "smalls" we might expect to see a shortage of small diamonds. That said, given these smaller diamonds were typically used in "fashion" jewellery (i.e., not bridal / engagement), some might see that this is exactly the market that is "at risk" from lab-grown diamonds. As an aside, Argyle was also famous for its rare pink diamonds.

Appendix

Price forecasts and summary of rationale/ risks

Exhibit 189: BofA price forecasts

We are bullish copper, aluminium, zinc, gold and silver

		Current	1Q24	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	2023	2024E	2025E	2026E	2027E	2028E	LT price
Base metals															
Aluminium	US$/t	2,413	2,240	2,300	2,500	2,750	3,000	3,000	2,254	2,447	3,000	3,250	3,015	2,781	2,546
	USc/lb	109	102	104	113	125	136	136	102	111	136	147	137	126	115
Copper	US$/t	9,209	8,534	9,000	9,500	10,250	10,500	10,500	8,484	9,321	10,750	12,000	11,206	10,411	9,617
	USc/lb	418	387	408	431	465	476	476	385	423	488	544	508	472	436
Lead	US$/t	2,098	2,087	2,000	2,000	2,000	1,750	1,750	2,136	2,022	1,750	2,024	2,217	2,409	2,602
	USc/lb	95	95	91	91	91	79	79	97	92	79	92	101	109	118
Nickel	US$/t	17,638	16,839	17,500	17,500	18,000	18,000	17,500	21,483	17,460	17,625	17,500	17,475	17,449	17,424
	USc/lb	800	764	794	794	817	817	794	974	792	800	794	793	792	790
NPI, 8-12%	CNY/t	930	938	975	975	1,003	1,003	975	1,131	973	982	975	1,053	1,132	1,210
Tin	US$/t	28,771	26,175	28,000	28,500	29,000	26,500	26,500	25,922	27,919	26,500	25,500	25,333	25,167	25,000
	USc/lb	1,305	1,187	1,270	1,293	1,315	1,202	1,202	1,176	1,266	1,202	1,157	1,149	1,142	1,134
Zinc	US$/t	2,601	2,475	2,600	2,750	3,000	2,750	2,500	2,648	2,706	2,688	2,424	2,596	2,769	2,942
	USc/lb	118	112	118	125	136	125	113	120	123	122	110	118	126	133
Precious metals															
Gold, nominal	US$/oz	2,334	2,069	2,300	2,400	2,500	2,500	2,300	1,943	2,317	2,513	2,625	2,448	2,270	2,093
Gold, real	US$/oz		2,069	2,300	2,400	2,500	2,439	2,244	1,943	2,317	2,451	1,995	1,946	1,898	1,850
Silver, nominal	US$/oz	27.80	23.33	26.00	27.50	29.00	31.00	29.00	23.39	26.46	32.50	35.00	33.14	31.28	29.42
Silver, real	US$/oz		23.33	26.00	27.50	29.00	30.24	28.29	23.39	26.46	31.71	33.31	30.88	28.44	26.00
Platinum	US$/oz	939	910	950	1,000	1,100	1,000	1,000	967	990	1,000	950	1,124	1,297	1,471
Palladium	US$/oz	1,014	978	900	800	700	600	600	1,340	844	600	500	824	1,147	1,471
		Current	**1Q24**	**2Q24E**	**3Q24E**	**4Q24E**	**1Q25E**	**2Q25E**	**2023**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**LT price**
Bulk Commodities															
Hard coking coal	US$/t fob	224	308	240	280	290	290	200	296	280	230	220	222	224	226
Semi-soft	US$/t fob	148	238	158	185	191	191	132	220	193	152	145	134	133	132
Thermal Coal	US$/t fob	129	127	148	151	153	125	125	176	145	125	112	112	113	113
Iron ore fines	US$/t CIF	99	120	100	100	110	90	90	120	107	90	90	94	98	102
		Current	**1Q24**	**2Q24E**	**3Q24E**	**4Q24E**	**1Q25E**	**2Q25E**	**2023**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**LT price**
Other materials															
Lithium spodumene	US$/t	1,035	927	1,200	1,100	1,200	1,200	1,500	3,821	1,107	1,488	1,750	1,650	1,550	1,450
Lithium carbonate	US$/t	14,100	13,789	14,500	13,750	14,500	15,250	16,000	40,469	14,135	16,313	18,000	18,667	19,333	20,000
Lithium hydroxide	US$/t	14,100	11,965	14,000	13,250	14,000	14,750	17,500	44,500	13,304	17,313	19,500	20,167	20,833	21,500
Alumina	$/t	372	367	340	340	340	348	348	344	347	348	357	375	394	412
Uranium	$/lb		96.90	95.00	110.00	118.00	115.00	120.00	60.17	104.98	120.00	135.00	110.00	85.00	60.00
Molybdenum	$/lb	19.5	19.93	19.93	19.93	19.93	19.93	19.93	24.12	19.93	19.93	19.93	17.54	15.15	12.76
Cobalt	$/lb	16.4	15.96	15.96	15.96	15.96	15.96	15.96	17.38	15.96	15.96	18.44	19.84	21.23	22.63
Manganese ore	$/dmtu	4.20	4.18	4.18	4.18	4.18	4.18	4.18	4.74	4.18	4.18	4.93	5.52	6.11	6.70
Steel, HRC															
HRC, Europe	US$/t	627	719	701	639	674	721	702	767	683	714				
HRC, US	US$/t	920	1,024	1,009	909	805	882	882	993	937	882				
HRC, China	US$/t	512	568	585	602	623	592	597	565	595	602				
		Current	**1Q24**	**2Q24E**	**3Q24E**	**4Q24E**	**1Q25E**	**2Q25E**	**2023**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**LT price**
WTI	US$/bbl	86	77	83	85	81	79	75	78	81	75	67	67	67	67
Brent	US$/bbl	90	82	88	90	86	84	80	82	86	80	70	70	70	70
Henry Hub	US$/MM Btu	1.8	2.1	2.1	2.5	2.9	3.1	3.0	2.7	2.4	3.3	3.0	3.0	3.0	3.0

Source: BofA Global Research

Exhibit 190: Price forecasts, fundamental drivers and risks
We are bullish a range of cyclical commodities

Metal	2024E	2025E	Fundamental drivers	Risks (D = downside; U = upside)
Aluminium	$2,447/t 111c/lb	$3,000/t 136c/lb	• China is almost operating at its 45mt capacity cap and smelters ex-China have closed capacity. • China's smelters remain under pressure on hydro power shortages. At the same time, demand has been strong, so exports will likely remain capped. • Market to tighten on a rebound of demand ex-China. • We expect rising **deficits** going forward	• D: China slows spending on green technologies • D: China exports more • D: China eases on 45Mt capacity cap; smelters ex-China increase production • U: Smelter restraint and/or production disruptions reduce output • U: Stronger-than-anticipated demand growth
Copper	$9,321/t 423c/lb	$10,750/t 488c/lb	• China's grid spending has completely offset weakness in housing. Demand to be more balanced in 2024, and should hold up. • Demand ex-China should also recover as economics bottom out. • Mine supply is an increasing constraint and production curtailments in China will likely support refined imports. • We expect a **deficit** for 2024	• D: China slows spending on green technologies • D: China re-exports metal • D: Mine supply issues ease • U: Strong restocking through the supply chain on improved confidence • U: Continued production disruptions in coming quarters
Lead	$2,022/t 92c/lb	$1,750/t 79c/lb	• There are no immediate scrap or concentrates shortages, suggesting the market could flip back into surplus. • China's demand has slowed structurally, as the ebike market has matured.	• D: Destocking in China or higher lead exports from the country. • U: Strong seasonal demand for replacement batteries after cold/hot winter/summer months
Nickel	$17,460/t 792c/lb	$17,625/t 800c/lb	• Nickel demand from electric vehicle producers should rise in the coming years, yet more NPI is being converted to nickel sulphate. • Indonesian capacity additions are big enough to keep the market in surplus; operators there are the swing producers and could easily rebalance the market if they decided to. • We expect a **surplus** for 2024, with prices increasingly supported by costs	• D: NPI producers don't close shop; ore inventories last for longer and more ores are imported form the Philippines. • D: Faster ramp-up of Indonesian NPI production • D: Stainless steel demand remains subdued • U: Sino-Indonesia production cuts
Zinc	$2,706/t 123c/lb	$2,688/t 122c/lb	• Sustained zinc surpluses have never materialised as mine supply has disappointed. Concentrates availability to constrain refined production this year. • Zinc may not be a primary beneficiary of the energy transition, but it is still required in galvanised steel, required in many green technologies. Steel production has turned the corner in 2H23. • We expect a **deficit** for 2024 and a small surplus in 2025.	• U: zinc mine supply tightens further • D: Unreported inventories exist on the zinc market. More metal could become available • D: The zinc market is fragmented. There is evidence that miners, especially in China, could consider further output increases
Gold	$2,317/oz	$2,513/oz	• Traditional relationships have broken. The recent rally was driven by central banks, Chinese investors and options buying. • Western investors are waiting for rate cuts; inflows into ETFs to resume once monetary easing sets in. • Chinese investors may slow gold buying, if sentiment improves; making Western purchases even more important. • Scope for gold to hit $3,000/oz.	• D: China's and CB buying subsides, without an offset from Western investors • D: Fed rate cuts come through slower • D: High gold prices deter buyers of physical gold; increased scrap supply
Silver	$26.46/oz	$32.50/oz	• The silver market has rebalanced on production discipline and demand from new applications including solar panels. • As more spending on solar panels come through, silver should rally. • Bottoming out of the global economy in 2024 should also help industrial demand	• U: Investors returning to the market • U: China's imports to rise • D: ETF liquidation • D: More supply
Platinum Palladium	$990/oz $844/oz	$1,000/oz $600/oz	• Palladium is slowly moving into surplus, keeping pressure on prices. • More production discipline is necessary. • Any supply cuts may reduce the palladium surpluses, but will likely push platinum into a deficit, so prices might diverge.	• D: Lack of production discipline. • D: Demand from key buyers like Europe not increasing • U: Production disruptions reduce availability of PT and PD
Iron Ore	$107/t CIF	$90/t CIF	• Iron ore inventories at China's mills are extremely low. • Production cuts at mills, along with recent government stimulus to support steel prices, likely giving helping iron ore.	• D: China's steel production slowing sharply • U: Mine closures/slowdown in production increases
HCC Thermal coal	$280/t $145/t	$230/t $125/t	• Thermal coal prices to come under pressure as supply is increasing and the energy emergency normalises • Normalisation of supply should also contribute to lower met coal prices	• D: Lack of supply discipline • U: Chinese steel production stronger (HCC) • U: supply disruptions and mine closures
Brent and WTI crude oil	$86/bbl $81/bbl	$80/bbl $75/bbl	• We project Brent and WTI to average $86/bbl and $81/bbl, respectively, in 2024. • The global oil balance should remain in a mild surplus during 2024, as OPEC+ withholds more supply from the market to counteract slowing demand growth • We forecast global demand growth of 1.5mn b/d YoY in 2024 and 1.3mn b/d in 2025. • Non-OPEC supply should grow roughly 1.25mn b/d YoY in 2024 and 1.5mn b/d in 2025. • We project total US crude and NGL supply to rise 800k b/d in 2024 and 650k b/d in 2025. • OPEC crude oil supplies are set to fall 160k b/d in 2024 and rise 360k b/d in 2025 as OPEC+ actively manages balances	

Colours indicate our stance on each commodity: Green = bullish, Yellow = neutral, Red = cautious. **Source:** BofA Global Research estimates

BofA GLOBAL RESEARCH

Supply and demand balances

Exhibit 191: Aluminium supply and demand balance
Deficits set to increase

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	68,342	69,881	72,280	73,902	75,238
YoY change	1.4%	2.3%	3.4%	2.2%	1.8%
Global consumption	69,061	70,415	73,447	76,385	79,440
YoY change	0.7%	2.0%	4.3%	4.0%	4.0%
Balance	**-719**	**-534**	**-1,167**	**-2,483**	**-4,203**
Market inventories	8,576	9,120	7,953	5,470	
Weeks of world demand	6.5	6.7	5.6	3.7	
LME Cash ($/t)	**2,706**	**2,254**	**2,447**	**3,000**	**3,250**
LME Cash (c/lb)	**123**	**102**	**111**	**136**	**147**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, IAI, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 192: Copper supply and demand balance
Balanced market to flip into deficit

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	24,717	26,418	26,544	27,655	28,318
YoY change	1.5%	6.9%	0.5%	4.2%	2.4%
Global consumption	25,164	26,061	26,868	27,943	29,061
YoY change	0.9%	3.6%	3.1%	4.0%	4.0%
Balance	**-447**	**357**	**-324**	**-288**	**-743**
Market inventories	1,030	1,016	692	404	
Weeks of world demand	2.1	2.0	1.3	0.8	
LME Cash ($/t)	**8,822**	**8,484**	**9,321**	**10,750**	**12,000**
LME Cash (c/lb)	**400**	**385**	**423**	**488**	**544**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ICSG, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 193: Nickel supply and demand balance
Nickel to be well supplied

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	3,135	3,396	3,515	3,860	4,111
YoY change	16.3%	10.2%	6.9%	9.9%	10.7%
Global consumption	3,087	3,287	3,468	3,833	4,127
YoY change	0.1%	6.5%	5.5%	8.9%	6.0%
Balance	**48**	**109**	**47**	**27**	**-15**
Weeks of world demand	2.8	3.0	3.5	3.6	3.1
LME price ($/t)	**25,707**	**21,483**	**17,460**	**17,625**	**17,500**
LME price (c/lb)	**1,166**	**974**	**792**	**800**	**794**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, INSG, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 194: Zinc supply and demand balance
Supply remains an issue

	2022	2023	2024E	2025E	2026E
Global production	13,353	13,863	13,900	14,400	14,700
YoY change	-3.9%	3.8%	0.3%	3.6%	2.1%
Global consumption	13,629	13,413	13,946	14,239	14,538
YoY change	-3.1%	-1.6%	4.0%	2.1%	2.1%
Balance	**-276**	**450**	**-46**	**161**	**162**
Market inventories	580	750	705	866	0
Weeks of world demand	2.2	2.9	2.6	3.2	0.0
LME Cash ($/t)	**3,482**	**2,648**	**2,706**	**2,688**	**2,424**
LME Cash (c/lb)	**158**	**120**	**123**	**122**	**110**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ILZSG, BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 195: Iron ore supply and demand balance
Flipping back into surplus

Wet Mt	2022	2023	2024E	2025E	2026E
Global production	2,363	2,375	2,422	2,504	2,544
YoY change	2.2%	0.5%	2.0%	3.4%	1.6%
Global consumption	2,301	2,361	2,358	2,342	2,338
YoY change	-5.0%	2.6%	-0.1%	-0.7%	-0.2%
Balance	**62**	**14**	**63**	**161**	**206**
Iron ore price (US$/t)	**120**	**120**	**107**	**90**	**90**

Source: Woodmac, CRU, Bloomberg, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 196: Metallurgical coal supply and demand balance
Flipping into a small surplus

Mt	2022	2023E	2024E	2025E	2026E
Global production	902	921	941	966	975
YoY change	-0.8%	2.1%	2.2%	2.6%	1.0%
Global consumption	932	947	964	960	966
YoY change	-0.7%	1.6%	1.8%	-0.4%	0.6%
Balance	**-31**	**-27**	**-23**	**6**	**9**
Met coal price (US$/t)	**365**	**296**	**280**	**230**	**220**

Source: Woodmac, McCloskey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 197: Platinum supply and demand balance
Supply cuts could flip the market into a deeper deficit

'000 ounces	2022	2023	2024E	2025E	2026E
Global production	6,561	6,711	7,157	7,607	7,706
YoY change	-13.5%	2.3%	6.6%	6.3%	1.3%
Global consumption	6,057	7,231	7,255	7,250	7,255
YoY change	-22.8%	19.4%	0.3%	-0.1%	0.1%
Balance	**504**	**-519**	**-99**	**357**	**451**
Spot ($/oz)	**964**	**967**	**990**	**1,000**	**950**

Source: Matthey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 198: Palladium supply and demand balance
Rising surpluses ahead

'000 ounces	2022	2023	2024E	2025E	2026E
Global production	9,314	9,320	9,970	10,572	10,819
YoY change	-5.1%	0.1%	7.0%	6.0%	2.3%
Global consumption	9,829	9,710	8,771	8,434	8,024
YoY change	-3.2%	-1.2%	-9.7%	-3.8%	-4.9%
Balance	**-515**	**-390**	**1,199**	**2,138**	**2,795**
Spot ($/oz)	**2,110**	**1,340**	**844**	**600**	**500**

Source: Matthey, company reports, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 199: Lithium supply and demand balance
The lithium market is increasingly oversupplied

tonnes	2022	2023	2024E	2025E	2026E
Global production	657,337	897,532	1,245,682	1,704,066	1,986,158
YoY change	-2.5%	36.5%	38.8%	36.8%	16.6%
Global consumption	688,335	869,496	1,120,566	1,410,128	1,778,390
YoY change	48.5%	26.3%	28.9%	25.8%	26.1%
Balance	**-30,998**	**28,036**	**125,115**	**293,938**	**207,768**
Spot ($/t)	**71,531**	**45,980**	**14,135**	**16,313**	**18,000**

Source: Company reports, Woodmac, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 200: Cobalt supply and demand balance
The cobalt market needs some supply cuts

tonnes	2022	2023	2024E	2025E	2026E
Global production	198,235	231,241	274,225	301,692	309,256
YoY change	25.4%	16.6%	18.6%	10.0%	2.5%
Global consumption	186,279	210,900	250,033	291,266	335,607
YoY change	17.0%	13.2%	18.6%	16.5%	15.2%
Balance	**11,956**	**20,341**	**24,192**	**10,425**	**-26,351**
Spot ($/t)	**68,428**	**38,733**	**39,681**	**39,681**	**40,652**

Source: Company reports, CRU, Bloomberg, BofA Global Research estimates

BofA GLOBAL RESEARCH

Key Market Data

Exhibit 201: Commodity prices, exchange rates, equity indices, yields and inventories
Macro headwinds turned out to be bearish for most mined commodities in 2023

Base metals	Cash, US$/t	3-month, $/t	Cash, YoY change	3-month, YoY change
Aluminium	2,338	2,380	-0.6%	-0.7%
Copper	8,888	8,991	-0.3%	0.8%
Lead	1,986	2,021	-6.2%	-4.5%
Nickel	16,845	17,030	-27.3%	-27.1%
Tin	27,868	27,897	6.8%	7.1%
Zinc	2,431	2,480	-16.8%	-14.5%
LMEX	3,863		-3.5%	
	Cash, c/lb	3-month, c/lb		
Aluminium	106	108		
Copper	403	408		
Lead	90	92		
Nickel	764	773		
Tin	1,264	1,265		
Zinc	110	112		
Other commodities, freight, exchange rates, equities and yields	**Spot**	**YoY change**		
Gold, $/oz	2,281	14.9%		
Silver, $/oz	26	9.0%		
Platinum, $/oz	925	-6.8%		
Palladium, $/oz	1,006	-31.3%		
Iron ore, China fines cfr $/dmt	102	-16.3%		
Brent, $/bbl	89	13.3%		
Baltic Dry Index	1,714	21.4%		
EUR/USD	1.077	-1.2%		
Dow Jones Industrial Average	39,170	16.6%		
10-year US Treasury yield	4.350	27.4%		
ICE BofA Commodity index, ER	441	2.2%		
ICE BofA Commodity index Industrial Metals, ER	182	-6.8%		
ICE BofA Commodity index Precious Metals, ER	241	7.1%		
ICE BofA Commodity index Energy, ER	545	11.2%		
Exchange stocks and cancelled warrants	**Stocks, tonnes**	**YoY change**	**Canc. warrants, tonnes**	**Canc. warr., of stocks**
Aluminium				
LME	541,350	3.3%	214,875	39.7%
Shanghai	219,474	-23.2%		
Total aluminium	760,824	-6.1%		
Copper				
LME	112,975	76.9%	14,200	12.6%
Comex	27,117	76.4%		
Shanghai	291,849	86.4%		
Total copper	431,941	83.2%		
Lead				
LME	275,925	946.2%	10,650	3.9%
Shanghai	51,781	45.7%		
Total lead	327,706	429.2%		
Nickel				
LME	77,604	80.2%	9,132	11.8%
Shanghai	22,541	1147.4%		
Total nickel	100,145	123.2%		
Tin	4,435	122.9%	465	10.5%
Zinc				
LME	264,200	486.5%	37,400	14.2%
Shanghai	123,846	27.2%		
Total zinc	388,046	172.5%		

Source: BofA Global Research

BofA GLOBAL RESEARCH

Disclosures

Important Disclosures

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.
BofA Securities fixed income analysts regularly interact with sales and trading desk personnel in connection with their research, including to ascertain pricing and liquidity in the fixed income markets.

Other Important Disclosures

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 BofAS 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.bofaml.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 (HKSFC); 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; 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 HKSFC; 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.

Futures and options are not appropriate for all investors. Such financial instruments may expire worthless. Before investing in futures or options, clients must receive the appropriate risk disclosure documents. Investment strategies explained in this report may not be appropriate at all times. Costs of such strategies do not include commission or margin expenses.

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 in this report. Investors in such securities and instruments 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.

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 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.

Research Analysts

Australia

James Redfern >>
Research Analyst
Merrill Lynch (Australia)
+61 2 9226 5746
james.redfern@bofa.com

Matt Chalmers, CFA >>
Research Analyst
Merrill Lynch (Australia)
+61 2 9226 5634
matt.chalmers2@bofa.com

Hong Kong

Matty Zhao >>
Research Analyst
Merrill Lynch (Hong Kong)
+852 3508 4001
matty.zhao@bofa.com

Japan

Takashi Enomoto >>
Research Analyst
BofAS Japan
+81 3 6225 8362
takashi.enomoto@bofa.com

EMEA

Jason Fairclough >>
Research Analyst
MLI (UK)
+44 20 7995 0225
jason.fairclough@bofa.com

Commodities

Michael Widmer
Commodity Strategist
MLI (UK)
+44 20 7996 0694
michael.widmer@bofa.com

Danica Averion
Commodity Strategist
MLI (UK)
+44 20 7996 2325
danica_ana.averion@bofa.com

Francisco Blanch
Commodity & Deriv Strategist
BofA Europe (Madrid)
+34 91 514 3070
francisco.blanch@bofa.com

Canada

Lawson Winder, CFA >>
Research Analyst
Merrill Lynch (Canada)
+1 416 369 7592
lawson.winder@bofa.com

USA

Caio Ribeiro
Research Analyst
BofAS
+1 646 855 4051
caio.ribeiro@bofa.com