

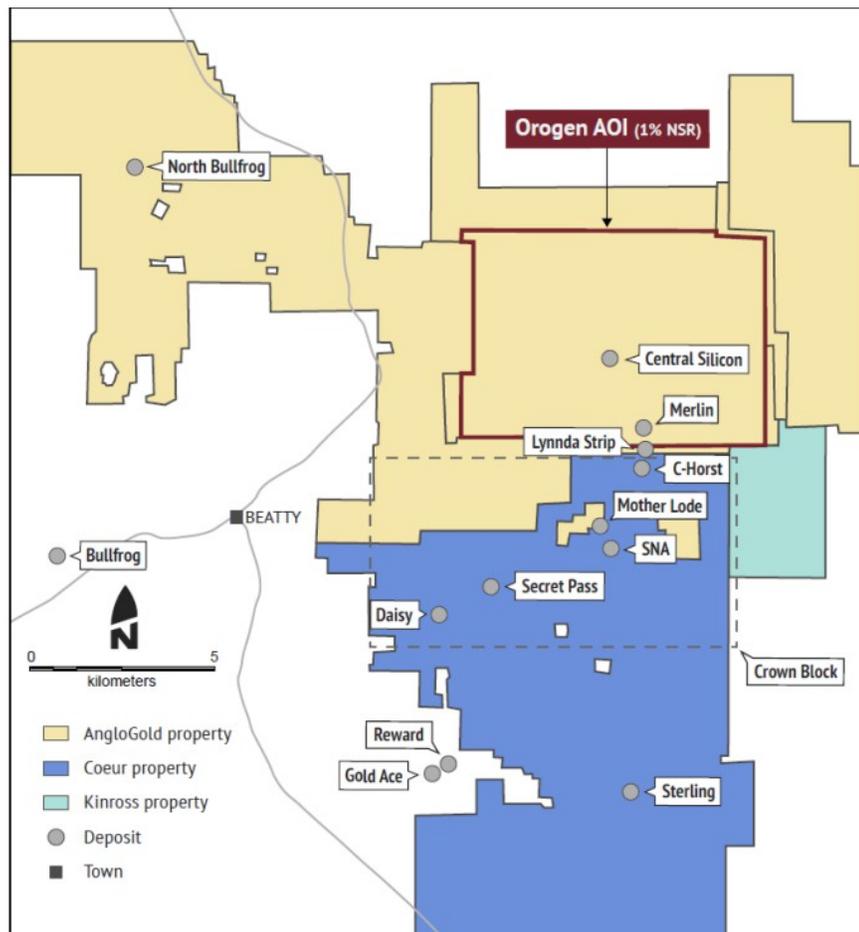
January 14, 2022 06:58 AM GMT

SA Rocks | Europe

SA Golds' interest in juniors

With shareholder approval for the Corvus acquisition obtained, we provide updated economics for additional disclosure included in the circular. We also provide thoughts on ANG's and GFI's material interest in juniors/explorers in the context of reserve replacement.

Exhibit 1: AngloGold's Silicon and Merlin deposits are adjacent to Corvus Gold's North Bullfrog, Mother Lode and Lynnda Strip, as well as multiple deposits on Coeur Mining's contiguous tenements, potentially allowing for district-level synergies



Source: Orogen Royalties

AngloGold receives shareholder approval for Corvus Gold acquisition - updated transaction estimates accretive; synergies with adjacent deposits and peers by Feb22; growth or replacement? The remaining CP involves approval from a Canadian court expected on 18 January. **Following additional disclosure in the shareholder circular**, and applying [our base case gold price forecasts](#) (LT real

RMB MORGAN STANLEY PROPRIETARY LIMITED+

Jared Hoover
EQUITY ANALYST
Jared.Hoover@rmbmorganstanley.com +27 11 282-1082

Christopher Nicholson
EQUITY ANALYST
Christopher.Nicholson@rmbmorganstanley.com +27 11 282-1154

Brian Morgan
EQUITY ANALYST
Brian.Morgan3@rmbmorganstanley.com +27 11 282-8969

EEMEA - Metals & Mining

Europe
IndustryView **Attractive**

Carbon Steel

Europe
IndustryView **In-Line**

Gold and Precious Metals

Europe
IndustryView **In-Line**

Stainless Steel

Europe
IndustryView **In-Line**

[SA Diversified Mining: 1Q22 price deck update \(8 Dec 2021\)](#)

[Exxaro Resources Limited: Recycling returns don't appear well priced \(8 Dec 2021\)](#)

[SA Gold: 1Q22 price deck update \(8 Dec 2021\)](#)

[metal&ROCK: Long-term incentive prices – all in the money \(8 Dec 2021\)](#)

[metal&ROCK: The Price Deck – 1Q 2022 \(9 Dec 2021\)](#)

[Glencore PLC: More to play for. Next catalyst – Investor Day \(23 Nov 2021\)](#)

[SA Platinum Group Metals: Lofty heights \(17 Nov 2021\)](#)

[Sappi Ltd: Buy the dip \(11 Nov 2021\)](#)

[Implats Limited: 101 \(19 Oct 2021\)](#)

RMB Morgan Stanley is a member of the JSE Limited and A2X (Pty) Ltd.

Morgan Stanley does and seeks to do business with companies covered in Morgan Stanley Research. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of Morgan Stanley Research. Investors should consider Morgan Stanley Research as only a single factor in making their investment decision.

For analyst certification and other important disclosures, refer to the Disclosure Section, located at the end of this report.

+ = Analysts employed by non-U.S. affiliates are not registered with FINRA, may not be associated persons of the member and may not be subject to FINRA restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.

gold of \$1,172 vs. \$1,396 for consensus) to both the North Bull Frog and Mother Lode projects within Corvus Gold, we estimate the acquisition is NPV neutral. Assuming consensus LT gold prices, we estimate a NPV/s, IRR, payback period, and acquisition-implied gold price of \$1.2/s, 30%, 4 years (LoM: 15 year), and \$1,455 respectively. **Both these estimates exclude synergies** with ANGs adjacent Silicon and Merlin deposits, for which we expect an outlook in Feb22. Given a layback agreement is required with adjacent gold mining peer Coeur Mining, to fully access the Mother Lode deposit, synergies with them could also exist - we understand Coeur are likely to publish an economic assessment to mine deposits within their crown block (see chart) by mid-2022. Lastly, while **Corvus Gold appears to be reflect growth ounces, it isn't clear** whether ANGs North American footprint (c.300-350k oz pa) could in fact be replacement for under-earning areas of the portfolio (e.g Sunrise Dam and Serra Grande), which we understand are being reviewed for their full potential/fit within the portfolio.

AngloGold's c.14% interest in Pure Gold: Although a material holding given the investee's geological potential and preferable jurisdiction in Canada, execution risk is elevated following operational disruptions and Management changes in 2021. In addition, with a number of items on ANG's own agenda (improving underlying operational performance, Obuasi ramp-up, greenfields, brownfields, Corvus Gold acquisition), we see limited scope for further corporate activity here.

Gold Fields stake in Asanko Gold (45%), Chakana copper (19.9%), Western Lefroy Project (up to 70%), Consolidated Woodjam Copper Corporation (c.16.3%), Magmatic Resources (c.10.9%), Orsu Metals (c.6.1%): We understand the latter three interests are legacy investments, similar to the Cardinal Resources stake (which was sold in FY20). Near term, we think Management will likely seek a better understanding of challenges inhibiting operational improvements at **Asanko** (higher-for-longer cost outlook vs. Group) ahead of an optimization decision, potentially by mid-year. [A maiden mineral resource](#) has recently been declared at **Chakana Copper's Cu-Au-Ag silver deposit in Peru**, and is a longer-term option to replace declining Group production from FY25. GFI recently opted to earn [up to a 70% stake in the Western Lefroy Project](#), which has tenements adjacent to its St Ives mine - this could aid in filling the mill/replacing production post FY24, as the mine transitions to campaign milling.

Spot-based comparative

Exhibit 2: Spot comps for SA Resource stocks

	Spot commodity prices and FX						Upside / (downside) to consensus at spot	
	P/E		EV/EBITDA		FCF Yield		2021	2022
	2021	2022	2021	2022	2021	2022		
Anglo American	6.4x	5.9x	4.1x	3.9x	10.3%	10.3%	-1%	52%
ARM	3.7x	4.9x	2.1x	2.4x	14.0%	15.2%	0%	-16%
BHP	8.7x	7.9x	4.9x	4.9x	12.1%	9.6%	0%	13%
Exxaro	3.8x	4.0x	2.8x	2.2x	21.7%	21.8%	-12%	19%
Glencore	6.6x	3.7x	5.0x	3.0x	16.2%	26.4%	0%	73%
Kumba	5.1x	6.1x	3.4x	3.8x	24.8%	17.9%	-11%	59%
South 32	22.1x	5.2x	6.6x	3.0x	7.9%	21.0%	0%	46%
Thungela	3.5x	1.1x	2.0x	0.7x	21.6%	79.8%	-34%	97%
Mondi	15.4x	13.6x	8.8x	7.6x	2.7%	5.9%	-2%	-6%
Sappi	17.8x	5.5x	6.2x	3.6x	-2.4%	20.8%	0%	45%
Sasol	7.0x	5.2x	4.0x	3.2x	15%	19%	NM	2%
Anglo Platinum	6.3x	9.6x	4.5x	6.3x	15.6%	8.9%	14%	-11%
Implats	5.1x	5.4x	3.0x	3.2x	17.8%	17.1%	NM	-6%
Northam	8.1x	5.3x	6.5x	4.5x	9.2%	16.3%	NM	1%
RBPlat	6.0x	7.9x	4.3x	4.6x	15.1%	11.1%	1%	-10%
Sibanye	3.7x	5.0x	2.3x	2.5x	22.7%	17.9%	6%	10%
AngloGold Ashanti	12.6x	10.7x	5.4x	4.6x	0.9%	3.1%	2%	-20%
GoldFields	10.1x	11.2x	4.8x	5.1x	6.2%	4.6%	3%	-8%
Harmony	13.2x	5.8x	4.6x	3.0x	3.3%	7.2%	NM	28%

Source: Morgan Stanley Research estimates. Note: Priced at close on 13 January 2021.

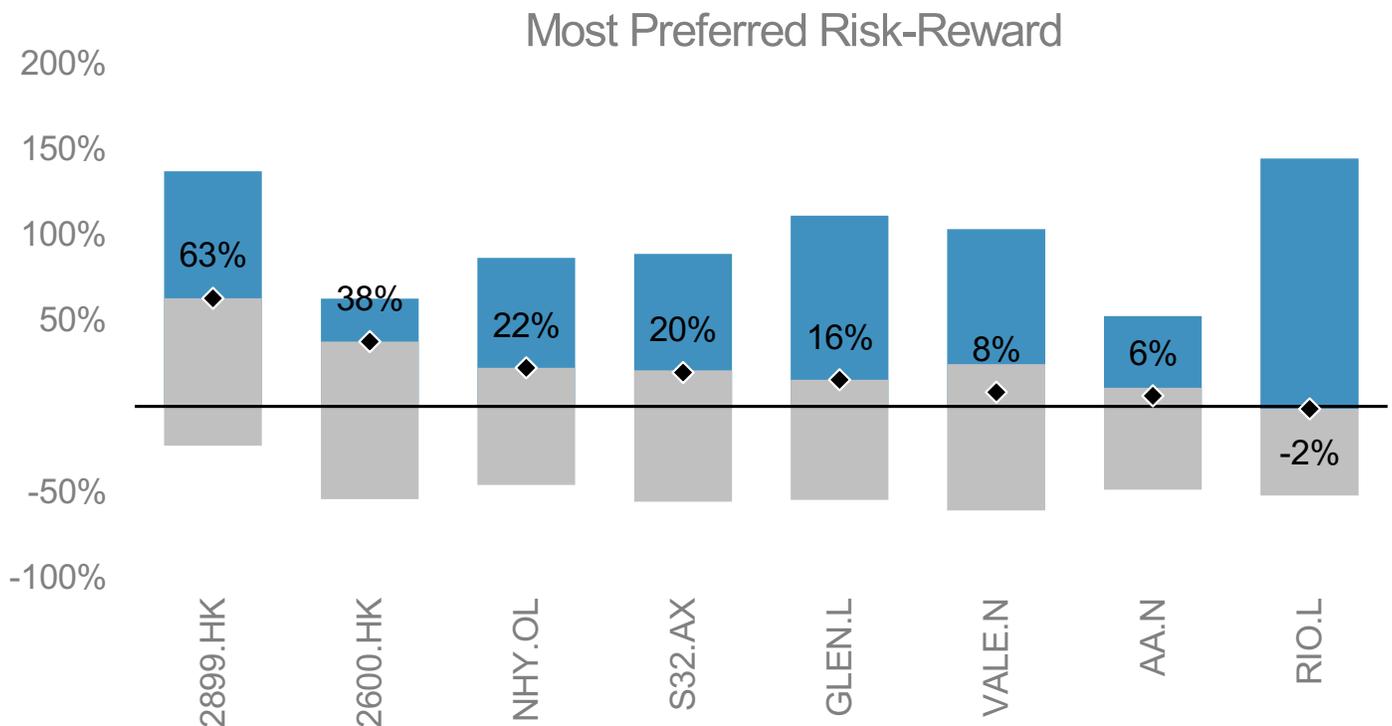
Global Picks

Exhibit 3: Global Mining Equities: Most Preferred and Least Preferred Stocks

		Rating	Rating	CCY	Current Price	Price Target	% to PT	Analyst
Most Preferred								
Alcoa Corp	AA.N	Overweight	OW	USD	62.2	66.0	6%	Carlos De Alba
Aluminum Corp. of China Ltd.	2600.HK	Overweight	OW	HKD	4.8	6.6	38%	Rachel Zhang
Norsk Hydro ASA	NHY.OL	Overweight	OW	NOK	70.2	86.0	22%	Ioannis Masvoulas
Zijin Mining Group	2899.HK	Overweight	OW	HKD	9	15	63%	Sara Chan
South32 Ltd	S32.AX	Overweight	OW	AUD	4.1	4.9	20%	Rahul Anand
Rio Tinto Plc	RIO.L	Overweight	OW	GBP	5,301.00	5,220.00	-2%	Alain Gabriel
Glencore PLC	GLEN.L	Overweight	OW	GBP	387.80	448.00	16%	Alain Gabriel
Vale	VALE.N	Overweight	OW	USD	15.24	16.50	8%	Carlos De Alba
Least Preferred								
Yanzhou Coal	1171.HK	Underweight	UW	HKD	16	11	-29%	Sara Chan
Zhongjin Gold Corp. Ltd.	600489.SS	Underweight	UW	CNY	8.3	9.2	10%	Sara Chan
Fortescue Metals Group Ltd.	FMG.AX	Underweight	UW	AUD	20.88	14.05	-33%	Rahul Anand
Sumitomo Metal Mining	5713.T	Underweight	UW	JPY	4,773.00	4,300.00	-10%	Yu Shirakawa
Antofagasta	ANTO.L	Underweight	UW	GBP	1,342.00	1,300.00	-3%	Ioannis Masvoulas

Source: Morgan Stanley Research. Note: Priced at close on 11 January 2022.

Exhibit 4: Most Preferred Mining Stocks



Source: Morgan Stanley Research estimates. Note: Shown in descending order of upside to price target. Priced at close on 11 January 2022.

Exhibit 5: Least Preferred Mining Stocks



Source: Morgan Stanley Research estimates. Note: Shown in descending order of upside to price target. Priced at close on 11 January 2022.

Exhibit 6: Global Steel Equities: Most Preferred and Least Preferred Stock

		Rating	Rating	CCY	Current Price	Price Target	% to PT	Analyst
Most Preferred								
SSAB AB	SSABa.ST	Overweight	OW	SEK	56	70	26%	Alain Gabriel
Erdemir	EREGL.IS	Overweight	OW	TRY	31.76	28.00	-12%	Dan Shaw
Baoshan Iron & Steel	600019.SS	Overweight	OW	CNY	7.5	11.0	46%	Rachel Zhang
POSCO	005490.KS	Overweight	OW	KRW	305,500.0	410,000.0	34%	Young Suk Shin
Least Preferred								
voestalpine AG	VOES.VI	Underweight	UW	EUR	34.0	35.0	3%	Alain Gabriel
Grupo Simec S.A.B. de C.V.	SIMECB.MX	Underweight	UW	MXN	177.0	149.0	-16%	Carlos De Alba
US Steel	X.N	Underweight	UW	USD	24.4	20.0	-18%	Carlos De Alba
Salzgitter AG	SZGG.DE	Underweight	UW	EUR	35.4	30.7	-13%	Alain Gabriel

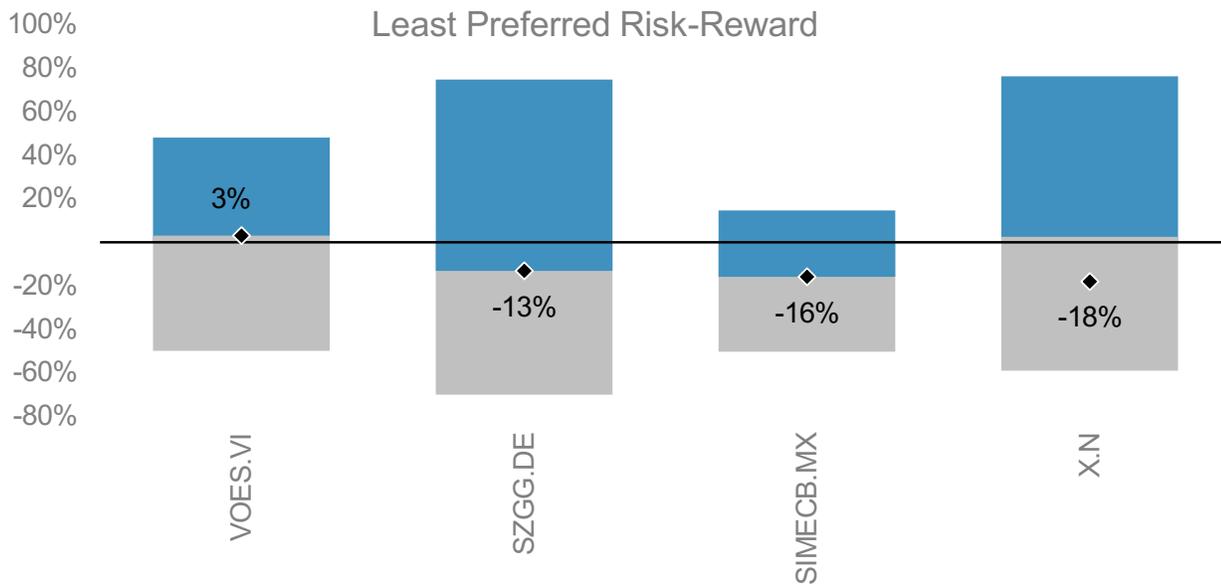
Source: Morgan Stanley Research. Note: Priced at close on 11 January 2022.

Exhibit 7: Most Preferred Steel Stocks



Source: Morgan Stanley Research estimates. Note: Shown in descending order of upside to price target. Priced at close on 11 January 2022.

Exhibit 8: Least Preferred Steel Stocks

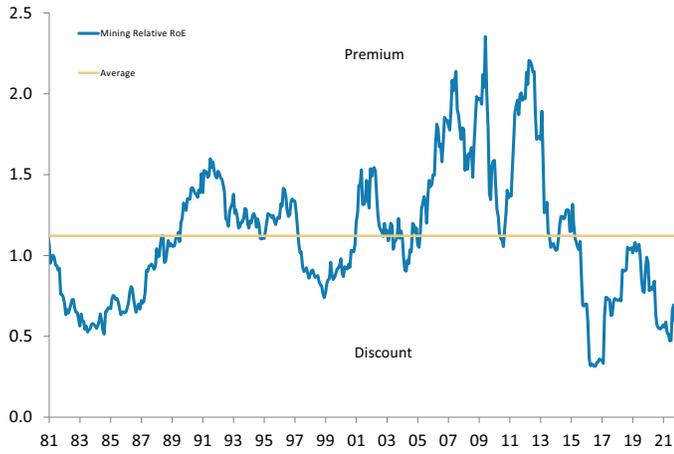


Source: Morgan Stanley Research estimates. Note: Shown in descending order of upside to price target. Priced at close on 11 January 2022.

For further details on our top picks, please refer to our report [Global Metals & Mining: Global Preference List - 1Q22 \(23 Dec 2021\)](#)

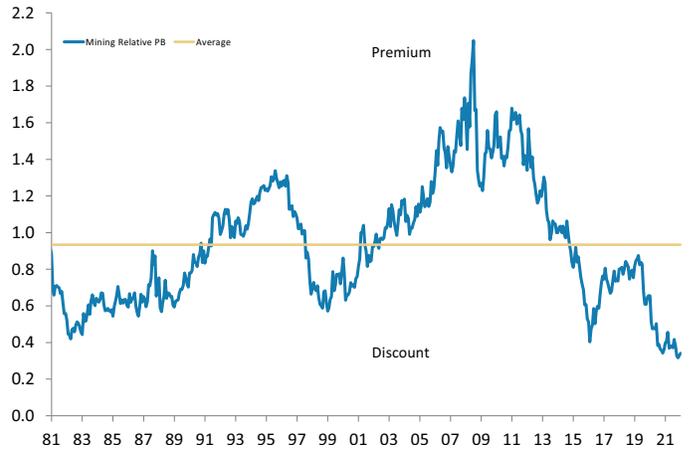
Mining – Relative performance & valuation

Exhibit 9: World Datastream Mining index RoE relative to the Datastream World Index



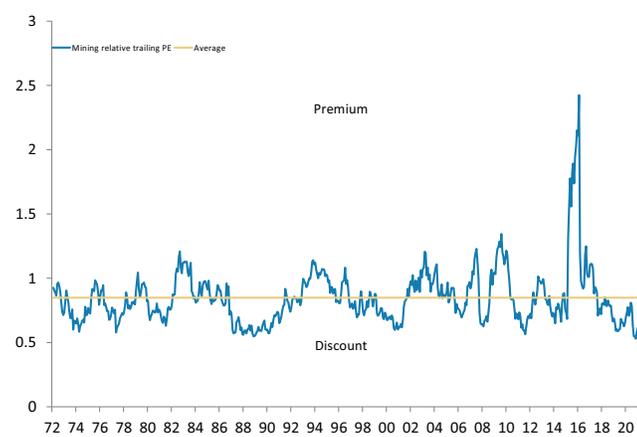
Source: Datastream, Morgan Stanley Research

Exhibit 10: World Datastream Mining index P/B relative to the Datastream World Index



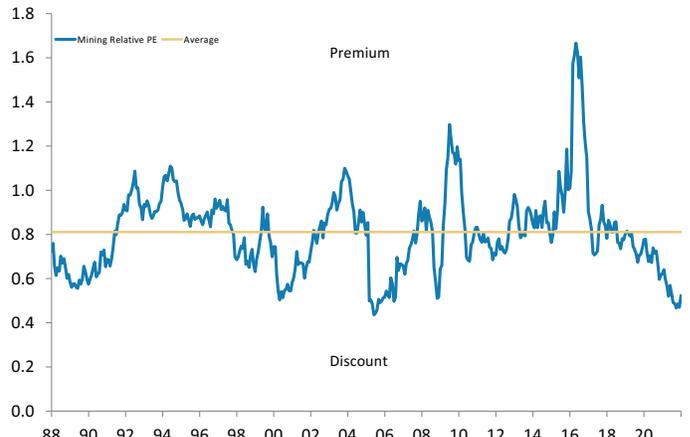
Source: Datastream, Morgan Stanley Research

Exhibit 11: World Datastream Mining index trailing P/E relative to the Datastream World Index



Source: Datastream, Morgan Stanley Research

Exhibit 12: World Datastream Mining index 12m forward P/E relative to the Datastream World Index



Source: Datastream, Morgan Stanley Research

Exhibit 13: World Datastream Mining index 12m forward DY relative to the Datastream World Index



Exhibit 14: World Datastream Mining index share price relative to the Datastream World Index



Valuation Tables – Base Case

Exhibit 15: Base case valuation multiples and key metrics: diversified miners

Diversified Companies	Rating	FX	Price Target	Share Price	Market cap (US\$m)	EV** (USD) 2022CY	P/E 2022CY	P/E 2033CY	P/E 2044CY	EV/EBITDA 2022CY	EV/EBITDA 2033CY	EV/EBITDA 2044CY	FCF Yield 2022CY	FCF Yield 2033CY	FCF Yield 2044CY	Dividend Yield 2022CY	Dividend Yield 2033CY	Dividend Yield 2044CY	P/B 2022CY	P/B 2033CY	P/B 2044CY	2022e ROE	2023e ROE	2024e ROE	2022e ND/(ND+E+M)	2023e ND/(ND+E+M)	2024e ND/(ND+E+M)	2022e Net Debt/EBITDA	2023e Net Debt/EBITDA	2024e Net Debt/EBITDA
African Rainbow Minerals*	OW	Zac	27,000	24,096	3,452	2,897	4.5x	6.2x	NA	2.4x	2.8x	NA	5.7%	6.2%	NA	10.0%	7.4%	NA	1.1x	1.0x	NA	24.3%	15.8%	NA	Cash	Cash	NA	NA	NA	NA
Anglo American Plc	EW	GBP	2,870	3,239	53,816	78,874	8.8x	13.4x	16.1x	5.2x	6.8x	5.6x	4.0%	1.4%	1.6%	4.6%	3.0%	2.5%	4.4x	3.8x	1.5x	20.9%	12.2%	9.5%	0.1x	0.2x	0.2x	0.4x	0.7x	0.8x
BHP Group Ltd**	++	AUD	++	44.65	162,077	225,935	11.2x	16.2x	21.5x	7.5x	9.9x	12.1x	7.0%	5.6%	4.2%	6.5%	4.4%	3.4%	3.8x	3.7x	3.7x	31.0%	23.7%	17.3%	0.2x	0.2x	0.2x	0.4x	0.4x	0.5x
BHP Group Plc**	++	GBP	++	2,274	156,528	218,135	10.8x	15.6x	20.7x	7.2x	9.5x	11.7x	7.3%	5.8%	4.3%	6.8%	4.5%	3.5%	3.7x	3.6x	3.5x	31.0%	23.7%	17.3%	0.2x	0.2x	0.2x	0.4x	0.4x	0.5x
Exaro Resources Limited	UW	Zac	13,000	16,592	3,843	3,758	3.9x	4.4x	NA	2.9x	2.9x	NA	21.0%	15.3%	NA	11.9%	11.1%	NA	1.2x	1.1x	NM	25.3%	19.6%	NA	Cash	Cash	NA	Cash	Cash	NA
Glencore	OW	GBP	448	388	68,934	97,885	7.5x	13.3x	17.6x	5.0x	7.5x	8.8x	13.7%	9.6%	6.6%	14.6%	8.8%	7.5%	1.9x	2.2x	2.4x	23.5%	11.7%	9.9%	0.3x	0.4x	0.4x	1.2x	2.0x	2.4x
MMG Ltd.	EW	HKD	3.50	2.54	2,625	9,868	4.8x	8.4x	7.1x	3.6x	4.2x	3.8x	44.5%	38.9%	36.0%	0.0%	0.0%	0.0%	1.1x	1.0x	0.9x	29.9%	13.3%	13.9%	0.6x	0.5x	0.4x	1.6x	1.6x	1.1x
Norilsk Nickel	EW	USD	31.0	32.1	50,714	61,787	6.2x	7.8x	9.9x	5.0x	6.2x	7.4x	10.7%	7.6%	5.2%	10.6%	7.5%	5.0%	6.9x	6.0x	5.2x	NM	88.2%	60.7%	0.5x	0.5x	0.5x	0.8x	1.1x	1.4x
Rio Tinto Limited**	OW	AUD	109.00	106.37	124,347	150,219	8.9x	12.0x	16.5x	5.9x	7.8x	9.9x	8.1%	4.5%	3.1%	6.9%	5.0%	3.7%	2.2x	2.1x	2.1x	26.9%	18.7%	13.0%	0.0x	0.1x	0.1x	0.2x	0.4x	0.6x
Rio Tinto Plc**	OW	GBP	5,220	5,301	117,282	143,153	8.3x	11.3x	15.5x	5.7x	7.5x	9.4x	8.6%	4.8%	3.3%	7.3%	5.3%	3.9%	2.1x	2.0x	1.9x	26.9%	18.7%	13.0%	0.0x	0.1x	0.1x	0.2x	0.4x	0.6x
South32*	OW	AUD	4.85	4.05	13,714	13,013	6.9x	10.8x	NA	3.8x	5.2x	NA	9.7%	2.4%	NA	5.8%	5.7%	NA	1.3x	1.2x	NA	20.5%	11.8%	NA	Cash	Cash	NA	NA	NA	NA
Teck Resources Limited	OW	USD	33.0	32.4	17,527	22,925	6.3x	13.9x	13.1x	3.8x	5.3x	4.2x	8.0%	9.9%	9.2%	0.5%	0.5%	0.5%	0.9x	0.8x	0.8x	15.8%	6.2%	6.2%	0.2x	0.2x	0.1x	0.9x	1.0x	0.5x
Vale S.A.	OW	USD	16.5	15.2	74,553	83,149	7.4x	9.1x	12.0x	4.3x	5.2x	6.1x	8.0%	7.2%	5.7%	11.8%	11.4%	4.3%	2.1x	2.2x	2.1x	28.0%	23.4%	18.4%	0.2x	0.2x	0.2x	0.4x	0.6x	0.7x
Vedanta Ltd**	NA	INR	NA	331	16,572	23,742	6.3x	6.3x	NA	4.0x	4.1x	NA	26.8%	26.5%	NA	7.0%	6.5%	NA	1.6x	1.4x	NA	25.4%	22.7%	NA	NA	NA	NA	0.3x	0.3x	NA
Weighted Average					579,562	758,989	7.6x	11.0x	14.6x	5.1x	6.7x	8.2x	9.0%	6.7%	4.5%	8.1%	5.9%	3.9%	2.7x	2.6x	2.5x	24.6%	23.8%	17.5%	0.2x	0.2x	0.2x	0.5x	0.7x	0.8x

Source: Morgan Stanley Research estimates (e), Thomson Reuters for non-covered companies (* Not covered by Morgan Stanley, ** Market cap based on total no. of group shares, *** provisions and pensions included in EV, ^ Fiscal year ending in June, ^^ Fiscal year ending in March, ^^^ Fiscal year ending in September, ^^^^ Fiscal year ending in August, ^^^^^ Fiscal year ending in July). Weighted Average for P/E, FCF Yield, Dividend Yield, P/B, ROE based on Market Cap. Weighted Average for EV/EBITDA, Net Debt/EBITDA based on EV. Share prices as of January 11, 2021. NA = Not applicable, NM = Not meaningful. ++ Stock Rating, Price Target, or Estimates for this company have been removed from consideration in this report because, under applicable law and/or Morgan Stanley policy, Morgan Stanley may be precluded from issuing such information with respect to this company at this time.

Exhibit 16: Base case valuation multiples and key metrics: copper producers

Copper Companies	Rating	FX	Price Target	Share Price	Market cap (US\$m)	EV (US\$m) 2022CY	P/E 2022CY	P/E 2033CY	P/E 2044CY	EV/EBITDA 2022CY	EV/EBITDA 2033CY	EV/EBITDA 2044CY	FCF Yield 2022CY	FCF Yield 2033CY	FCF Yield 2044CY	Dividend Yield 2022CY	Dividend Yield 2033CY	Dividend Yield 2044CY	P/B 2022CY	P/B 2033CY	P/B 2044CY	2022e ROE	2023e ROE	2024e ROE	2022e ND/(ND+E+M)	2023e ND/(ND+E+M)	2024e ND/(ND+E+M)	2022e Net Debt/EBITDA	2023e Net Debt/EBITDA	2024e Net Debt/EBITDA
Antofagasta Plc	UW	GBP	1,300	1,342	17,973	27,841	16.5x	27.3x	24.5x	7.8x	9.1x	9.1x	1.5%	-1.1%	0.0%	3.5%	2.4%	2.7%	2.1x	2.1x	2.0x	11.6%	7.7%	8.5%	Cash	0.1x	0.1x	Cash	0.2x	0.4x
Aurubis AG**	UW	EUR	76	91.1	4,520	4,797	15.9x	17.0x	16.2x	7.7x	8.3x	8.0x	-3.3%	-4.2%	0.4%	1.7%	2.1%	2.2%	1.1x	1.0x	1.0x	7.2%	6.4%	6.5%	Cash	0.0x	0.1x	Cash	0.7x	0.8x
Boliden AB	EW	SEK	325	366	11,089	11,832	11.4x	14.5x	15.9x	6.2x	7.1x	7.6x	4.0%	4.1%	3.5%	4.9%	3.8%	3.5%	1.8x	1.8x	1.7x	17.3%	12.6%	11.1%	Cash	0.0x	0.0x	Cash	0.1x	0.1x
Copper Mountain Mining Corporation*	NA	CAD	NA	3.56	596	NA	8.1x	10.5x	3.7x	NA	NA	NA	6.4%	-11.4%	27.5%	0.0%	0.0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.0x	3.0x	NA	
First Quantum Minerals Ltd.	OW	CAD	37.0	33.0	18,136	28,083	10.2x	15.5x	13.8x	6.1x	7.2x	6.2x	11.5%	8.4%	8.6%	0.9%	0.6%	0.6%	1.5x	1.4x	1.3x	17.7%	9.9%	10.2%	0.2x	0.1x	0.0x	0.8x	0.6x	0.2x
Freeport-Moconan	EW	USD	34.0	43.0	63,797	72,440	11.0x	19.3x	17.6x	5.8x	7.1x	6.4x	6.5%	6.6%	7.5%	0.7%	0.7%	0.7%	3.1x	2.7x	2.4x	37.5%	15.9%	15.4%	Cash	Cash	Cash	Cash	Cash	Cash
Grupo Mexico	OW	MXN	104	90	34,376	37,884	9.8x	11.0x	9.4x	5.9x	5.0x	4.2x	11.9%	11.1%	12.3%	6.0%	6.4%	6.0%	2.1x	2.0x	1.8x	23.6%	19.5%	21.3%	0.0x	Cash	Cash	0.1x	Cash	Cash
Ivanhoe Mines Ltd*	NA	CAD	NA	11.27	10,842	NA	25.1x	21.6x	17.2x	NA	NA	NA	1.5%	-2.2%	NA	0.0%	0.0%	NA	NA	NA	NA	13.7%	15.9%	NA	NA	NA	NA	Cash	0.1x	NA
Jiangxi Copper Company Limited	EW	CNY	24.0	22.6	9,555	10,776	12.9x	14.6x	12.0x	5.3x	5.3x	4.4x	13.3%	13.3%	11.1%	1.2%	1.3%	1.2%	1.1x	1.0x	1.0x	9.3%	7.6%	8.7%	0.2x	0.2x	0.1x	1.7x	1.4x	1.0x
KGHM Polska	EW	PLN	140	143.1	7,175	8,706	7.4x	9.5x	7.4x	4.6x	5.2x	4.0x	11.0%	10.1%	11.0%	2.7%	3.5%	4.5%	1.0x	0.9x	0.8x	14.8%	10.0%	12.0%	Cash	Cash	Cash	Cash	Cash	Cash
Lundin Mining Corporation	++	SEK	++	71.0	5,847	6,897	7.8x	12.3x	11.4x	4.1x	5.1x	4.5x	9.4%	8.4%	7.2%	3.8%	3.4%	2.9%	1.2x	1.1x	1.0x	16.8%	9.4%	9.7%	Cash	Cash	Cash	Cash	Cash	Cash
MMG Ltd.	EW	HKD	3.50	2.54	2,625	9,868	4.8x	8.4x	7.1x	3.6x	4.2x	3.8x	44.5%	38.9%	36.0%	0.0%	0.0%	0.0%	1.1x	1.0x	0.9x	29.9%	13.3%	13.9%	0.6x	0.5x	0.4x	1.6x	1.6x	1.1x
Mitsubishi Materials Corporation**	EW	JPY	2,150	2,052	2,328	3,972	6.1x	NA	NA	4.2x	NA	NA	20.8%	NA	NA	3.5%	NA	NA	0.4x	NA	NA	7.5%	NA	NA	NA	NA	NA	1.2x	NA	NA
Oz Minerals Limited	EW	AUD	27.30	26.52	6,796	6,967	12.4x	18.4x	NA	6.5x	8.8x	NA	3.9%	-0.8%	NA	1.5%	1.3%	NA	2.2x	2.0x	NM	20.7%	11.9%	NA	0.1x	0.1x	NA	0.2x	0.4x	NA
Sandfire Resources*	OW	AUD	7.35	6.94	888	2,006	9.9x	13.9x	NA	3.8x	3.5x	NA	-75.7%	24.4%	NA	3.6%	2.5%	NA	1.2x	1.1x	NA	21.3%	8.4%	NA	0.1x	0.0x	NA	0.4x	NA	NA
Southern Copper Corporation	EW	USD	55.0	66.0	51,032	53,631	19.6x	22.4x	18.6x	9.4x	10.2x	8.5x	5.6%	5.2%	5.9%	5.4%	3.6%	3.5%	6.3x	6.0x	5.4x	31.4%	28.1%	32.1%	0.3x	0.2x	0.1x	0.6x	0.5x	0.2x
Sumitomo Metal Mining**	UW	JPY	4,800	4,716	11,283	5,882	10.0x	NA	NA	4.1x	NA	NA	9.4%	NA	NA	3.6%	NA	NA	0.9x	NA	NA	9.5%	NA	NA	0.1x	NA	NA	0.9x	NA	NA
Weighted Average					258,888	291,571	13.5x	18.1x	15.9x	6.4x	7.4x	6.6x	7.3%	6.4%	7.7%	3.3%	2.5%	2.7%	3.0x	2.9x	2.6x	24.6%	16.8%	18.1%	0.2x	0.2x	0.1x	0.7x	0.6x	0.4x

Source: Morgan Stanley Research estimates (e), Thomson Reuters for non-covered companies (*not covered by Morgan Stanley, ** Market cap based on total no. of group shares, *** provisions and pensions included in EV, ^ Fiscal year ending in June, ^^ Fiscal year ending in March, ^^^ Fiscal year ending in September, ^^^^ Fiscal year ending in August, ^^^^^ Fiscal year ending in July). Weighted Average for P/E, FCF Yield, Dividend Yield, P/B, ROE based on Market Cap. Weighted Average for EV/EBITDA, Net Debt/EBITDA based on EV. Share prices as of January 11, 2021. NA = Not applicable, NM = Not meaningful

Exhibit 17: Base case valuation multiples and key metrics: iron ore producers

Iron Ore Companies	Rating	FX	Price Target	Share Price	Market cap (US\$m)	EV (US\$m) 2022CY	P/E 2022CY	P/E 2033CY	P/E 2044CY	EV/EBITDA 2022CY	EV/EBITDA 2033CY	EV/EBITDA 2044CY	FCF Yield 2022CY	FCF Yield 2033CY	FCF Yield 2044CY	Dividend Yield 2022CY	Dividend Yield 2033CY	Dividend Yield 2044CY	P/B 2022CY	P/B 2033CY	P/B 2044CY	2022e ROE	2023e ROE	2024e ROE	2022e ND/(ND+E+M)	2023e ND/(ND+E+M)	2024e ND/(ND+E+M)	2022e Net Debt/EBITDA	2023e Net Debt/EBITDA	2024e Net Debt/EBITDA
Anglo American Plc	EW	GBP	2,870	3,239	53,816	78,874	8.8x	13.4x	16.1x	5.2x	6.8x	5.6x	3.6%	1.3%	1.4%	4.6%	3.0%	2.5%	4.4x	3.8x	1.5x	20.9%	12.2%	9.5%	0.1x	0.2x	0.2x	0.4x	0.7x	0.8x
Rio Tinto Plc*	OW	GBP	5,220	5,301	117,282	143,153	8.3x	11.3x	15.5x	5.7x																				

Exhibit 18: Base case valuation multiples and key metrics: aluminium producers

Aluminium Companies	Rating	FX	Price Target	Share Price	Market cap (US\$m)	EV (US\$ m)	P/E			EV/EBITDA			FCF Yield			Dividend Yield			P/B			ROE			ND/(ND+E+M)			Net Debt/EBITDA		
							2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022e	2023e	2024e	2022e	2023e	2024e
Alcoa Inc.	OW	USD	66.0	62.2	11,876	12,248	15.2x	12.8x	13.5x	5.0x	4.5x	4.0x	9.6%	11.8%	10.1%	0.6%	0.6%	0.6%	2.1x	1.7x	1.4x	17.7%	16.1%	12.3%	Cash	Cash	Cash	Cash	Cash	Cash
Alumina Limited	OW	AUD	2.15	2.01	4,153	4,124	12.9x	37.6x	29.6x	NA	NA	NA	14.5%	4.6%	4.8%	7.7%	2.3%	1.7%	2.2x	2.4x	2.3x	17.4%	6.0%	8.0%	Cash	0.0x	0.0x	Cash	NM	NM
Aluminium Bahrain*	NA	BHD	NA	0.81	3,051	NA	3.4x	3.3x	NA	NA	NA	NA	37.8%	38.4%	NA	12.0%	17.9%	NA	NA	NA	NA	20.6%	17.7%	NA	NA	NA	NA	NA	NA	NA
Aluminum Corporation Of China	OW	HKD	6.60	4.79	14,794	24,324	7.1x	6.4x	6.7x	6.7x	6.0x	5.8x	22.4%	23.1%	21.8%	0.0%	0.0%	0.0%	0.9x	0.8x	0.7x	15.4%	14.9%	12.4%	0.4x	0.3x	0.1x	2.0x	1.2x	0.5x
Century Aluminum Company*	NA	USD	NA	17.40	1,568	NA	4.6x	5.5x	NA	NA	NA	NA	29.1%	22.2%	NA	0.0%	0.0%	NA	NA	NA	NA	16.2%	5.8%	NA	NA	NA	NA	0.1x	Cash	NA
China Hongqiao Group*	NA	HKD	NA	9.05	10,589	NA	3.2x	2.9x	NA	NA	NA	NA	49.0%	53.3%	NA	14.9%	16.1%	0.0%	0.7x	0.6x	NA	21.9%	20.1%	NA	NA	NA	NA	0.2x	Cash	NA
Constellation N*	NA	USD	NA	18.8	2,668	5,259	13.1x	9.5x	NA	7.0x	6.0x	NA	10.2%	19.6%	NA	0.0%	0.0%	NA	5.3x	3.4x	NA	49.4%	40.1%	NA	NA	NA	NA	2.8x	2.0x	NA
Hindalco Industries Limited**	NA	INR	NA	486	14,722	23,217	8.8x	8.8x	NA	6.4x	6.3x	NA	17.2%	17.2%	NA	1.0%	0.9%	NA	1.3x	1.1x	NA	15.5%	13.6%	NA	NA	NA	NA	1.4x	1.0x	NA
Kaiser Aluminum Corp*	NA	USD	NA	100	1,589	NA	18.8x	13.0x	NA	NA	NA	NA	4.5%	7.9%	NA	3.0%	3.1%	NA	2.1x	2.0x	NA	11.4%	14.7%	NA	NA	NA	NA	3.0x	2.7x	NA
National Aluminum Co Ltd*	NA	INR	NA	108.45	2,691	NA	9.3x	10.8x	NA	NA	NA	NA	10.6%	7.1%	NA	3.3%	3.4%	NA	1.6x	1.4x	NA	17.0%	13.7%	NA	NA	NA	NA	Cash	Cash	NA
Nippon Light Metals Holding Company**	EW	JPY	1,800	1,817	975	1,966	5.9x	NA	NA	4.6x	NA	NA	11.8%	NA	NA	6.1%	NA	NA	0.5x	NA	NA	9.1%	NA	NA	0.2x	NA	NA	1.4x	NA	NA
Norsk Hydro ASA	OW	NOK	86.00	70.22	16,396	18,973	7.1x	9.0x	9.0x	4.4x	5.1x	4.9x	10.7%	10.6%	10.0%	7.0%	5.6%	5.5%	1.6x	1.5x	1.4x	24.6%	17.4%	16.2%	Cash	Cash	Cash	Cash	Cash	Cash
Shandong Nanshan Aluminium Corp	OW	CNY	6.50	4.85	9,094	7,467	12.5x	11.0x	8.2x	6.1x	4.9x	3.3x	7.3%	9.5%	13.2%	0.8%	0.9%	1.2%	1.2x	1.1x	1.0x	10.6%	11.1%	13.5%	Cash	Cash	Cash	Cash	Cash	Cash
South32*	OW	AUD	4.85	4.05	13,714	13,013	6.9x	10.8x	NA	3.8x	5.2x	NA	9.7%	2.4%	NA	5.8%	3.7%	NA	1.3x	1.2x	NA	20.5%	11.8%	NA	Cash	Cash	NA	NA	NA	NA
UACI Corp**	OW	JPY	3,500	2,809	1,175	3,288	9.5x	NA	NA	5.5x	NA	NA	15.2%	NA	NA	3.4%	NA	NA	0.6x	NA	NA	6.7%	NA	NA	0.5x	NA	NA	3.1x	NA	NA
United Company Rusal Plc*	NA	HKD	NA	7.98	15,687	NA	3.0x	3.0x	5.4x	NA	NA	NA	15.7%	15.3%	6.2%	4.6%	3.9%	4.2%	8.2x	6.8x	NA	30.6%	23.9%	17.5%	NA	NA	NA	0.4x	Cash	Cash
Yunnan Aluminium Co*	NA	CNY	NA	12.72	6,919	NA	9.3x	8.8x	NA	NA	NA	NA	16.7%	18.5%	NA	NA	9.6%	NA	2.1x	1.8x	NA	25.1%	22.7%	NA	NA	NA	NA	0.2x	Cash	NA
Weighted Average					131,663	113,879	8.2x	9.0x	9.6x	5.6x	5.6x	4.9x	17.3%	17.1%	11.7%	5.2%	5.0%	3.2%	2.3x	2.0x	1.2x	20.6%	16.7%	14.2%	0.4x	0.2x	0.1x	1.9x	1.2x	0.5x

Source: Morgan Stanley Research estimates (e), Thomson Reuters for non covered companies (*not covered by Morgan Stanley, ** Market cap based on total no. of group shares, *** provisions and pensions included in EV, * Fiscal year ending in June, ** Fiscal year ending in March, *** Fiscal year ending in September, **** Fiscal year ending in August, ***** Fiscal year ending in July). Weighted Average for P/E, FCF Yield, Dividend Yield, P/B, ROE based on Market Cap. Weighted Average for EV/EBITDA, Net Debt/EBITDA based on EV. Share prices as of January 11, 2021. NA = Not applicable, NM = Not meaningful

Exhibit 19: Base case valuation multiples and key metrics: coal producers

Coal Companies	Rating	FX	Price Target	Share Price	Market cap (US\$m)	EV (USD)	P/E			EV/EBITDA			FCF Yield			Dividend Yield			P/B			ROE			ND/(ND+E+M)			Net Debt/EBITDA			
							2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022e	2023e	2024e	2022e	2023e	2024e	2022e
THERMAL COAL																															
Aldao Energy	UW	IDR	1,428	2,340	5,234	4,402	12.0x	14.9x	12.7x	3.7x	3.9x	3.4x	5.5%	10.3%	11.1%	4.2%	3.4%	3.9%	1.2x	1.2x	1.1x	11.0%	8.4%	9.4%	Cash	Cash	Cash	Cash	Cash	Cash	
Arch Coal, Inc.*	NA	USD	NA	98.15	1,503	NA	2.6x	6.3x	31.6x	NA	NA	NA	53.0%	27.0%	NA	1.0%	1.0%	1.0%	NA	NA	NA	61.2%	21.5%	NA	NA	NA	NA	NA	NA	NA	
China Coal Energy Co.	OW	CNY	5.11	6.57	12,005	21,231	5.4x	6.9x	NA	2.7x	3.0x	NA	66.0%	51.1%	NA	4.7%	3.6%	NA	0.7x	0.7x	NM	14.4%	10.2%	NA	0.1x	0.0x	NA	0.4x	0.2x	NA	
China Shenhua Energy Company Limited	OW	HKD	23.3	18.8	66,923	52,737	6.7x	7.0x	NA	3.7x	3.7x	NA	NM	NM	NA	5.7%	5.4%	NA	0.7x	0.7x	NM	11.6%	10.2%	NA	Cash	Cash	NA	Cash	Cash	NA	
Coal India Limited***	NA	INR	NA	159	13,200	10,416	5.7x	5.5x	NA	3.1x	3.0x	NA	11.5%	13.7%	NA	10.9%	11.3%	NA	2.2x	1.9x	NA	39.4%	36.7%	NA	NA	NA	NA	Cash	Cash	NA	
Consol Energy Inc.*	NA	USD	NA	24.6	849	NA	4.8x	4.1x	NA	NA	NA	NA	41.6%	37.0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Exaro Resources Limited	UW	ZAC	13,000	16,592	3,843	3,758	3.9x	4.4x	NA	2.9x	2.9x	NA	21.8%	15.9%	NA	11.9%	11.1%	NA	1.2x	1.1x	NM	25.3%	19.6%	NA	Cash	Cash	NA	Cash	Cash	NA	
Harum Energy*	NA	IDR	NA	10,900	2,061	NA	14.5x	9.8x	NA	NA	NA	NA	7.9%	11.5%	NA	0.9%	1.8%	NA	3.8x	3.3x	NA	22.0%	29.4%	NA	NA	NA	NA	NA	NA	NA	
Indo Tambora Energy Megah*	NA	IDR	NA	20,175	1,594	1,143	5.2x	7.9x	NA	2.3x	3.4x	NA	29.1%	19.0%	NA	17.1%	13.3%	NA	1.4x	1.4x	NA	26.0%	18.0%	NA	NA	NA	NA	Cash	Cash	NA	
New Hope Corporation Limited*****	NA	AUD	NA	2.30	1,372	NA	4.3x	7.8x	NA	NA	NA	NA	34.8%	21.4%	NA	10.8%	7.3%	4.1%	0.9x	0.8x	NA	22.8%	11.7%	NA	NA	NA	NA	Cash	Cash	NA	
Peabody Energy Corporation*	NA	USD	NA	11.98	1,526	NA	2.9x	34.1x	28.9x	NA	NA	NA	65.7%	36.1%	29.9%	0.0%	0.0%	0.0%	NA	NA	NA	33.6%	NM	NA	NA	NA	NA	0.8x	NA	NA	
Shaanxi Coal Industry	UW	CNY	13.12	12.36	19,393	1,509	7.4x	8.0x	NA	0.3x	0.7x	NA	72.3%	6.7%	NA	4.1%	3.7%	NA	1.3x	1.1x	NM	19.6%	15.8%	NA	Cash	Cash	NA	Cash	Cash	NA	
Whitehaven Coal Limited*	OW	AUD	3.80	2.87	2,114	1,804	3.5x	6.0x	NA	1.7x	2.5x	NA	32.1%	15.1%	NA	6.7%	4.7%	NA	0.8x	0.7x	NA	28.1%	13.1%	NA	Cash	Cash	NA	NA	NA	NA	
Yancoal Australia Ltd	EW	HKD	17.66	17.40	2,949	3,336	4.7x	4.8x	NA	2.7x	2.3x	NA	27.9%	30.9%	NA	10.7%	10.3%	NA	0.7x	0.6x	NM	15.8%	14.1%	NA	0.3x	0.2x	NA	1.2x	0.8x	NA	
Yangquan Coal Industry Group Co Ltd*	NA	CNY	NA	12.20	4,692	NA	10.6x	10.3x	NA	NA	NA	NA	-2.1%	18.5%	NA	0.0%	0.0%	NA	1.2x	1.0x	NA	9.8%	9.3%	NA	NA	NA	NA	0.0x	0.0x	NA	
Thungela Resources Ltd	OW	ZAC	12,000	8,727.00	760	NA	2.1x	3.2x	5.2x	NA	NA	NA	NA	NA	NA	12.5%	7.5%	9.6%	NA	NA	NA	39.3%	15.2%	25.0%	NA	NA	NA	NA	NA	NA	
Yanzhou Coal Mining Company Limited	UW	HKD	11.23	15.88	14,938	27,338	3.2x	4.5x	5.6x	3.9x	5.7x	7.2x	22.7%	-38.1%	-15.4%	13.6%	15.6%	11.2%	0.8x	0.8x	NA	28.1%	17.4%	13.2%	0.4x	0.5x	0.5x	1.4x	2.5x	3.4x	
Weighted Average					154,867	127,675	6.4x	7.3x	10.3x	3.4x	3.9x	6.8x	37.5%	10.2%	-5.8%	7.0%	6.8%	8.5%	1.0x	0.9x	1.1x	18.6%	14.7%	12.7%	0.1x	0.1x	0.5x	1.0x	1.5x	3.4x	
COKING COAL																															
(Persero) Pt Aneka Tambang Tbk*	NA	IDR	NA	2,080	3,494	3,556	17.7x	15.1x	NA	9.6x	8.3x	NA	6.4%	8.6%	NA	1.4%	2.1%	NA	2.1x	2.0x	NA	12.9%	14.0%	NA	NA	NA	NA	0.7x	Cash	NA	
Arch Coal, Inc.*	NA	USD	NA	98.15	1,503	2,252	2.6x	6.3x	31.6x	2.4x	4.3x	10.0x	53.0%	27.0%	NA	1.0%	1.0%	1.0%	NA	NA	NA	61.2%	21.5%	NA	NA	NA	NA	NA	NA	Cash	NA
Banpu Public Company Limited*	NA	THB	NA	11.2	2,276	NA	5.7x	6.9x	6.5x	6.1x	6.4x	NA	30.4%	33.2%	NA	6.6%	5.9%	NA	0.9x	0.9x	NA	16.7%	12.1%	NA	NA	NA	NA	2.2x	1.8x	NA	
Open Joint Stock Company "Raspaskaya**																															

Valuation Tables – Base Case (cont'd)

Exhibit 24: Base case valuation multiples and key metrics: other miners

Other Companies	Rating	FX	Price Target	Share Price	Market cap (US\$mn)	EV (USD) 2022CY	P/E			EV/EBITDA			FCF Yield			Dividend Yield			P/B			ROE			ND/(ND+E+M)			Net Debt/EBITDA		
							2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022e	2023e	2024e	2022e	2023e	2024e
PLATINUM																														
Anglo Platinum Limited	UW	ZAc	140,000	181,880	30,734	28,788	9.7x	13.6x	NA	6.0x	8.6x	NA	8.1%	3.3%	NA	10.4%	7.4%	NA	5.1x	5.5x	NM	49.1%	37.5%	NA	Cash	Cash	NA	Cash	Cash	NA
Impats Platinum Holdings Limited*	OW	ZAc	24,000	23,276	12,282	11,198	5.9x	6.7x	NA	3.3x	3.6x	NA	11.8%	10.6%	NA	15.5%	15.1%	NA	1.9x	1.9x	NA	35.0%	26.6%	NA	Cash	Cash	NA	NA	NA	NA
Royal Bafokeng Platinum Ltd	EW	ZAc	13,000	16,201	3,034	2,996	8.7x	10.3x	NA	5.2x	6.0x	NA	10.1%	11.7%	NA	10.5%	10.9%	NA	2.0x	2.0x	NM	21.2%	19.0%	NA	Cash	Cash	NA	Cash	Cash	NA
Weighted Average					46,050	42,982	8.6x	11.5x	NA	5.3x	7.2x	NA	9.9%	5.8%	NA	11.7%	9.7%	NA	4.0x	4.3x	NA	43.5%	33.9%	NA	NA	NA	NA	NA	NA	NA
DIAMONDS																														
Amos	UW	RUB	110	120.8	11,740	13,733	12.8x	11.6x	16.0x	9.3x	8.7x	11.0x	8.0%	8.9%	5.5%	7.5%	8.5%	4.7%	5.6x	5.7x	5.2x	41.5%	48.4%	35.9%	0.5x	0.5x	0.4x	1.3x	1.2x	1.4x
Gem Diamonds Limited*	NA	GBp	NA	49.1	94	NA	4.1x	4.4x	NA	NA	NA	NA	-11.6%	-13.1%	NA	4.9%	4.9%	NA	NA	NA	NA	12.0%	8.7%	NA	NA	NA	NA	NA	NA	NA
Lucara Diamond Corp.*	NA	CAD	NA	0.60	216	279	10.6x	8.4x	NA	2.7x	3.3x	NA	-7.1%	0.4%	NA	0.0%	0.0%	NA	0.5x	NA	NA	26.5%	NA	NA	NA	NA	NA	0.3x	1.3x	NA
Petra Diamonds Limited**	NA	GBp	NA	72.0	191	NA	5.4x	4.0x	9.3x	NA	NA	NA	37.1%	36.3%	24.0%	0.0%	0.0%	0.0%	NA	NA	NA	6.9%	9.0%	NA	NA	NA	NA	1.5x	1.0x	NA
Weighted Average					12,241	14,011	12.6x	11.4x	15.9x	9.2x	8.6x	11.0x	8.9%	9.0%	5.8%	7.5%	8.5%	4.7%	5.5x	5.7x	5.2x	40.4%	47.5%	35.9%	0.5x	0.5x	0.4x	1.2x	1.2x	1.4x
RARE EARTHS																														
China Molybdenum Co. Ltd.	OW	HKD	6.20	3.96	17,449	21,358	9.8x	13.1x	11.9x	7.8x	9.2x	8.0x	2.0%	0.5%	6.5%	4.3%	4.8%	3.9%	1.4x	1.3x	1.2x	16.1%	10.7%	11.2%	0.2x	0.3x	0.2x	1.6x	2.0x	1.5x
Iuka Resources Limited	EW	AUD	8.80	10.82	3,284	2,733	10.9x	9.2x	NA	4.8x	3.8x	NA	7.2%	8.6%	NA	3.2%	3.8%	NA	2.4x	2.1x	NM	27.1%	26.6%	NA	Cash	Cash	NA	Cash	Cash	NA
Lynas Corporation Limited**	NA	AUD	NA	10.99	7,109	6,857	10.6x	20.1x	16.4x	16.5x	13.8x	11.6x	3.0%	5.0%	6.9%	0.0%	0.0%	0.7%	6.0x	4.6x	4.1x	28.2%	23.7%	20.2%	NA	NA	NA	Cash	Cash	Cash
Tronox	EW	USD	26.00	24.6	3,525	5,802	8.1x	6.8x	NA	5.5x	4.6x	NA	11.9%	17.0%	NA	2.0%	0.0%	NA	1.6x	1.3x	NM	22.7%	22.8%	NA	0.4x	0.4x	NA	2.1x	1.5x	NA
Weighted Average					31,367	36,740	13.1x	13.6x	13.2x	8.8x	9.0x	8.9x	3.9%	4.2%	6.6%	3.8%	4.7%	3.0%	2.6x	2.2x	2.1x	20.8%	16.7%	13.6%	0.3x	0.3x	0.2x	1.7x	1.9x	1.5x
Manganese																														
African Rainbow Minerals*	OW	ZAc	27,000	24,096	3,452	2,697	4.5x	6.2x	NA	2.4x	2.8x	NA	5.7%	6.2%	NA	10.0%	7.4%	NA	1.1x	1.0x	NA	24.3%	15.8%	NA	Cash	Cash	NA	NA	NA	NA
Eramet S.A.	NA	EUR	NA	77	2,320	5,024	3.9x	5.7x	3.6x	4.3x	4.9x	4.9x	31.4%	26.3%	24.9%	0.0%	1.6%	2.3%	1.5x	1.3x	0.9x	32.0%	19.8%	28.6%	NA	NA	NA	0.8x	0.9x	0.4x
South32*	OW	AUD	4.85	4.05	13,714	13,013	6.9x	10.8x	NA	3.8x	5.2x	NA	9.7%	2.4%	NA	5.8%	3.7%	NA	1.3x	1.2x	NA	20.5%	11.8%	NA	Cash	Cash	NA	NA	NA	NA
Vale S.A.	OW	USD	16.5	15.2	74,553	83,149	7.4x	9.1x	12.0x	4.3x	5.2x	6.1x	8.0%	7.2%	5.7%	11.8%	11.4%	4.3%	2.1x	2.2x	2.1x	28.0%	23.4%	18.4%	0.2x	0.2x	0.2x	0.4x	0.6x	0.7x
Weighted Average					94,039	103,883	7.1x	9.2x	11.7x	4.2x	5.1x	6.1x	8.7%	6.9%	6.3%	10.9%	9.9%	4.3%	2.0x	2.0x	2.0x	26.8%	21.3%	18.7%	0.2x	0.2x	0.2x	0.4x	0.6x	0.7x
PROCESSING																														
Aurubis AG***	UW	EUR	76	91.1	4,520	4,787	15.9x	17.0x	16.2x	7.7x	8.3x	8.0x	-3.3%	-4.2%	0.4%	1.7%	2.1%	2.2%	1.1x	1.0x	1.0x	7.2%	6.4%	6.5%	Cash	0.0x	0.1x	Cash	0.7x	0.8x
Boliden AB	EW	SEK	325	366	11,089	11,832	11.4x	14.5x	15.9x	6.2x	7.1x	7.6x	4.0%	4.1%	3.5%	4.9%	3.8%	3.5%	1.8x	1.8x	1.7x	17.3%	12.6%	11.1%	Cash	0.0x	0.0x	Cash	0.1x	0.1x
Dowa Holdings Co., Ltd. **	EW	JPY	5,100	4,915	2,537	2,453	7.2x	NA	NA	3.8x	NA	NA	7.9%	NA	NA	2.6%	NA	NA	0.8x	NA	NA	12.2%	NA	NA	0.2x	NA	NA	1.1x	NA	NA
Jiangxi Copper Company Limited	EW	CNY	24	22.6	9,555	10,778	12.9x	14.6x	12.0x	5.3x	5.3x	4.4x	13.3%	13.3%	11.1%	1.2%	1.3%	1.2%	1.1x	1.0x	1.0x	9.3%	7.6%	8.7%	0.2x	0.2x	0.1x	1.7x	1.4x	1.0x
KGHM Polska Miedz Spolka Akcyjna	EW	PLN	140	143.1	7,175	8,706	7.4x	9.5x	7.4x	4.6x	5.2x	4.0x	11.0%	10.1%	11.0%	2.7%	3.5%	4.5%	1.0x	0.9x	0.8x	14.8%	10.0%	12.0%	Cash	Cash	Cash	Cash	Cash	Cash
Mitsubishi Materials Corporation**	EW	JPY	2,150	2,052	2,326	3,972	6.1x	NA	NA	4.2x	NA	NA	20.6%	NA	NA	3.5%	NA	NA	0.4x	NA	NA	7.5%	NA	NA	0.4x	NA	NA	1.2x	NA	NA
Mitsui Mining And Smelting Company**	OW	JPY	4,150	3,190	1,580	2,730	5.5x	NA	NA	3.7x	NA	NA	0.0%	NA	NA	0.0%	NA	NA	0.7x	NA	NA	13.3%	0.0%	NA	0.4x	NA	NA	1.3x	NA	NA
Weighted Average					38,783	45,250	10.7x	13.8x	12.9x	5.4x	6.3x	6.0x	7.9%	7.0%	6.9%	2.5%	2.7%	2.8%	1.2x	1.3x	1.2x	12.6%	9.7%	9.9%	0.3x	0.1x	0.1x	1.5x	0.7x	0.6x
TECHNICAL GRADE METALS																														
Mineral Resources Limited	EW	AUD	44.70	60.73	8,144	9,334	24.0x	NM	NA	12.7x	16.1x	NA	-7.7%	-4.0%	NA	2.1%	1.2%	NA	3.2x	3.2x	NA	14.2%	6.7%	NA	0.3x	0.4x	NA	1.5x	3.2x	NA
Syrah Resources	EW	AUD	1.35	2.03	695	796	NM	NM	NA	NM	NM	NA	-8.2%	-8.5%	NA	0.0%	0.0%	NA	2.4x	2.3x	NM	0.0%	2.0%	NA	0.2x	0.3x	NA	6.3x	4.9x	NA
Orocobre Ltd.*	EW	AUD	9.80	10.88	4,973	4,778	27.9x	NM	NA	18.2x	NM	NA	2.1%	2.1%	NA	0.0%	0.0%	NA	1.3x	1.3x	NA	18.1%	1.6%	NA	Cash	Cash	NA	NA	NA	NA
Weighted Average					13,812	14,908	25.5x	NA	NA	14.5x	16.1x	NA	-11.7%	-8.6%	NA	2.1%	1.2%	NA	2.5x	2.5x	NA	14.9%	4.6%	NA	0.3x	0.4x	NA	1.9x	3.4x	NA

Source: Morgan Stanley Research estimates (e), Thomson Reuters for non covered companies (*not covered by Morgan Stanley, ** Market cap based on total no. of group shares, *** provisions and pensions included in EV, * Fiscal year ending in June, ** Fiscal year ending in March, *** Fiscal year ending in September, **** Fiscal year ending in August, ***** Fiscal year ending in July). Weighted Average for P/E, FCF Yield, Dividend Yield, P/B, ROE based on Market Cap. Weighted Average for EV/EBITDA based on EV. Share prices as of January 11, 2021. NA = Not applicable, NM = Not meaningful.

Exhibit 25: Base case valuation multiples and key metrics: Lithium miners

Lithium Companies	Rating	FX	Price Target	Share Price	Market cap (US\$mn)	EV (US\$ mn) 2022CY	P/E			EV/EBITDA			FCF Yield			Dividend Yield			P/B			ROE			ND/(ND+E+M)			Net Debt/EBITDA		
							2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022CY	2023CY	2024CY	2022e	2023e	2024e	2022e	2023e	2024e
Albemarle Corporation	UW	USD	80	240.2	25,758	29,937	NM	NM	NM	NM	NM	NM	-1.8%	-1.1%	-0.5%	0.7%	0.7%	0.7%	4.8x	4.6x	4.4x	10.7%	8.8%	8.1%	0.3x	0.3x	0.3x	2.2x	2.9x	3.3x
Sociedad Quimica y Minera de Chile S.A.	UW	USD	51	51.9	13,652	16,751	19.5x	21.3x	NA	10.8x	11.4x	NA	0.6%	4.4%	NA	5.1%	4.7%	NA	4.6x	4.6x	NM	23.4%	21.4%	NA	0.4x	0.4x	NA	1.2x	1.5x	NA
Livent*	NA	USD	NA	24.7	3,996	NA	NM	38.1x	NM	NA	NA	NA	0.3%	1.3%	3.6%	0.0%	0.0%	0.0%	5.6x	4.9x	NA	11.9%	13.2%	NA	NA	NA	NA	1.4x	1.6x	1.2x
Orocobre*	EW	AUD	9.80	10.88	4,973	4,778	27.9x	NM	NA	18.2x	NM	NA	2.1%	2.1%	NA	0.0%	0.0%	NA	1.3x	1.3x	NA	18.1%	1.6%	NA	Cash	Cash	NA	NA	NA	NA
Mineral Resources*	EW	AUD	44.7	60.73	8,144	9,334	24.0x	NM	NA	12.7																				

Paper and Packaging Comps

Exhibit 29: Base case valuation multiples and key metrics: Paper, pulp and packaging companies

Companies	Rating	FX	Price Target	Share Price	Market cap (US\$m)	EV*** (USD) 2022CY	P/E		EV/EBITDA		FCF Yield		Dividend Yield		P/B		Cash conversion 2022CY	Capex/sales 2022CY	ROE 2022e	Net Debt/EBITDA		
							2022CY	2023CY	2022CY	2023CY	2022CY	2023CY	2022CY	2023CY	2022CY	2023CY				2022e	2023e	
SIG Combibloc	EW	CHF	23.5	24.0	8,315	9,826	29.4x	26.3x	14.5x	13.1x	3.4%	3.9%	1.9%	2.1%	3.4x	3.4x	69.0%	8.2%	11.8%	2.2x	1.8x	
Weighted Average					8,315	9,826	29.4x	26.3x	14.5x	13.1x	3.4%	3.9%	1.9%	2.1%	3.4x	3.4x	69.0%	8.2%	11.8%	2.2x	1.8x	
Non-system Suppliers																						
Greatview aseptic ^c	NA	HKD	NA	2.8	485	408	8.1x	7.5x	3.9x	3.8x	15.5%	8.8%	10.3%	12.5%	1.2x	1.2x	88.0%	2.0%	15.2%	Cash	Cash	
Weighted Average					485	408	8.1x	7.5x	3.9x	3.8x	15.5%	8.8%	10.3%	12.5%	1.2x	1.2x	88.0%	2.0%	15.2%	NA	NA	
Diversified packaging																						
Amcor Ltd ^a	OW	AUD	19.0	17.0	18,567	23,853	14.8x	14.2x	10.9x	10.4x	6.1%	6.1%	4.0%	4.2%	3.7x	3.5x	75.1%	4.0%	25.7%	2.4x	2.2x	
Ardagh	NA	USD	NA	8.7	5,249	8,041	16.9x	13.0x	10.0x	8.4x	-1.2%	6.2%	0.0%	0.7%	4.3x	2.4x	7.5%	16.3%	49.3%	3.5x	3.0x	
Ball Corp	OW	USD	110.0	89.9	29,613	38,211	20.2x	17.1x	13.7x	12.8x	1.7%	2.9%	0.9%	1.0%	NM	NM	46.2%	9.9%	45.3%	3.4x	3.4x	
Berry Global Group Inc ^{***}	EW	USD	71.0	72.4	10,085	17,512	11.9x	10.8x	7.6x	7.0x	10.0%	10.5%	0.0%	0.0%	2.5x	2.1x	65.4%	5.5%	25.2%	3.2x	2.7x	
Crown Holdings	OW	USD	129.0	109.4	14,103	20,816	14.2x	12.4x	9.6x	9.3x	2.1%	3.6%	0.7%	0.7%	7.3x	6.7x	53.7%	8.4%	NM	3.5x	3.5x	
Huhtamaki OY ^a	NA	EUR	NA	37.9	4,629	6,042	16.3x	14.9x	9.7x	9.0x	5.0%	5.2%	2.8%	3.0%	2.6x	2.4x	54.4%	6.5%	16.2%	2.3x	2.0x	
Pact Group Holdings Limited ^{^^}	EW	AUD	3	2.48	612	1,076	10.1x	9.2x	4.9x	4.6x	18.6%	19.2%	4.7%	5.1%	1.7x	1.6x	69.1%	5.3%	17.9%	2.1x	1.9x	
Sealed Air Corporation	EW	USD	61.0	66.0	9,878	12,962	16.0x	14.7x	10.8x	10.2x	6.0%	6.5%	1.2%	1.2%	NM	NM	82.6%	3.6%	NM	2.5x	2.3x	
Silgan Holdings Inc ^c	NA	USD	NA	42.2	4,662	7,400	11.3x	10.7x	7.9x	7.3x	9.5%	10.4%	1.4%	1.4%	2.5x	2.1x	73.6%	4.0%	24.4%	2.9x	2.5x	
Orora Limited ^a	EW	AUD	3.5	3.5	2,243	2,720	19.1x	18.0x	9.8x	9.2x	5.5%	7.2%	4.1%	4.4%	3.8x	3.6x	72.4%	2.9%	20.9%	1.7x	1.4x	
Weighted Average					99,638	138,632	16.2x	14.4x	10.7x	10.1x	4.4%	5.5%	1.8%	1.8%	4.2x	3.7x	58.5%	7.3%	34.1%	3.0x	2.9x	
Glass packaging																						
Owens-Illinois Inc ^c	NA	USD	NA	13.0	2,045	6,490	6.7x	6.0x	5.6x	5.4x	2.1%	2.8%	0.0%	0.5%	3.5x	2.3x	43.2%	10.3%	47.0%	3.9x	3.7x	
Vidrala SA ^a	NA	EUR	NA	85.3	2,882	2,954	15.5x	14.5x	8.6x	7.8x	5.5%	6.8%	1.7%	1.9%	2.4x	2.1x	61.0%	10.5%	16.2%	0.2x	Cash	
Vetropack Holding SA ^a	NA	CHF	NA	56.8	844	906	14.8x	13.9x	4.6x	4.3x	-6.8%	9.0%	2.4%	2.5%	1.4x	1.3x	NM	24.9%	9.3%	0.3x	0.2x	
Zignago Vetro SpA ^a	NA	EUR	NA	16.1	1,600	1,889	20.9x	19.7x	11.4x	10.6x	3.8%	6.0%	3.2%	3.4%	5.3x	4.8x	56.8%	11.8%	25.0%	1.7x	1.4x	
Weighted Average					7,372	12,239	14.2x	13.2x	7.2x	6.7x	2.8%	5.8%	2.3%	1.9%	3.2x	2.7x	54.4%	11.6%	25.9%	2.4x	2.9x	
Paper packaging																						
BillerudKorsnas AB ^a	NA	SEK	NA	166	3,793	4,360	16.8x	16.1x	8.6x	8.1x	3.6%	4.2%	3.1%	3.5%	1.6x	1.6x	46.6%	8.6%	9.8%	1.1x	0.8x	
International Paper	NA	USD	NA	49	18,790	22,419	10.4x	10.0x	6.7x	6.2x	9.3%	9.7%	4.2%	4.0%	1.9x	1.8x	73.8%	4.3%	18.0%	1.1x	0.7x	
Lee & Man Paper Manufacturing	EW	HKD	6.70	5.67	3,175	4,706	6.4x	6.2x	5.9x	5.6x	5.7%	6.4%	5.6%	5.8%	0.7x	0.7x	51.7%	10.4%	12.6%	1.9x	1.7x	
Louisiana-Pacific Corp ^a	NA	USD	NA	74	6,541	6,027	8.6x	12.0x	5.3x	NA	7.7%	6.4%	1.0%	1.1%	4.2x	2.7x	75.5%	7.3%	38.5%	Cash	NA	
Mondi PLC	OW	GBP	2,100	1,860	10,784	13,051	14.0x	13.2x	7.8x	7.3x	5.7%	7.4%	2.7%	2.9%	2.2x	2.0x	62.3%	7.8%	17.5%	1.1x	0.8x	
DS Smith plc ^{****}	OW	GBP	450	394	5,437	7,140	12.8x	11.1x	7.5x	6.6x	7.0%	8.5%	3.9%	4.5%	1.5x	1.5x	54.4%	6.4%	12.0%	1.5x	1.2x	
Nine Dragons Paper	EW	HKD	11.0	9.0	5,385	11,713	5.1x	4.3x	5.2x	5.1x	-24.0%	-25.4%	5.6%	6.6%	0.7x	0.6x	NM	28.1%	14.0%	2.8x	3.0x	
Sappi Ltd	OW	ZAc	6,000	4,580	1,616	3,794	6.3x	6.4x	4.5x	4.3x	14.6%	18.6%	5.3%	5.2%	0.8x	0.7x	55.1%	6.4%	13.4%	2.3x	2.0x	
Svenska Cellulosa SCA AB ^a	NA	SEK	NA	161.6	12,475	13,441	27.7x	35.7x	17.8x	NM	1.5%	1.8%	1.6%	1.8%	1.4x	1.4x	43.8%	21.4%	5.2%	1.3x	1.6x	
Smurfit Kappa Group PLC ^c	EW	GBP	4,200.0	4,072.0	12,716	15,926	15.9x	16.0x	8.3x	8.1x	1.8%	3.2%	2.0%	2.2%	2.7x	2.5x	53.1%	8.2%	18.9%	1.6x	1.4x	
Stora Enso Oyj ^a	EW	EUR	12.5	16.7	13,140	16,117	12.3x	18.4x	7.2x	9.0x	8.1%	5.1%	4.1%	2.7%	1.3x	1.3x	69.1%	6.5%	11.1%	1.0x	1.2x	
UPM-Kymmene Oyj ^a	EW	EUR	36.0	34.1	18,171	17,188	16.3x	16.2x	9.3x	8.7x	3.7%	6.4%	3.8%	3.6%	1.8x	1.7x	54.4%	8.8%	11.3%	1.1x	0.8x	
Weighted Average					112,023	135,882	14.3x	15.8x	8.3x	7.3x	4.1%	4.7%	3.3%	3.3%	1.9x	1.7x	60.0%	10.3%	15.0%	1.4x	1.3x	
Pulp																						
Suzano Papel e Celulose	OW	BRL	65.0	59.5	14,494	25,141	15.2x	10.1x	5.3x	5.7x	7.2%	7.0%	1.6%	2.4%	5.1x	3.7x	45.0%	32.5%	44.5%	2.3x	2.4x	
Kalbar SA	OW	BRL	31.0	25.0	4,931	9,227	8.5x	8.2x	6.6x	6.1x	-0.2%	6.4%	5.7%	6.2%	5.1x	4.1x	44.3%	22.8%	NM	3.1x	2.8x	
Empresas CMPC SA	OW	CLP	1,963	1,405	4,244	7,290	9.3x	11.9x	4.5x	4.8x	7.2%	16.6%	4.3%	3.4%	0.5x	0.5x	51.7%	12.7%	5.9%	1.9x	1.8x	
Weighted Average					23,599	41,657	12.7x	10.1x	5.5x	5.7x	5.7%	8.6%	3.0%	3.4%	4.2x	3.2x	46.1%	26.9%	35.7%	2.4x	2.4x	

Source: Morgan Stanley Research estimates (e), Thomson Reuters for non covered companies (*not covered by Morgan Stanley, ** Market cap based on total no. of group shares, *** provisions and pensions included in EV. ^ Fiscal year ending in June, ^^ Fiscal year ending in March, ^^ Fiscal year ending in September, ^^ Fiscal year ending in August, ^^ Fiscal year ending in April). Weighted Average for P/E, FCF Yield, Dividend Yield, P/B, ROE based on Market Cap. Weighted Average for EV/EBITDA, Net Debt/EBITDA based on EV. Share prices as of January 11, 2021. NA = Not applicable, NM = Not meaningful.

Valuation Tables – Mark to Market

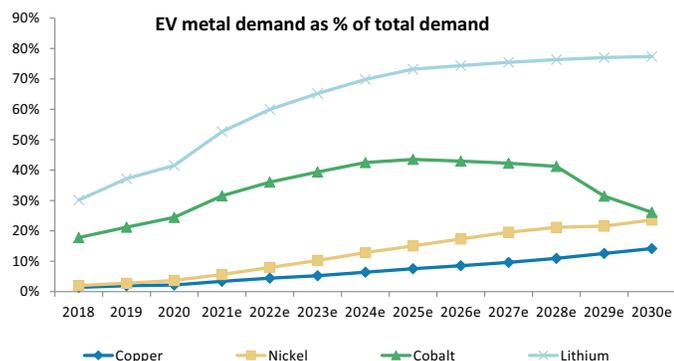
Exhibit 30: Mark-to-market valuation multiples and metrics for key mining companies

Global Stocks	Rating	FX	Price Target	Market cap (US\$m)	EV** (US\$m)	2022CY P/E	2023CY P/E	2022CY EV/EBITDA	2023CY EV/EBITDA	2022CY FCF Yield	2023CY FCF Yield	2022CY Dividend Yield	2023CY Dividend Yield	2022CY P/B	2023CY P/B	ROE 2022e ^{AA}	2022e Net Debt/EBITDA
North America																	
Alcoa Corp	OW	USD	66.0	11,876	15,588	7.1x	4.8x	3.3x	1.9x	13.8%	23.6%	13.8%	23.6%	1.8x	1.3x	29.8%	-0.28x
Freeport-McMoran	EW	USD	34.00	63,797	78,480	8.9x	11.6x	4.8x	4.7x	8.4%	11.9%	0.7%	0.7%	2.9x	2.4x	38.4%	-0.2x
Teck Resources	OW	USD	33.0	17,527	22,333	3.4x	3.8x	2.2x	1.8x	16.7%	31.4%	0.5%	0.5%	0.7x	0.6x	24.2%	0.5x
South America																	
Grupo Mexico	EW	USD	104.0	34,376	39,383	9.6x	10.9x	4.8x	5.0x	12.1%	11.2%	7.0%	5.5%	2.1x	2.0x	23.6%	0.1x
Southern Copper Corp.	EW	USD	55.0	51,032	53,915	16.8x	15.6x	8.3x	7.7x	6.0%	8.0%	5.9%	5.4%	6.0x	5.6x	35.7%	0.6x
Vale	OW	USD	16.5	74,553	77,769	4.6x	4.3x	2.9x	2.9x	15.4%	20.6%	13.8%	16.9%	1.7x	1.7x	40.2%	0.1x
CSN Mineracao	OW	BRL	8	6,953	6,976	9.0x	8.7x	4.3x	3.9x	-3.6%	3.2%	8.4%	11.1%	2.3x	2.3x	25.3%	-0.2x
China																	
Chalco	OW	HKD	6.60	14,794	27,621	8.5x	5.0x	6.5x	4.0x	25.6%	33.2%	0.0%	0.0%	1.2x	1.0x	14.4%	1.4x
Jiangxi Copper	OW	HKD	17.30	9,555	10,776	8.3x	7.0x	5.1x	4.2x	18.5%	17.9%	1.7%	2.0%	0.8x	0.7x	9.5%	1.7x
Zhaojin	EW	HKD	7.12	2,617	4,937	9.9x	7.3x	8.4x	6.7x	15.4%	15.2%	1.6%	2.1%	1.0x	0.9x	4.6%	3.9x
Zijin	OW	HKD	15.12	35,879	48,893	10.2x	8.8x	6.6x	5.4x	5.3%	10.5%	4.4%	5.1%	2.6x	2.2x	25.9%	1.0x
Russia																	
AK Alrosa	UW	RUB	110.0	11,740	12,931	11.2x	9.8x	7.9x	7.1x	9.0%	10.5%	8.5%	10.0%	5.4x	5.4x	47.9%	0.6x
Norilsk Nickel	EW	USD	31.0	50,714	56,457	5.9x	5.5x	4.9x	4.5x	11.3%	12.8%	11.3%	12.8%	6.6x	4.5x	111.9%	0.7x
Polymetal	OW	GBP	1,650	7,921	9,123	6.1x	5.7x	4.8x	4.4x	11.6%	12.8%	11.6%	12.8%	2.5x	2.2x	40.9%	0.6x
Polyus Gold	EW	USD	100.0	22,208	13,634	8.3x	7.6x	6.5x	5.8x	6.8%	8.5%	4.9%	5.4%	4.3x	3.2x	51.5%	0.4x
Europe																	
Anglo American	EW	GBP	2,870	53,816	59,770	6.0x	5.0x	3.9x	3.3x	9.9%	15.0%	6.8%	8.0%	1.5x	1.2x	25.2%	0.2x
Antofagasta	UW	GBP	1,300	17,973	27,489	13.5x	10.6x	5.3x	4.3x	2.9%	4.0%	4.8%	6.1%	2.0x	1.9x	15.2%	Cash
BHP Billiton ^A	++	GBP	++	156,528	181,939	6.7x	6.1x	4.3x	3.7x	13.2%	16.7%	9.1%	9.6%	3.2x	2.6x	47.0%	0.1x
Centamin	EW	GBP	100	1,431	1,182	10.9x	8.9x	3.1x	2.7x	5.1%	8.7%	4.9%	8.2%	1.0x	1.0x	9.4%	Cash
Glencore	OW	GBP	448	68,934	103,137	4.6x	4.0x	3.5x	3.2x	21.6%	26.5%	23.4%	26.7%	1.3x	1.3x	28.4%	0.7x
Lundin Mining	++	SEK	++	5,847	6,951	5.5x	4.8x	3.2x	2.4x	11.7%	19.2%	4.7%	7.7%	1.1x	1.0x	20.2%	Cash
Norsk Hydro	OW	NOK	86	16,366	19,496	6.5x	6.1x	3.8x	3.4x	9.4%	14.4%	7.7%	8.2%	1.5x	1.4x	23.7%	Cash
Rio Tinto	OW	GBP	5,220.0	117,282	142,772	5.5x	4.9x	3.9x	3.5x	14.9%	16.4%	16.5%	17.1%	2.0x	1.8x	35.6%	Cash

Source: Morgan Stanley Research estimates. ++ Stock Rating, Price Target, or Estimates for this company have been removed from consideration in this report because, under applicable law and/or Morgan Stanley policy, Morgan Stanley may be precluded from issuing such information with respect to this company at this time. ** Provisions and pensions included in Enterprise Value calculation. ^A Fiscal year ending in June. ^{AA} RoE calculated using year end book value. NM = Not meaningful. Companies valuation multiples and metrics are as of 11 January 2022.

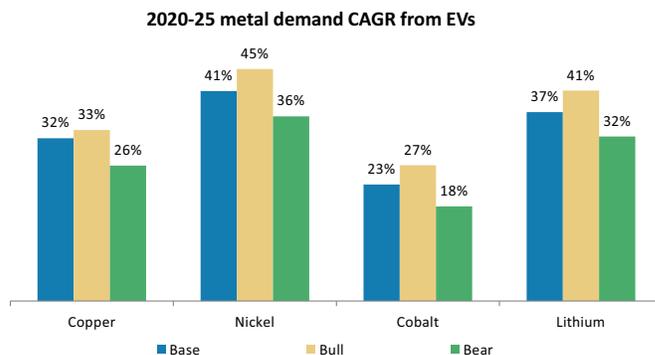
Raw materials, electric vehicles, and electrification

Exhibit 31: EV raw material demand as percentage of total global demand



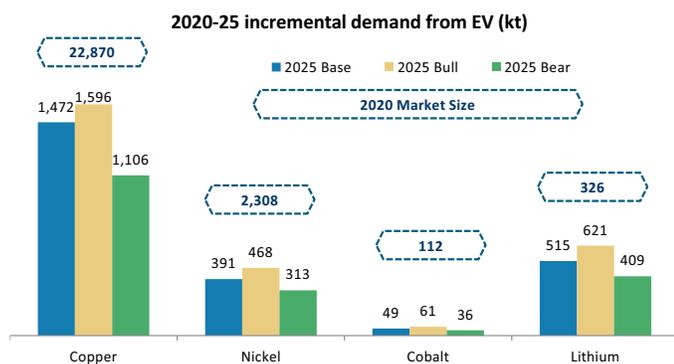
Source: Company data, Morgan Stanley Research estimates (e)

Exhibit 32: Metal demand growth rates under different scenarios



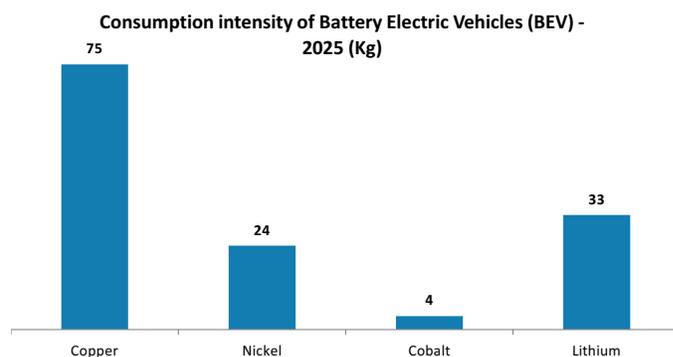
Source: Morgan Stanley Research estimates

Exhibit 33: Absolute EV raw material demand increase relative to total market size



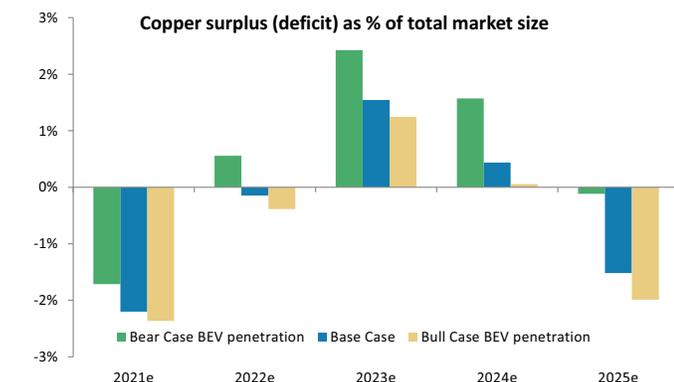
Source: Morgan Stanley Research estimates

Exhibit 34: Metal consumption intensity for battery electric vehicles (BEVs)



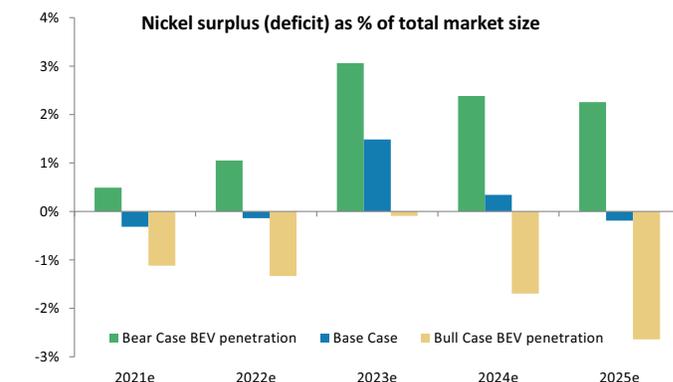
Source: Morgan Stanley Research estimates

Exhibit 35: Copper market deficit scenarios based on different EV penetration rates



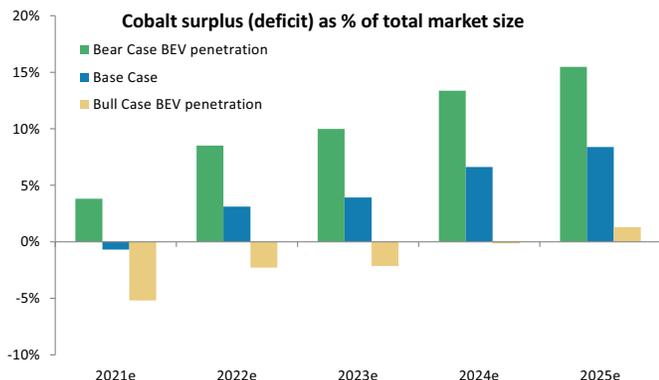
Source: Morgan Stanley Research estimates

Exhibit 36: Nickel market deficit scenarios based on different EV penetration rates



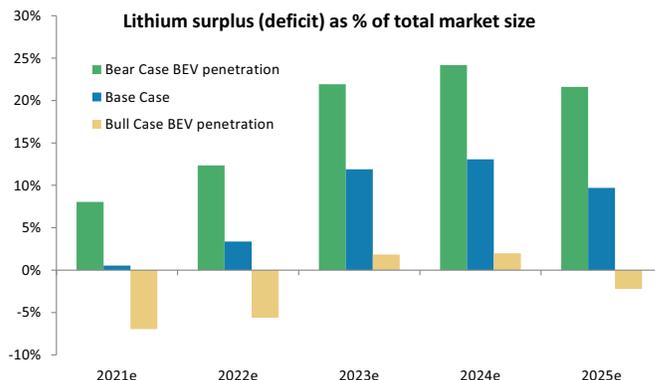
Source: Morgan Stanley Research estimates

Exhibit 37: Cobalt market deficit scenarios based on different EV penetration rates



Source: Morgan Stanley Research estimates

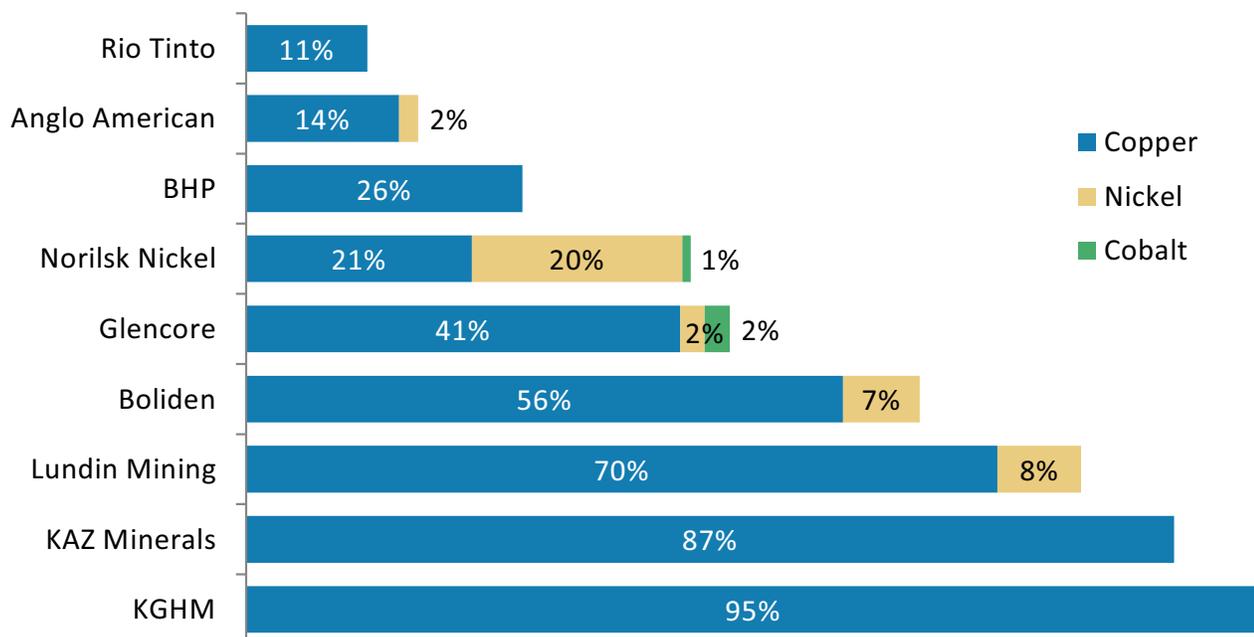
Exhibit 38: Lithium market deficit scenarios based on different EV penetration rates



Source: Morgan Stanley Research estimates

Exhibit 39: Revenue exposure to electric vehicle/electrification raw materials

2021e Revenue exposure to "EV metals"



Source: Morgan Stanley Research estimates

Exhibit 40: Impact of "electrification" on metal demand

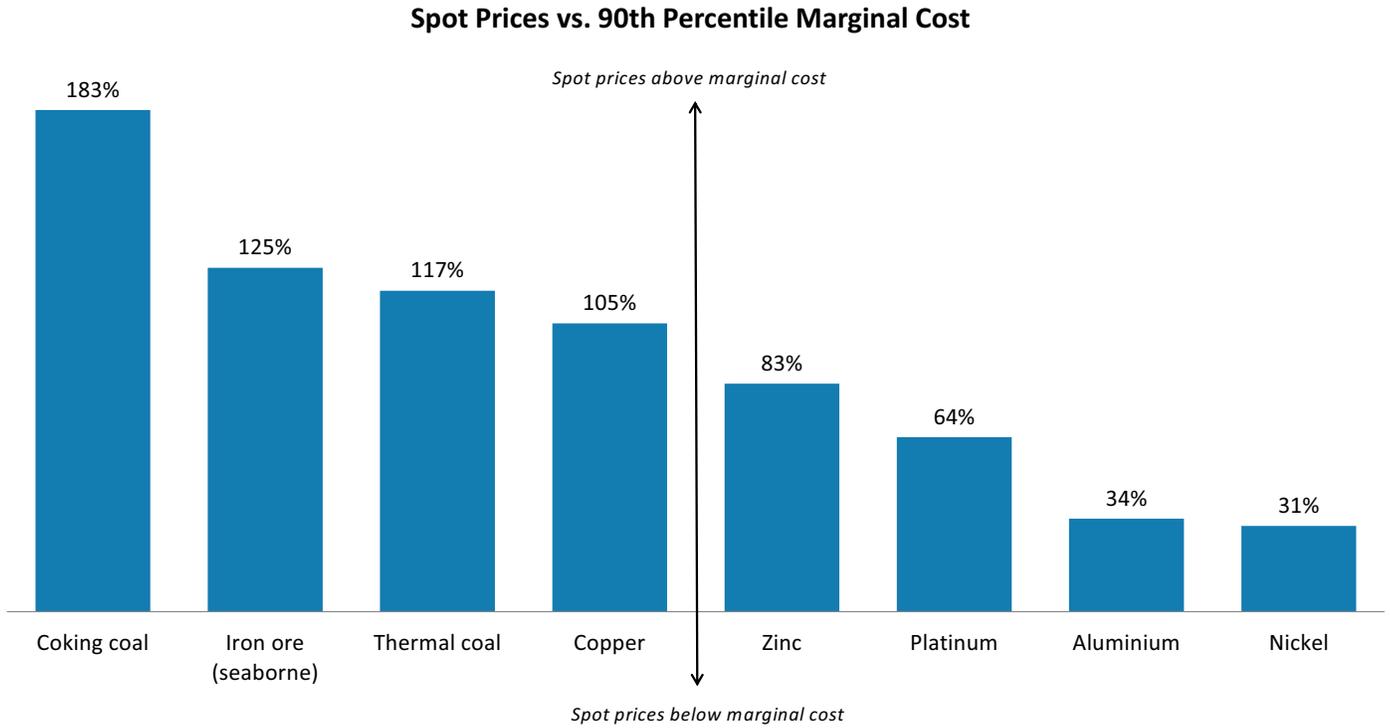


kt	2020		2025			
	Global demand	Generation & grid infrastructure*	Grid storage*	Charging infrastructure*	e-vehicles**	Total demand from electrification
Copper	22,870	170	86	115	1,968	2,339
Nickel	2,308		71		476	547
Cobalt	112		26		76	102

Source: Copper Development Association, Glencore, Morgan Stanley Research

Spot Commodity Prices vs. Marginal Costs

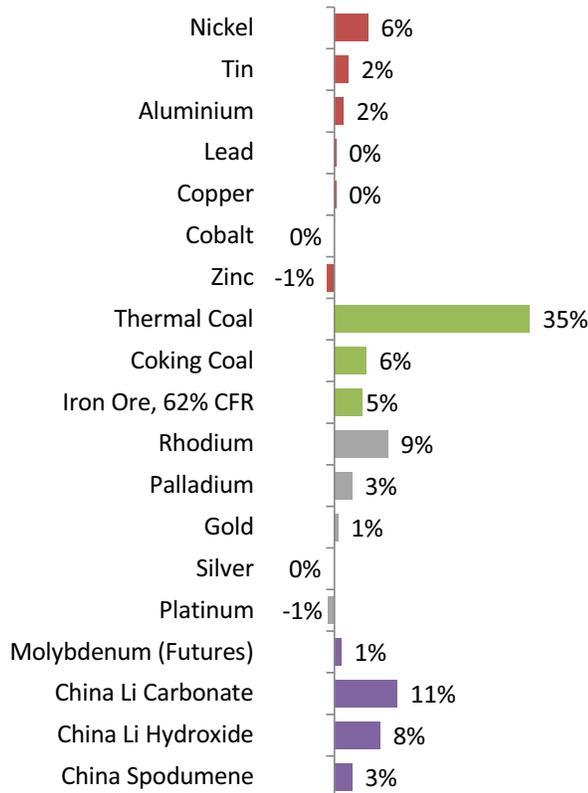
Exhibit 41: Spot commodity prices vs. the marginal cost of production



Source: Wood Mackenzie, Bloomberg, Morgan Stanley Research. Note: Marginal cost – year 2021; dataset Q4 2021; for coal, the dataset is as of Nov 2021; C1 cash costs for zinc, copper and aluminium. Total cash cost for iron ore, coking and thermal coal

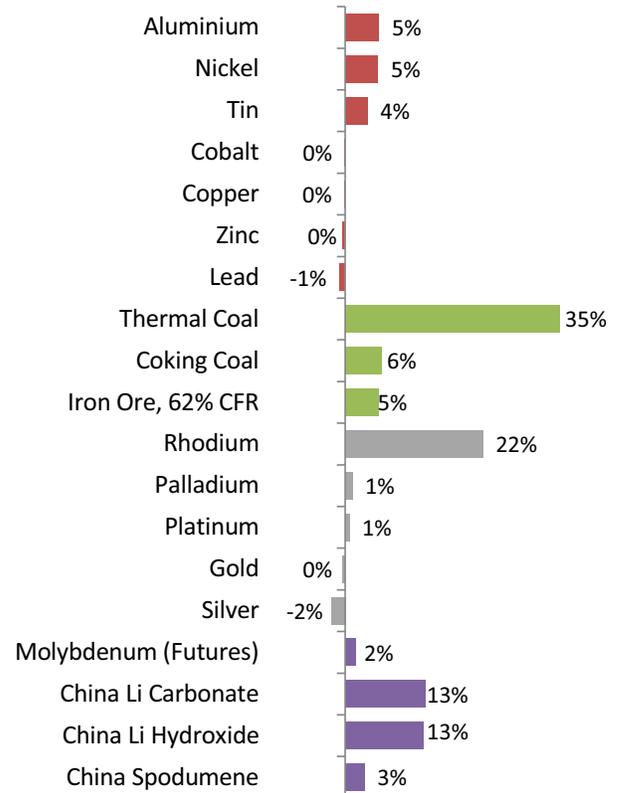
Commodity Price Snapshot

Exhibit 42: Key metals: 1-week absolute performance



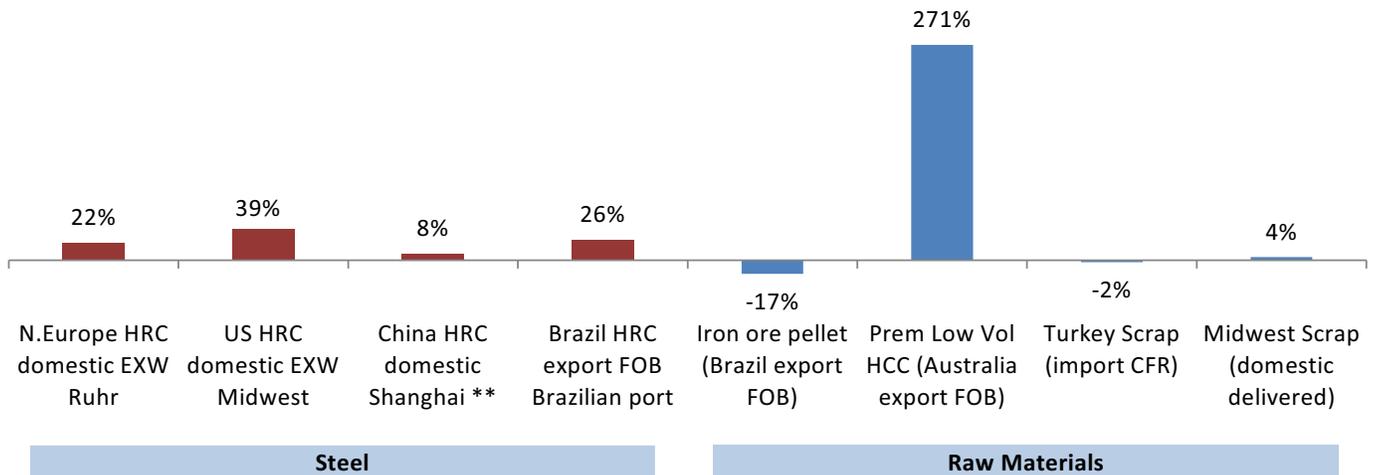
Source: Bloomberg, Morgan Stanley Research. Price as on 11 Jan 2022

Exhibit 43: Key metals: year-to-date absolute performance



Source: Bloomberg, Morgan Stanley Research. Price as on 11 Jan 2022

Exhibit 44: Key steel indicators: LTM absolute performance



Source: Morgan Stanley Research. Price as on 10 Jan 2022. ** VAT inclusive

Exhibit 45: Base metals: price snapshot

Base Metals	11-Jan-22	05-Jan-22	WoW Change (%)
Copper	4.42	4.40	0.3%
Aluminium	1.34	1.32	1.6%
Zinc	1.62	1.64	-1.3%
Nickel	9.97	9.41	5.9%
Lead	1.05	1.05	0.3%
Tin	18.51	18.06	2.5%
Cobalt	31.83	31.83	0.0%

Source: Bloomberg, Morgan Stanley Research. WoW = Week on week

Exhibit 46: Bulks: price snapshot

Bulks	11-Jan-22	05-Jan-22	WoW Change (%)
Iron Ore, 62% CFR	125.5	119.5	5.0%
Thermal Coal	125.8	93.5	34.6%
Coking Coal	379.0	358.8	5.6%

Source: Bloomberg, Morgan Stanley Research. WoW = Week on week.

Exhibit 47: Precious metals & PGMs: price snapshot

Precious Metals and PGMs	11-Jan-22	05-Jan-22	WoW Change (%)
Gold	1,822	1,810	0.6%
Silver	22.78	22.81	-0.1%
Platinum	975	986	-1.1%
Palladium	1,927	1,869	3.1%
Rhodium	17,300	15,800	9.5%

Source: Bloomberg, Morgan Stanley Research. WoW = Week on week

Exhibit 48: Other metals: price snapshot

Other	11-Jan-22	05-Jan-22	WoW Change (%)
Molybdenum, LME Cash (US\$/lb)	19.0	18.8	1.2%
Uranium UxC-Ux U308 Spot (US\$/lb)	43.1	43.1	0.0%
China Lithium Carbonate 99.5% Ex-VAT (US\$/t)	42,535.4	38,268.1	11.2%
China Lithium Hydroxide 56.5% Ex-VAT (US\$/t)	31,850.8	29,463.1	8.1%
China Spodumene 5% min CIF Ex-VAT (US\$/t)	2,275.9	2,206.9	3.1%

Source: Bloomberg, Morgan Stanley Research. WoW = Week on week

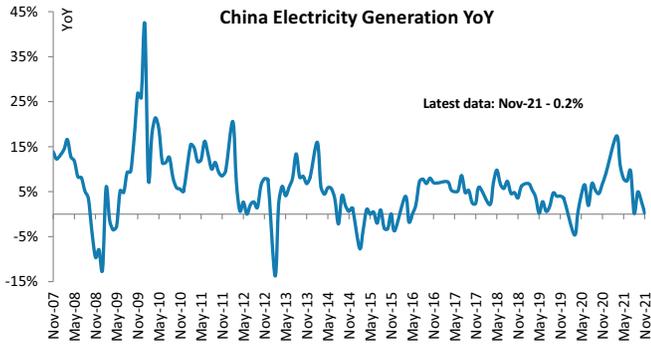
Exhibit 49: Exchange rate snapshot of major metal producing countries

FX Rates of Key Commodity Countries	11-Jan-22	05-Jan-22	WoW Change (%)
1 AUD = USD (Australian \$)	0.72	0.72	-0.2%
1 EUR = USD (Euro)	1.14	1.13	0.5%
1 USD = BRL (Brazilian Real)	5.57	5.72	-2.5%
1 USD = CAD (Canadian \$)	1.26	1.28	-1.4%
1 USD = CLP (Chilean Peso)	829	838	-1.0%
1 USD = CNY (Chinese Renmimbi)	6.37	6.36	0.2%
1 USD = KZT (Kazakh Tenge)	435	436	-0.2%
1 USD = MXN (Mexican Peso)	20.38	20.57	-0.9%
1 USD = NOK (Norwegian Krone)	8.80	8.85	-0.6%
1 USD = PEN (Peruvian New Sol)	3.91	3.96	-1.4%
1 USD = SEK (Swedish Krona)	9.04	9.11	-0.8%
1 USD = ZAR (S. African Rand)	15.53	15.90	-2.4%
1 USD = ZMW (Zambian Kwacha)	16.97	16.78	1.1%

Source: Bloomberg, Morgan Stanley Research. WoW = Week on week

China Macro Indicators

Exhibit 50: China electricity generation



Source: CEIC, Morgan Stanley Research

Exhibit 51: China Purchasing Managers Index and Industrial Production (IP)



Source: CEIC, Morgan Stanley Research

Exhibit 52: China M1 and M2 money supply



Source: CEIC, Morgan Stanley Research

Exhibit 53: China machinery sales



Source: CEIC, Morgan Stanley Research

Exhibit 54: China fixed asset investments (FAI)



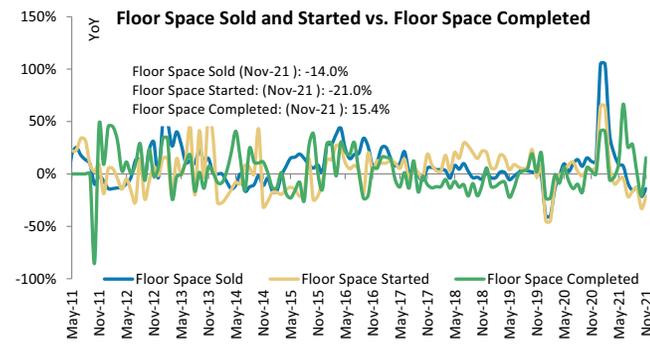
Source: CEIC, Morgan Stanley Research

Exhibit 55: China land sales



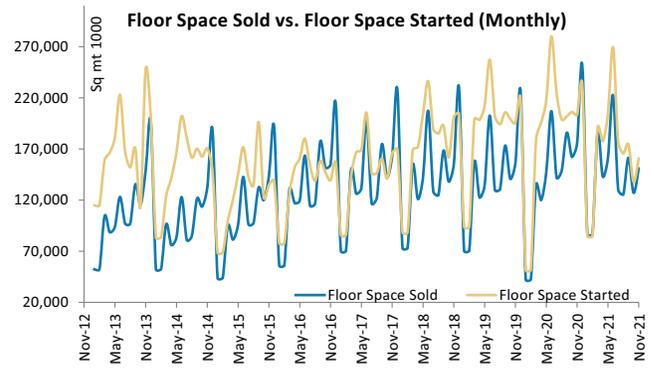
Source: CEIC, Morgan Stanley Research

Exhibit 56: China floor space sold and started vs floor space completed (monthly YoY)



Source: CEIC, Morgan Stanley Research

Exhibit 57: China floor space sold vs floor space started (monthly)



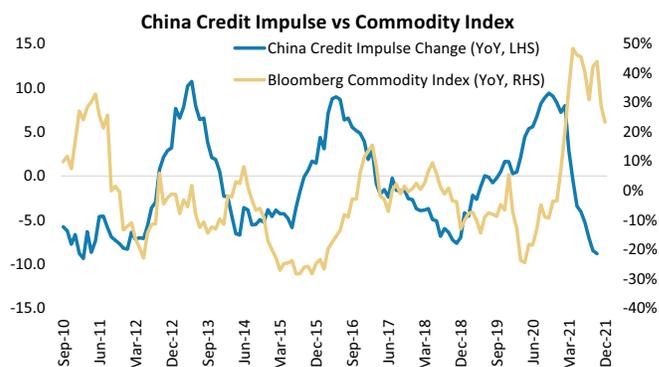
Source: CEIC, Morgan Stanley Research

Exhibit 58: China national average property realization growth



* Building sold value/Floor space volume sold (RMB/sq mt)
Source: CEIC, Morgan Stanley Research

Exhibit 59: China Credit Impulse vs Commodity Index



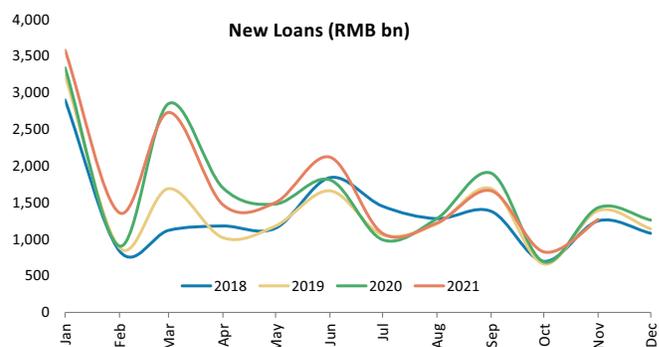
Source: Bloomberg

Exhibit 60: China 7-day repo rate



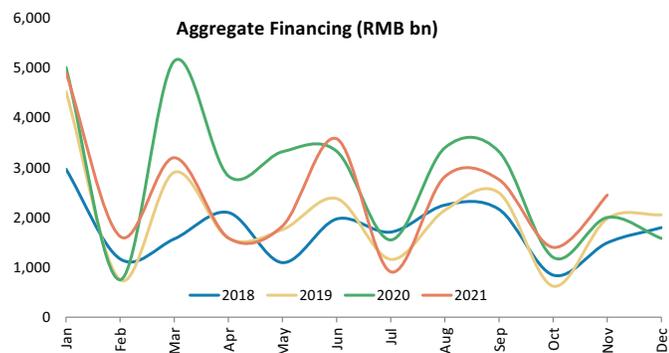
Source: Datastream

Exhibit 61: New loans (RMB bn)



Source: CEIC

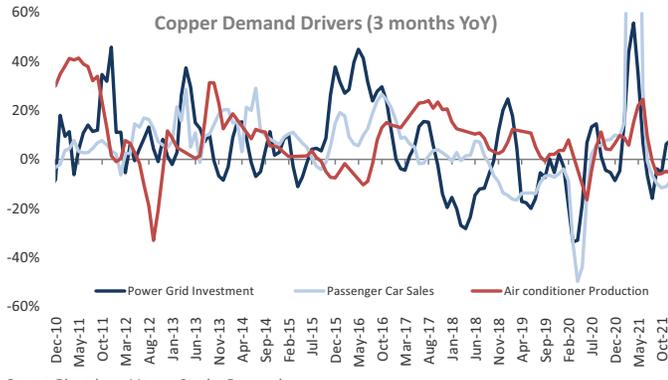
Exhibit 62: Aggregate financing (RMB bn)



Source: CEIC

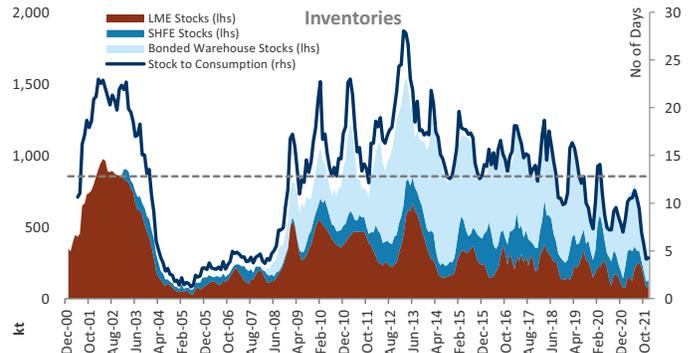
Copper

Exhibit 63: Grid investments, car sales, and air conditioner sales



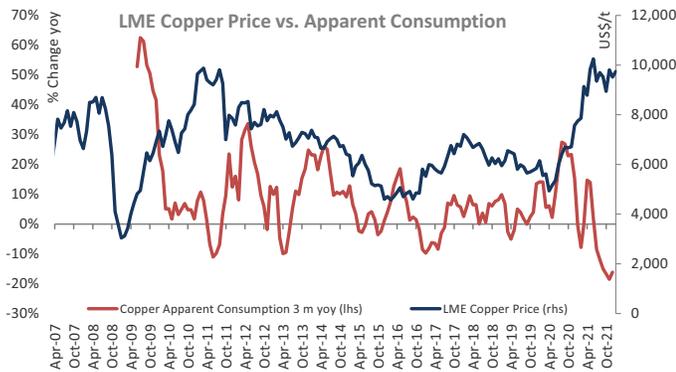
Source: Bloomberg, Morgan Stanley Research

Exhibit 64: Exchange and bonded warehouse stocks vs. days of consumption



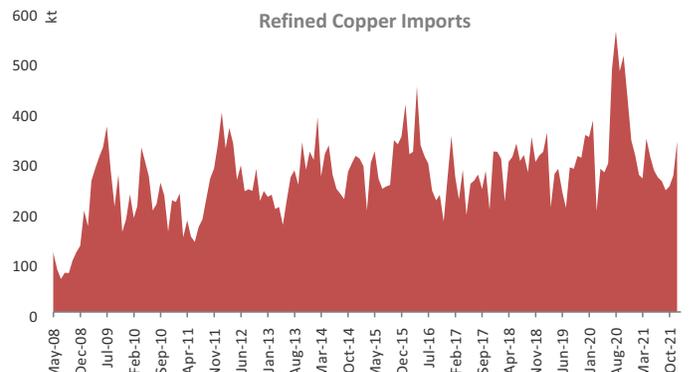
Source: Bloomberg, ICSG, Morgan Stanley Research

Exhibit 65: China's copper price vs. apparent consumption



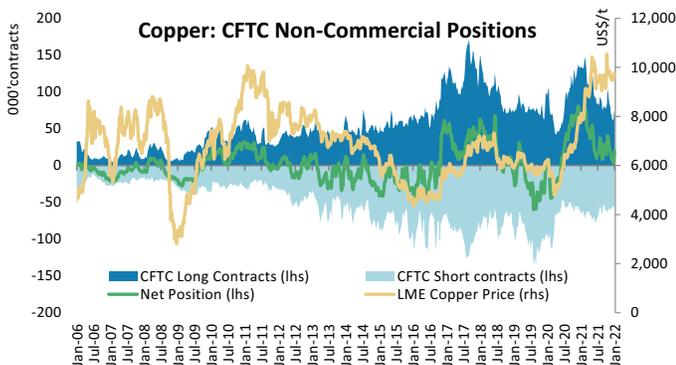
Source: Bloomberg, Morgan Stanley Research, *Apparent Consumption is calculated as refined production less net exports and change in SHFE stocks.

Exhibit 66: China refined copper imports



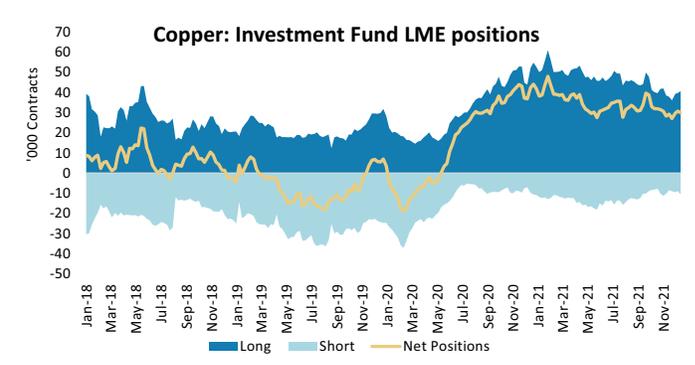
Source: Bloomberg, Morgan Stanley Research

Exhibit 67: CFTC speculative net length



Source: Bloomberg, CFTC, Morgan Stanley Research

Exhibit 68: LME speculative net length



Source: LME, Morgan Stanley Research

Exhibit 69: Raw materials: China's copper concentrate and scrap monthly imports

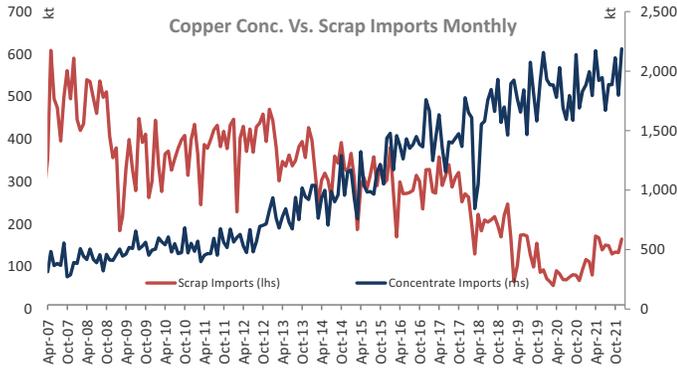


Exhibit 70: Physical demand: copper premia by region

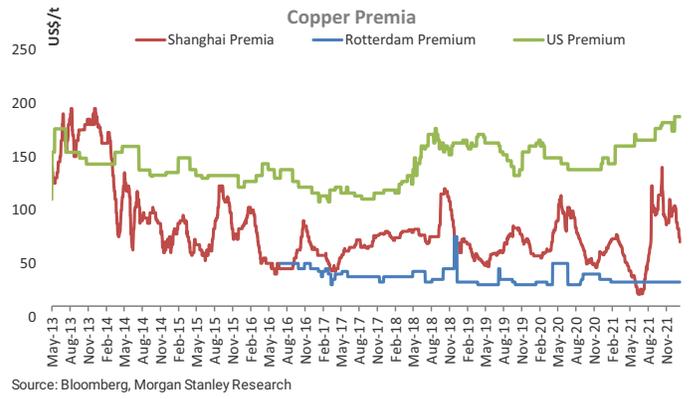


Exhibit 71: Price differentials: SHFE vs. LME

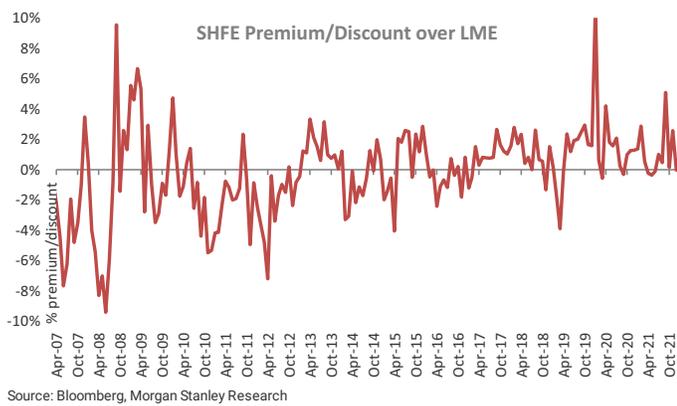


Exhibit 72: Copper treatment charges (TCs) vs. price

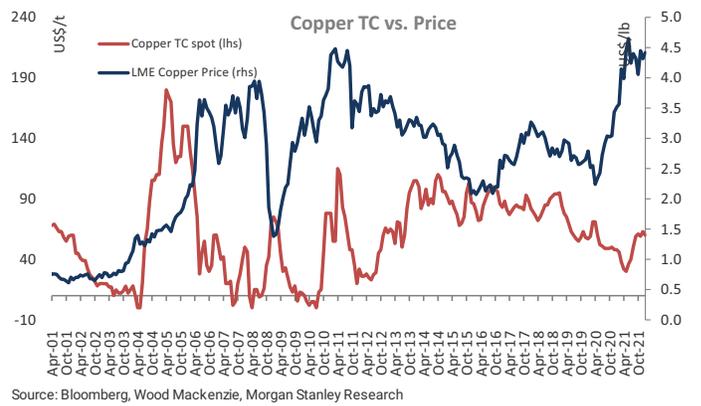


Exhibit 73: China grid investments (annualised) vs. government spending budget

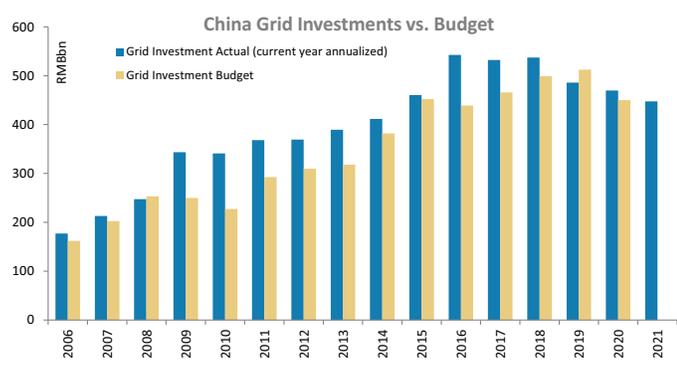


Exhibit 74: China total power consumption (% YoY) vs. household and industry consumption

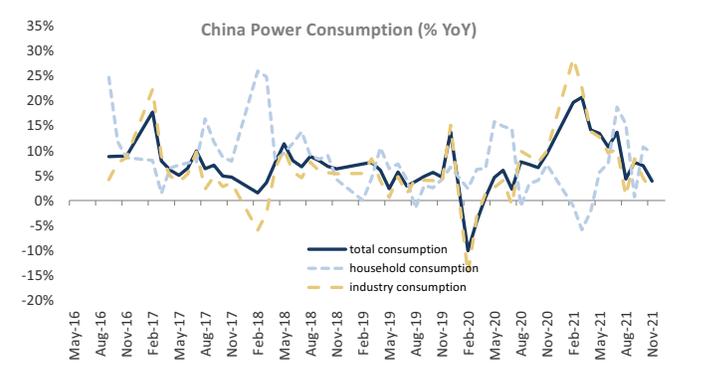
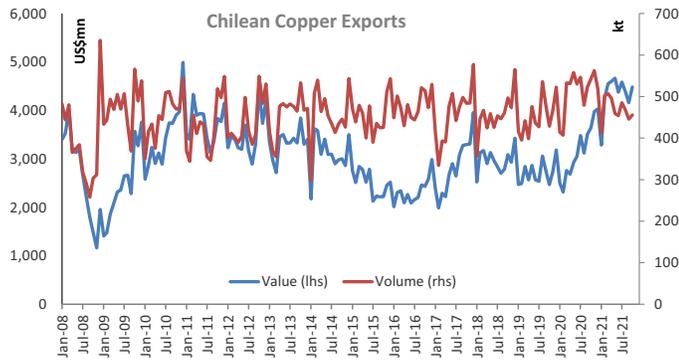
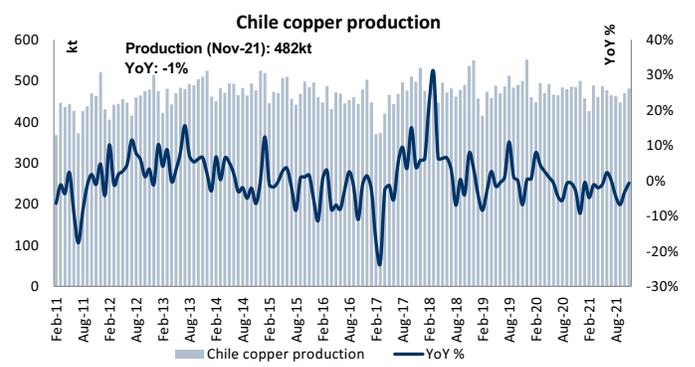


Exhibit 75: Chilean copper exports (monthly)



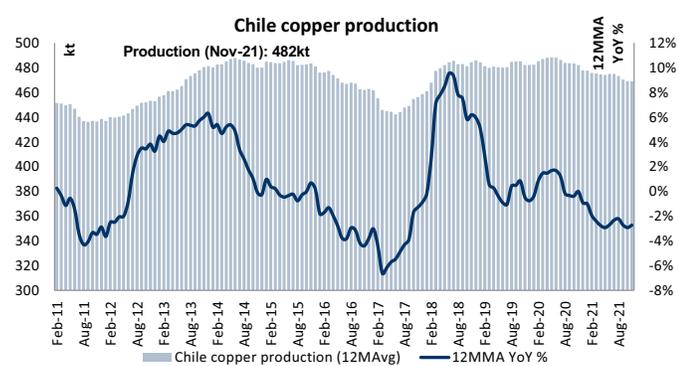
Source: Datastream, Morgan Stanley Research

Exhibit 76: Chile copper production



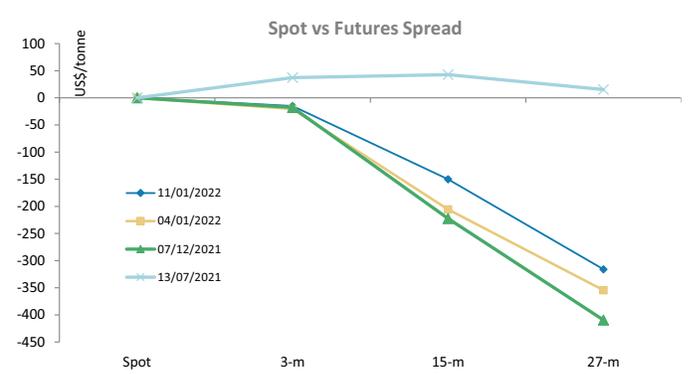
Source: Cochilco, Bloomberg, Morgan Stanley Research

Exhibit 77: Chile copper production – 12MMA



Source: Cochilco, Bloomberg, Morgan Stanley Research

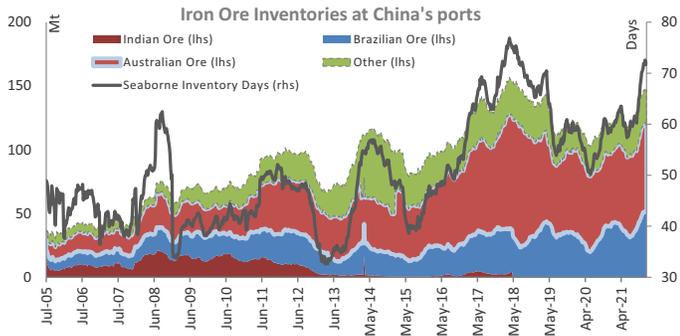
Exhibit 78: Contango vs. backwardation: copper futures curve movement



Source: Bloomberg, Morgan Stanley Research

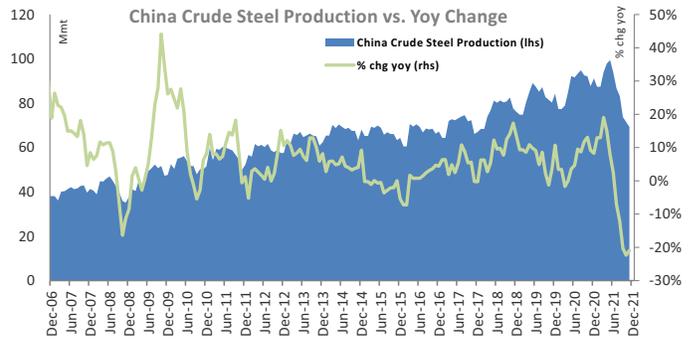
Iron Ore and Manganese

Exhibit 79: Iron ore inventories at Chinese sea ports and inventory days of consumption



Source: Mysteel, Morgan Stanley Research

Exhibit 80: China's crude steel production, absolute and YoY change



Source: NBS, Bloomberg, Morgan Stanley Research

Exhibit 81: China's iron ore prices vs. steel prices



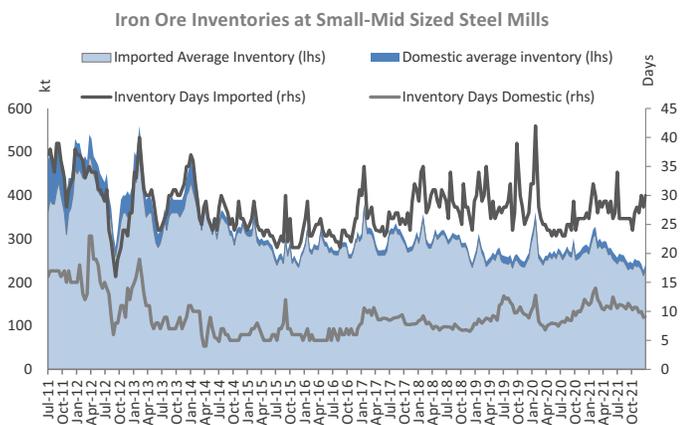
Source: Bloomberg, Morgan Stanley Research

Exhibit 82: Freight rates from key shipping regions to China



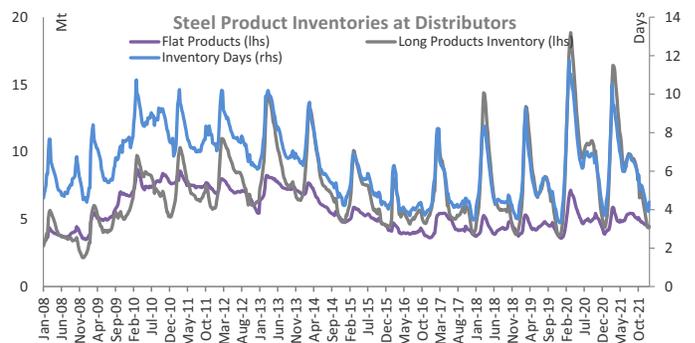
Source: Bloomberg, Morgan Stanley Research

Exhibit 83: China iron ore inventories at small and mid-sized steel mills



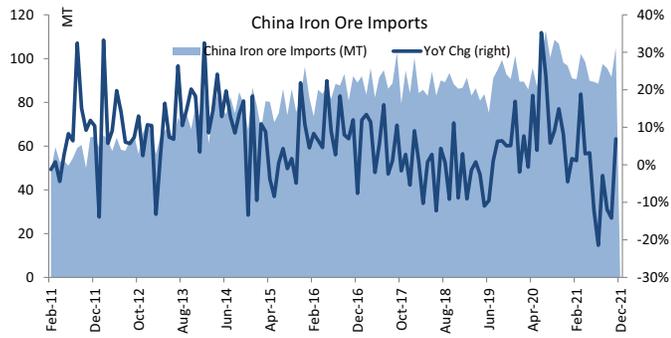
Source: Mysteel, Morgan Stanley Research

Exhibit 84: China steel product inventories at distributor level



Source: Mysteel, Bloomberg, Morgan Stanley Research

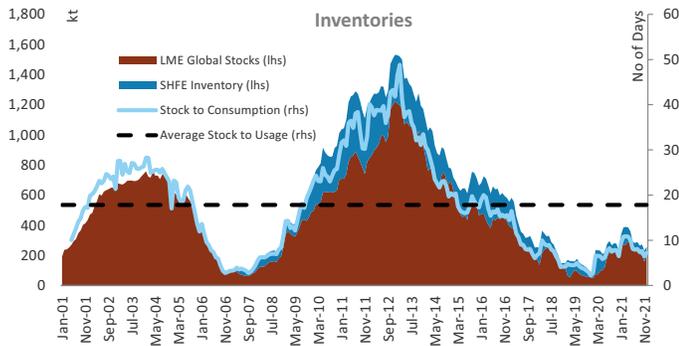
Exhibit 85: China iron ore imports



Source: Bloomberg, Morgan Stanley Research

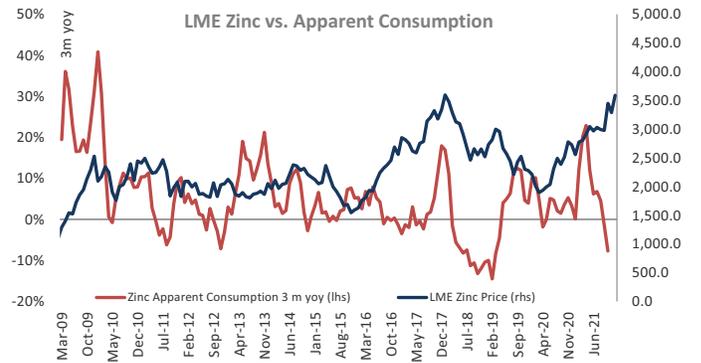
Zinc

Exhibit 86: Zinc exchange inventories and days of consumption



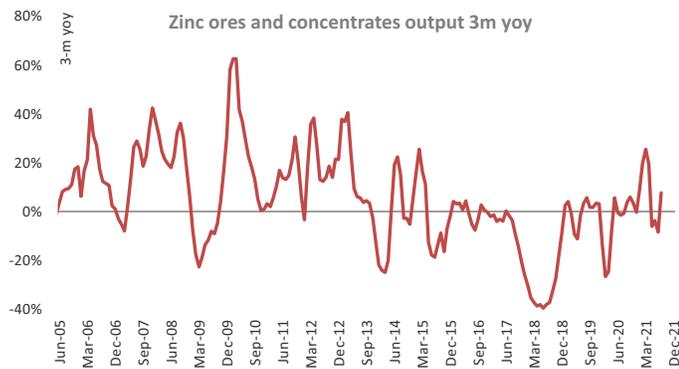
Source: Bloomberg, ILZSG, Morgan Stanley Research

Exhibit 87: China's apparent zinc consumption vs. LME price



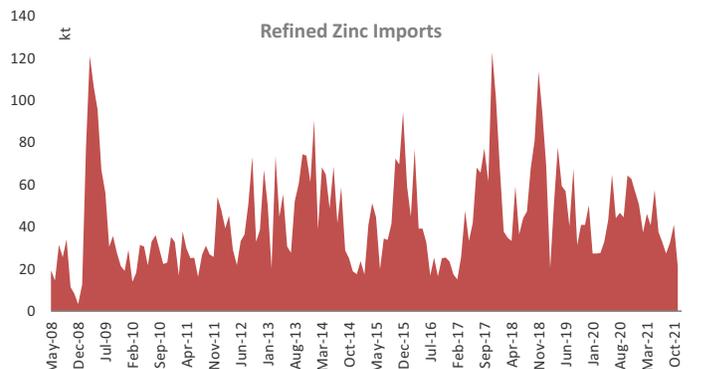
Source: Bloomberg, Morgan Stanley Research

Exhibit 88: Supply drivers: China's zinc ore and concentrate output



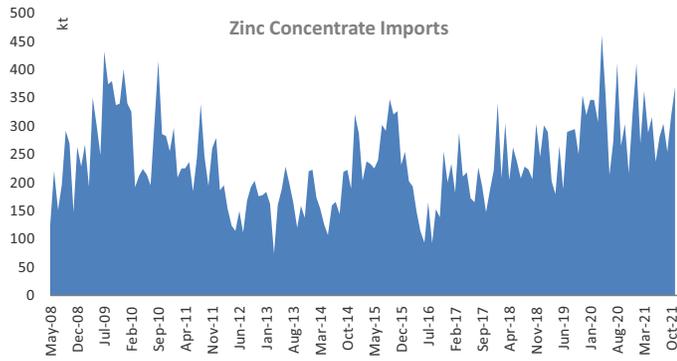
Source: Bloomberg, Morgan Stanley Research

Exhibit 89: Finished metal: China's refined zinc imports



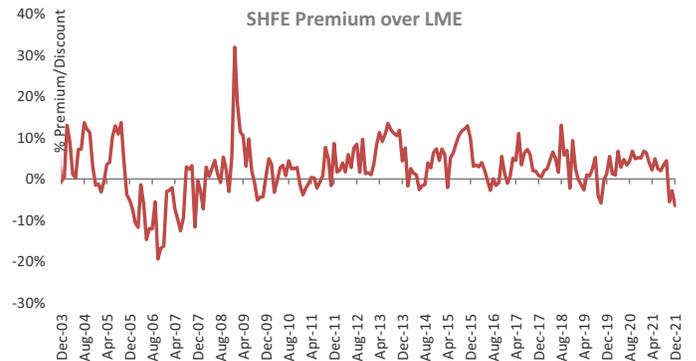
Source: Bloomberg, Morgan Stanley Research

Exhibit 90: Raw materials: China's zinc concentrate imports



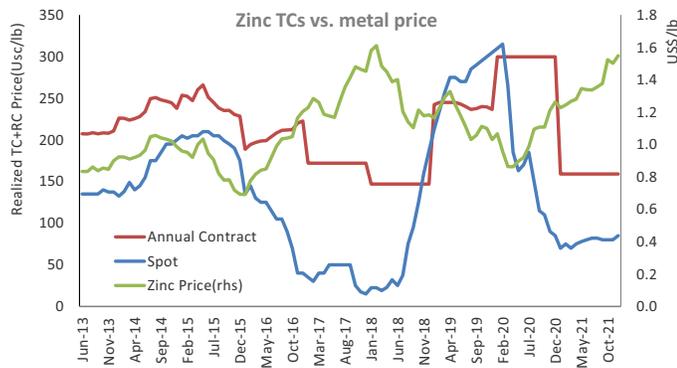
Source: Bloomberg, Morgan Stanley Research

Exhibit 91: Zinc price differentials: SHFE vs. LME



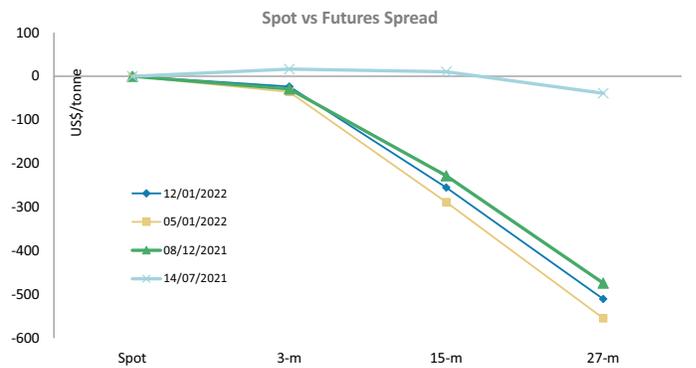
Source: Bloomberg, Morgan Stanley Research

Exhibit 92: Zinc TCs vs spot



Source: Bloomberg, Morgan Stanley Research

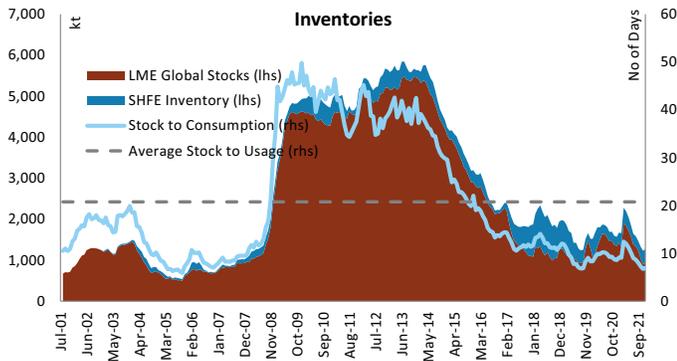
Exhibit 93: Contango vs. backwardation: zinc futures curve movement



Source: Bloomberg, Morgan Stanley Research

Aluminium

Exhibit 94: Aluminium exchange inventories and days of consumption



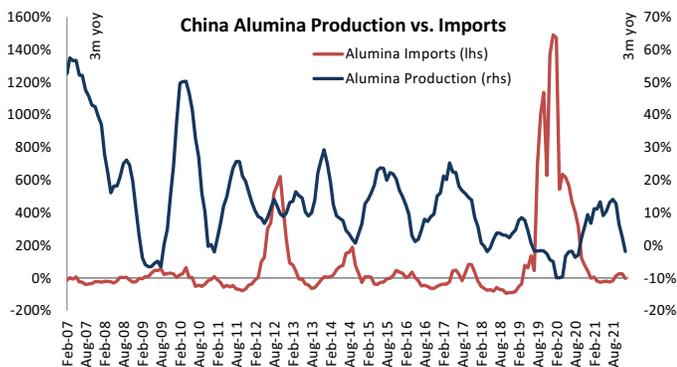
Source: Bloomberg, WBMS, Morgan Stanley Research

Exhibit 95: China's apparent aluminium consumption vs. LME price



Source: Bloomberg, Morgan Stanley Research

Exhibit 96: Raw materials: China's alumina production vs. imports



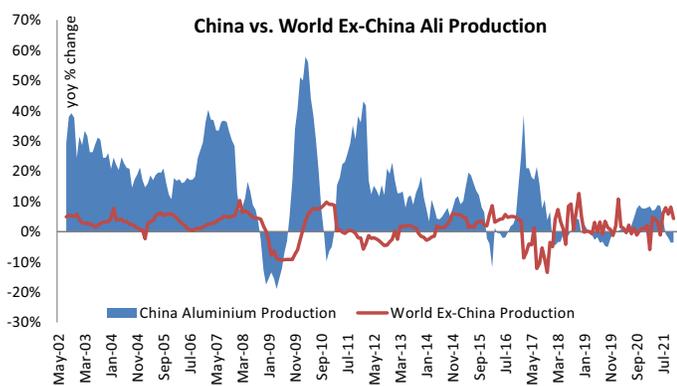
Source: Bloomberg, Morgan Stanley Research

Exhibit 97: Raw materials: spot alumina vs. China domestic price



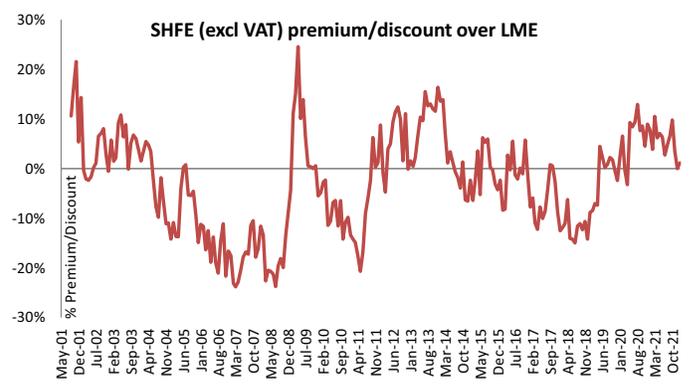
Source: Bloomberg, Morgan Stanley Research

Exhibit 98: Aluminium world production ex-China



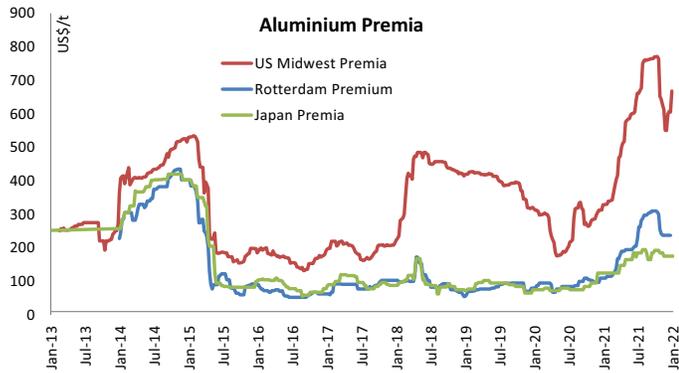
Source: Bloomberg, Morgan Stanley Research

Exhibit 99: Price differentials: SHFE vs. LME



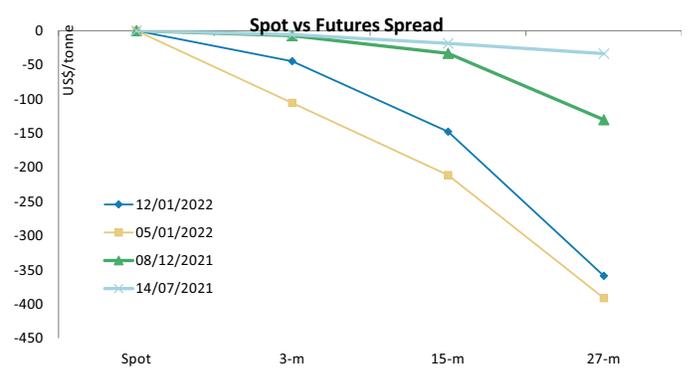
Source: Bloomberg, Morgan Stanley Research

Exhibit 100: Physical demand: aluminium premia by region



Source: Bloomberg, Morgan Stanley Research

Exhibit 101: Contango vs. backwardation: aluminium futures curve movement



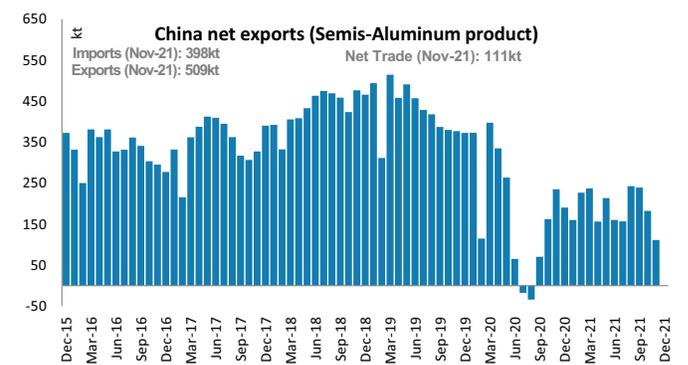
Source: Bloomberg, Morgan Stanley Research

Exhibit 102: China aluminium exports: breakdown by product type



Source: Bloomberg, Morgan Stanley Research, 2021 * YTD= Annualized figures

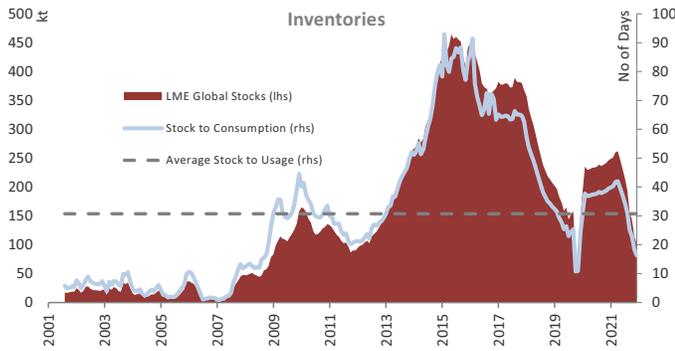
Exhibit 103: China aluminium net exports



Source: Bloomberg, Morgan Stanley Research

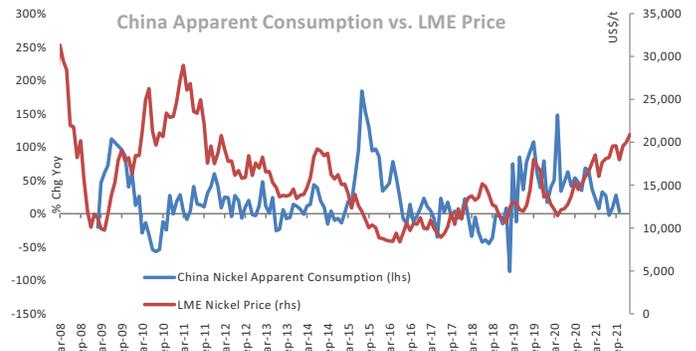
Nickel

Exhibit 104: Nickel exchange inventories and days of consumption



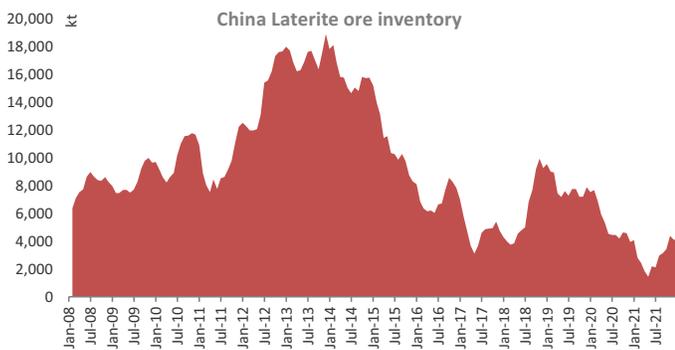
Source: Bloomberg, INSG, Morgan Stanley Research

Exhibit 105: China's apparent nickel consumption vs. LME price



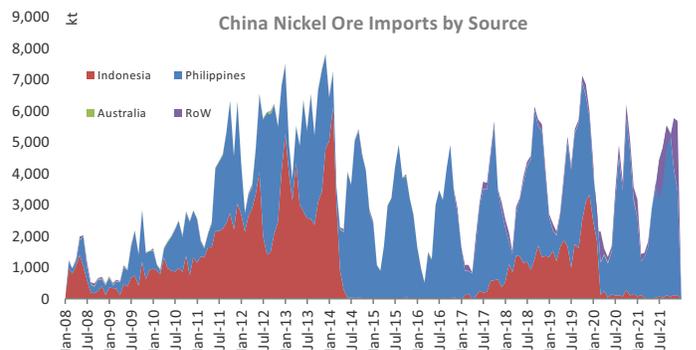
Source: Bloomberg, INSG, Morgan Stanley Research

Exhibit 106: Raw materials: nickel laterite ore inventories



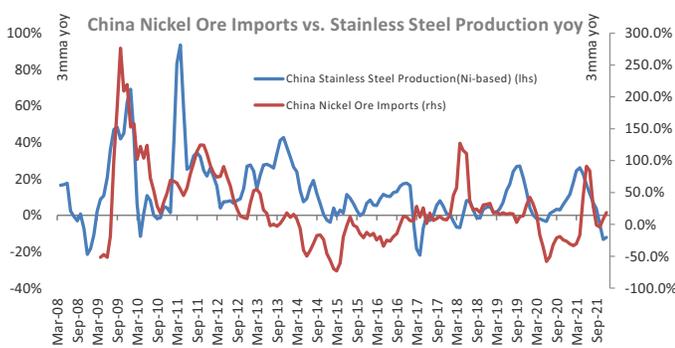
Source: Bloomberg, Morgan Stanley Research

Exhibit 107: Raw materials: China's ore imports by source



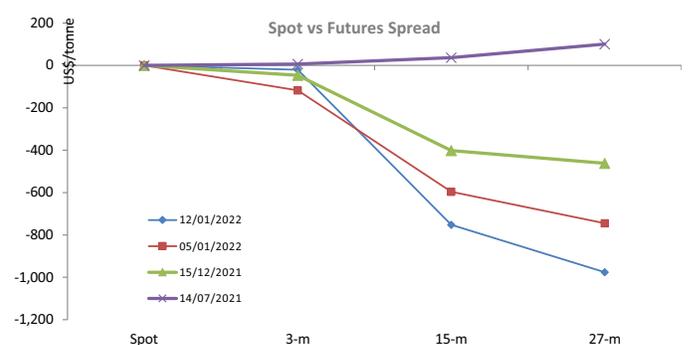
Source: Bloomberg, Morgan Stanley Research

Exhibit 108: China's nickel ore imports vs. stainless steel production



Source: Bloomberg, Morgan Stanley Research

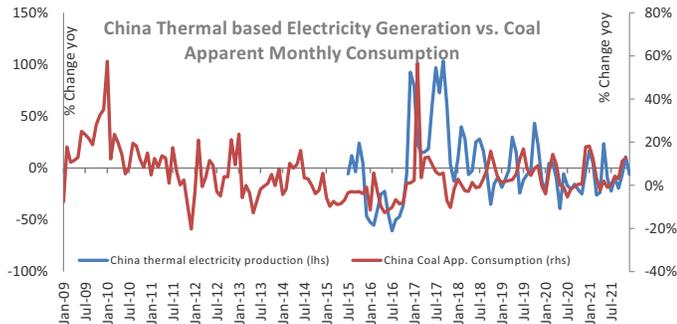
Exhibit 109: Contango vs. backwardation: nickel futures curve movement



Source: Bloomberg, Morgan Stanley Research

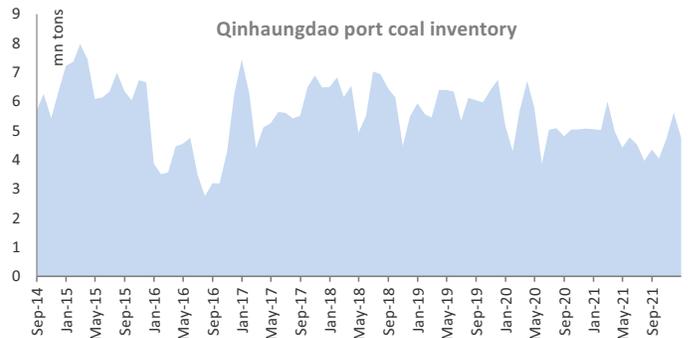
Coal

Exhibit 110: China's thermal-based power generation vs. coal apparent monthly consumption



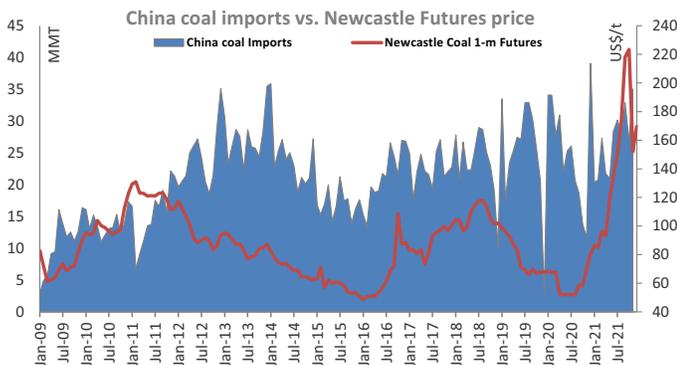
Source: NBS, Bloomberg, Morgan Stanley Research. Apparent Consumption is calculated as Domestic raw coal output less net coal exports

Exhibit 111: Inventories: Qinhuangdao port coal stocks



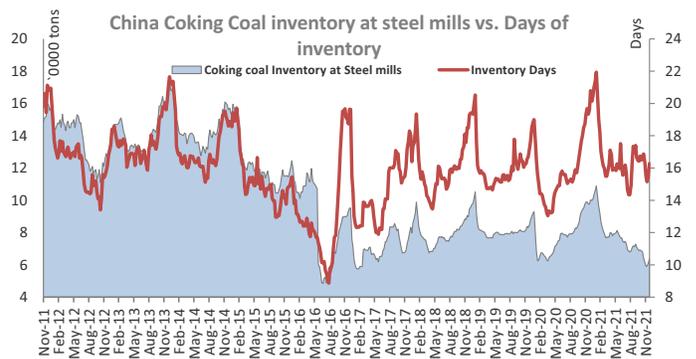
Source: Bloomberg, Morgan Stanley Research

Exhibit 112: China coal imports vs. prices



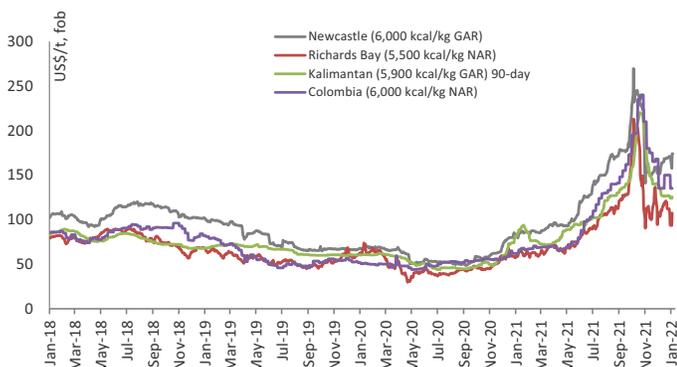
Source: Bloomberg, Morgan Stanley Research

Exhibit 113: Inventories: China's coking coal inventories at steel mills vs. days of consumption



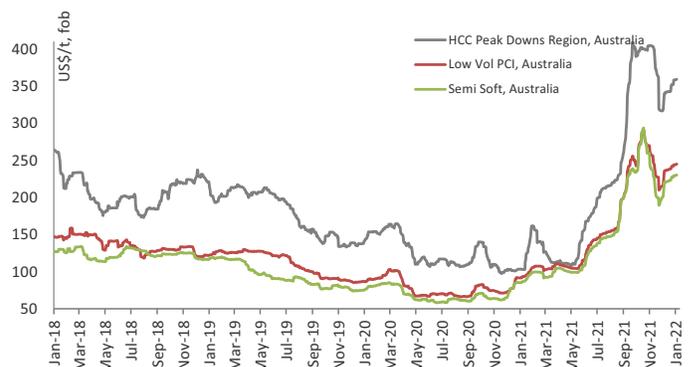
Source: Mysteel, Bloomberg, Morgan Stanley Research

Exhibit 114: Thermal coal prices (US\$/t fob)



Source: Morgan Stanley Research, IHS, Tex Report, Platt's

Exhibit 115: Metallurgical coal prices (US\$/t fob)

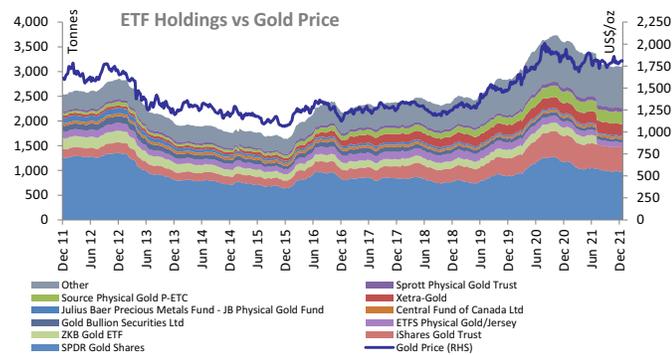


Source: Morgan Stanley Research, IHS, Tex Report, Platt's

Gold and Precious Metals

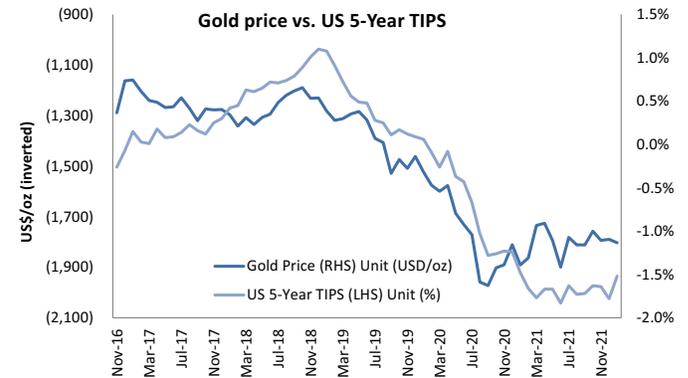
Gold

Exhibit 116: ETF gold holdings vs. gold price



Source: Bloomberg, Morgan Stanley Research (Other includes: ETFs Gold Trust, Central GoldTrust, Royal Canadian Mint - Canadian Gold Reserves, iShares Gold Bullion ETF, db Physical Gold ETC, UBS ETF CH-Gold CHF hedged CHF, db Physical Gold Euro Hedged ETC, Pictet CH Precious Metals Fund - Physical Gold, iShares Gold CH, iShares Gold CHF Hedged CH, db Physical Gold ETC EUR, ETFs Physical Swiss Gold, db Physical Gold SGD Hedged ETC, db Physical Gold CHF Hedged ETC, ETFs Physical Swiss Gold, EUWAX Gold, FinEx Gold ETF USD, iShares Physical Gold ETC, iShares Gold EUR Hedged CH, Raiffeisen ETF - Solid Gold Ounces - AC, Raiffeisen ETF - Solid Gold, RBS Physical Gold ETC, RBS Physical Gold ETC, UBS ETF CH-Gold EUR hedged EUR A-dis, UBS ETF CH-Gold USD, Reliance ETF Gold BeES, SBHETF Gold, Japan Physical Gold ETF, ValueGold ETF, NewGold Issuer Ltd, ETFs Metal Securities Australia Ltd - ETFs Physical Gold, Credit Suisse Institutional Fund II CH - Gold Fund, BMG Gold Bullion Fund, Spriott Gold Bullion Fund, Huanan Yifu Gold ETF, E Fund Gold Tradable Open-end Securities Investment Fund, HDFC Gold Exchange Traded Fund, Kotak Gold ETF, UTH-Gold Exchange Traded Fund)

Exhibit 117: Gold price vs. US 5-year TIPS



Source: Bloomberg, Morgan Stanley Research

Exhibit 118: Gold performance vs. volatility index vs. dollar index



Source: Bloomberg, Morgan Stanley Research

Exhibit 119: Gold imports: China vs. India



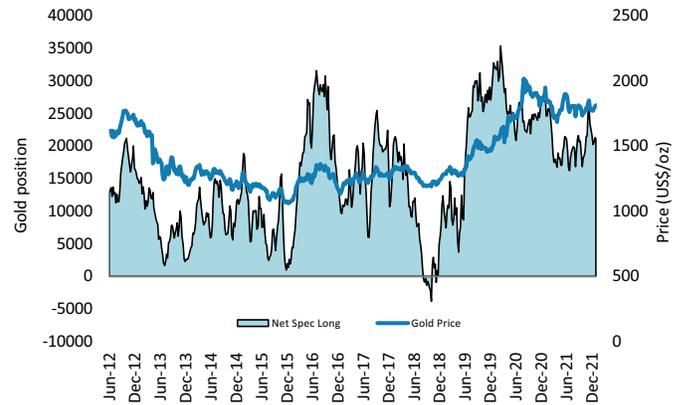
Source: Bloomberg, Morgan Stanley Research

Exhibit 120: Gold to silver ratio



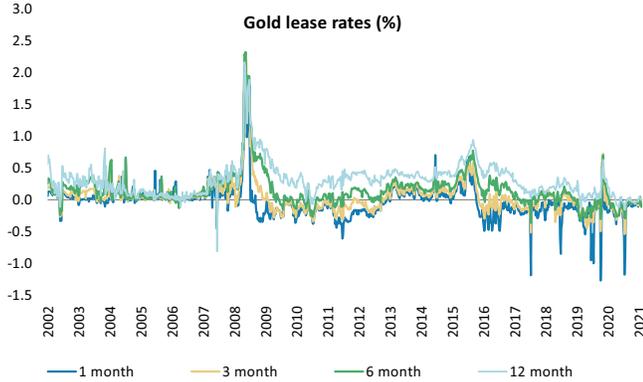
Source: Bloomberg, Morgan Stanley Research

Exhibit 121: Nymex positioning as per COTR



Source: COTR, Morgan Stanley Research

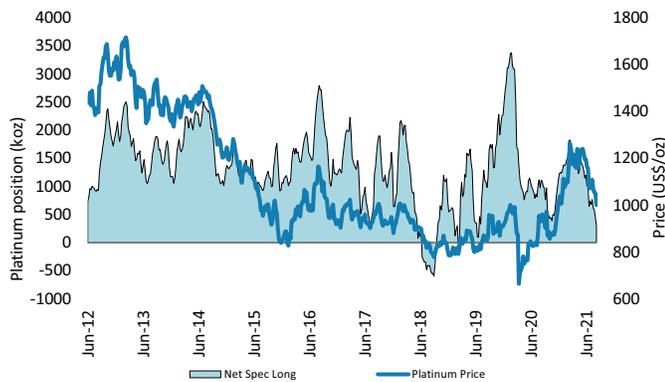
Exhibit 122: Lease rates (%)



Source: Bloomberg

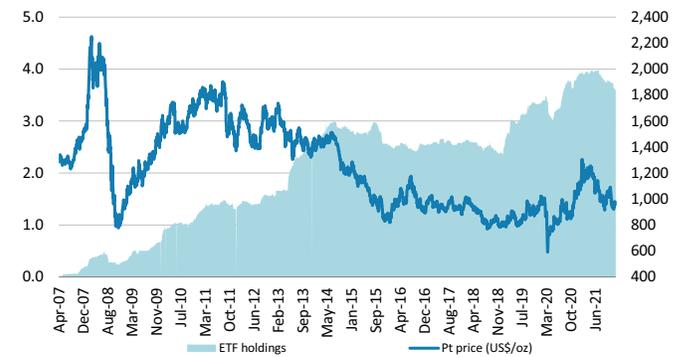
Platinum

Exhibit 123: Nymex positioning as per COTR



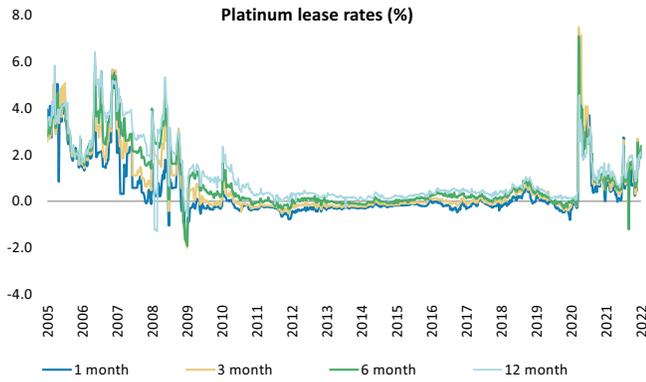
Source: COTR, Morgan Stanley Research

Exhibit 124: ETF Holdings



Source: Bloomberg

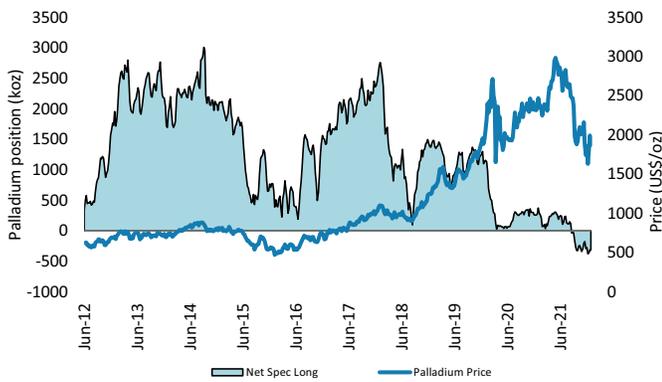
Exhibit 125: Lease rates (%)



Source: Bloomberg

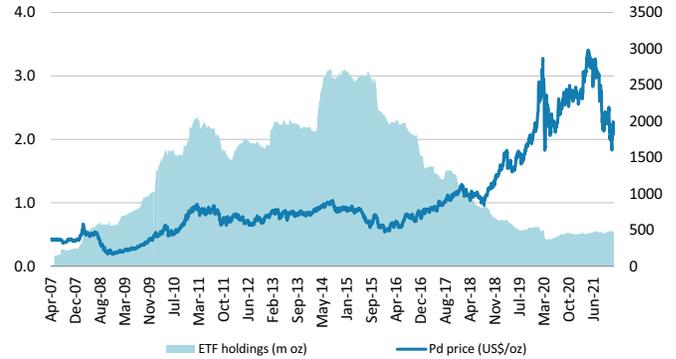
Palladium

Exhibit 126: Nymex positioning as per COTR



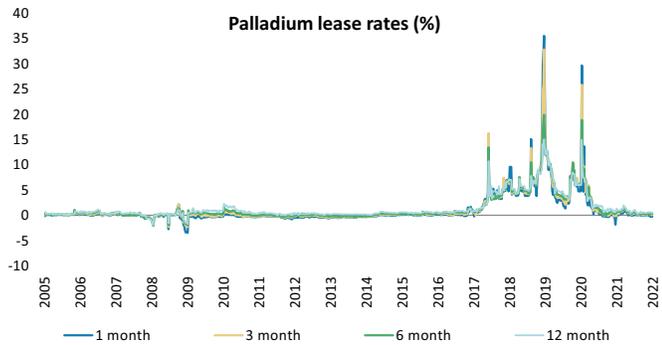
Source: COTR, Morgan Stanley Research

Exhibit 127: ETF Holdings



Source: Bloomberg

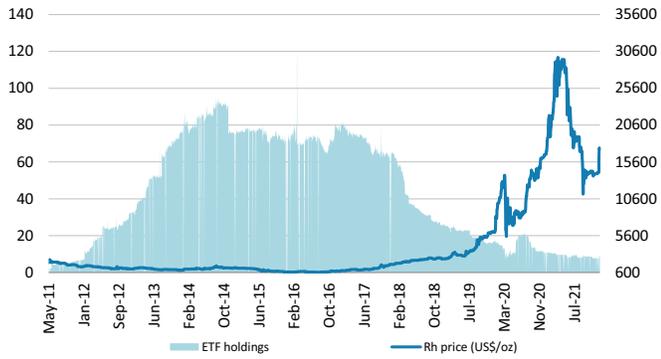
Exhibit 128: Lease rates (%)



Source: Bloomberg

Rhodium

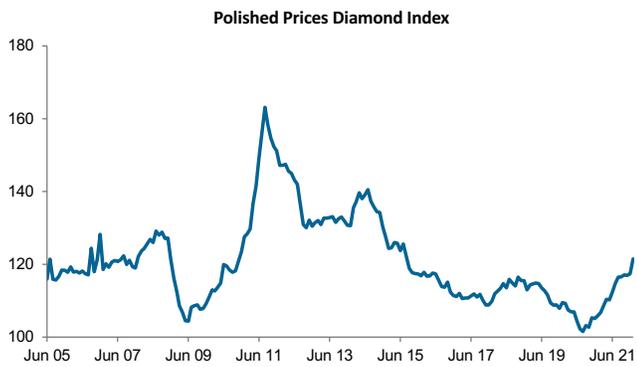
Exhibit 129: ETF holdings



Source: Bloomberg

Diamonds

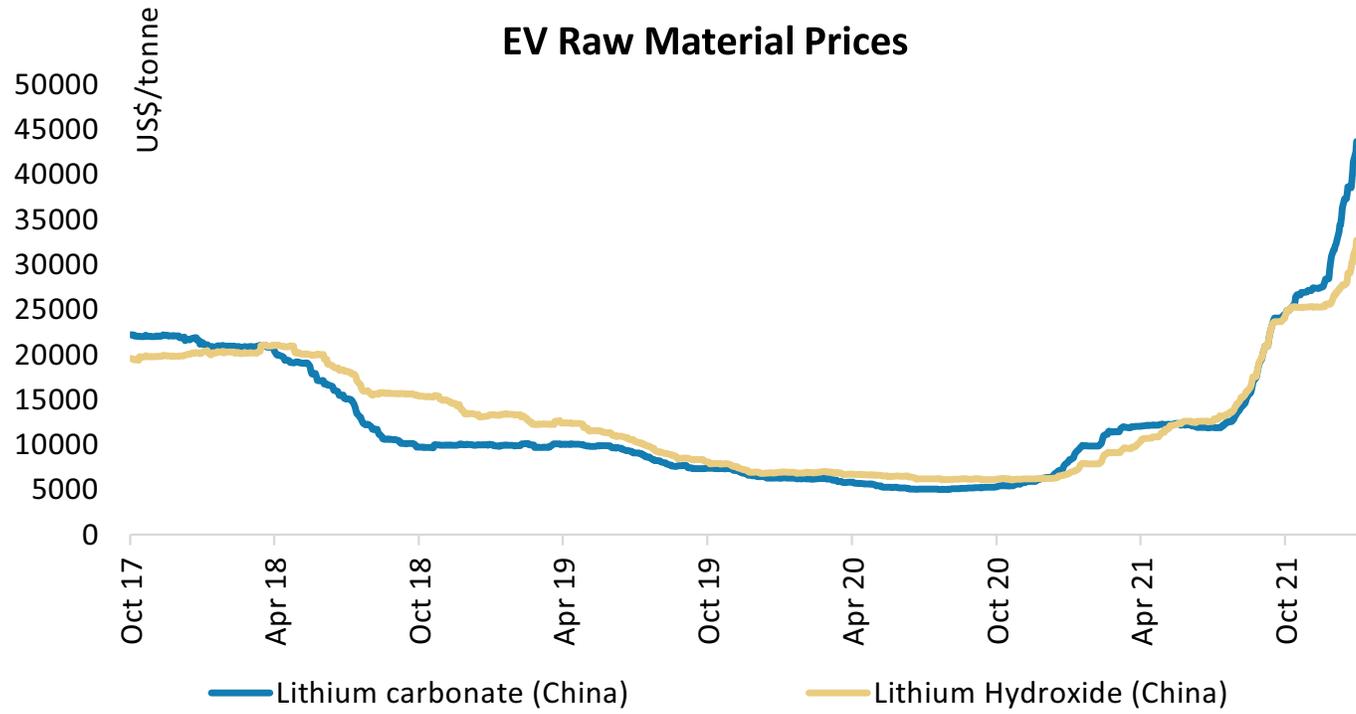
Exhibit 130: Polished Diamond Prices



Source: DataStream

EV raw material prices

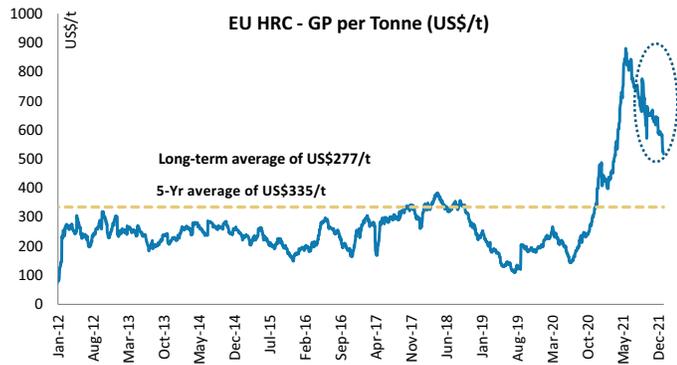
Exhibit 131: EV raw material prices



Source: Bloomberg, Datastream

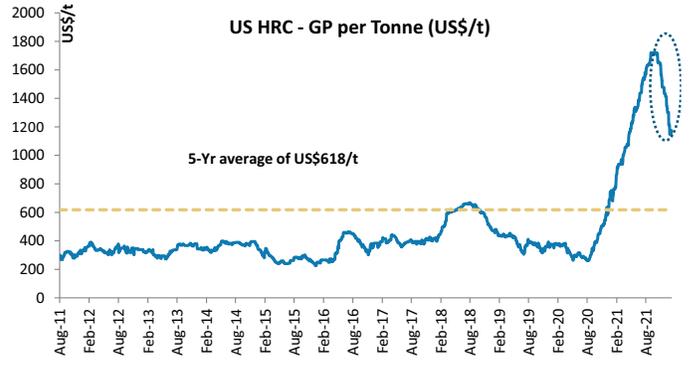
Steel Economics

Exhibit 132: EU HRC – GP per tonne



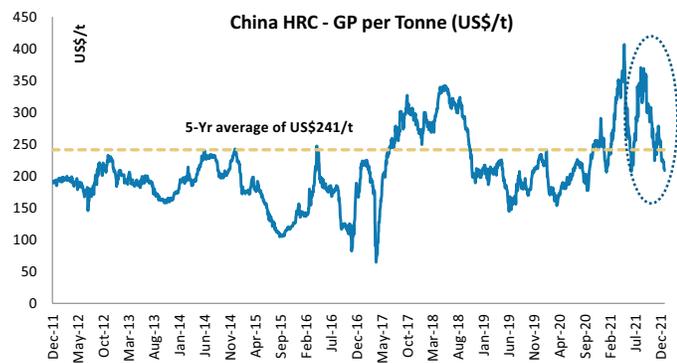
Source: Bloomberg, Morgan Stanley Research

Exhibit 133: US HRC – GP per tonne



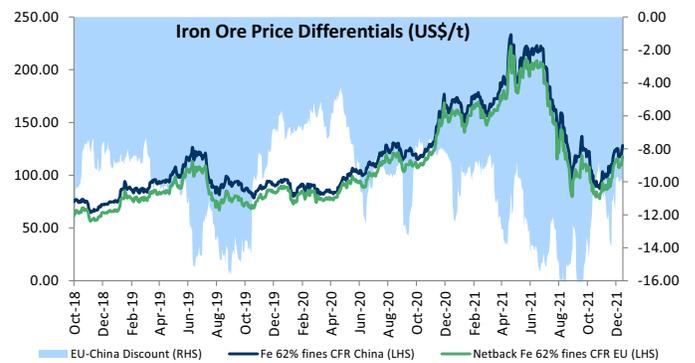
Source: Bloomberg, Morgan Stanley Research

Exhibit 134: China HRC – GP per tonne



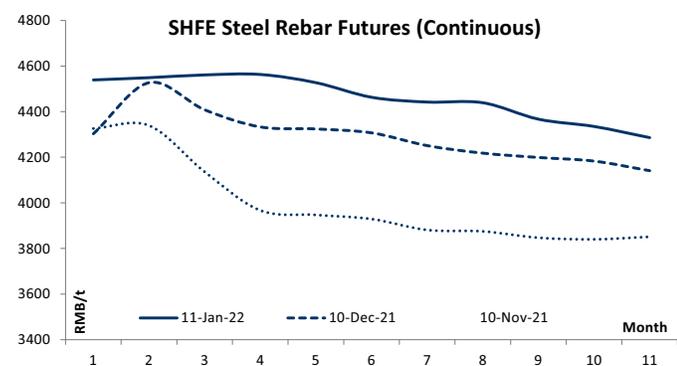
Source: Bloomberg, Morgan Stanley Research

Exhibit 135: Iron ore price differential (US\$/t)



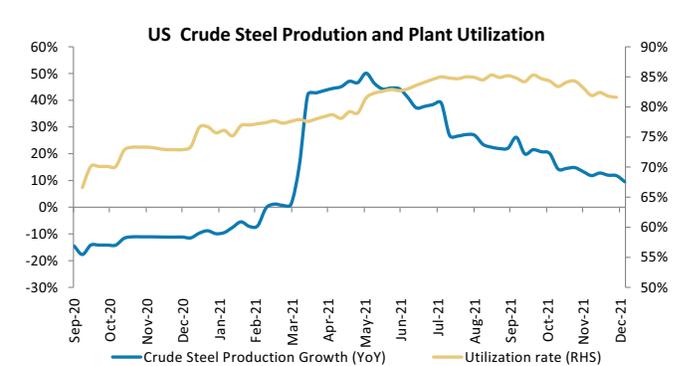
Source: Datastream, Morgan Stanley Research

Exhibit 136: SHFE Steel Rebar Futures



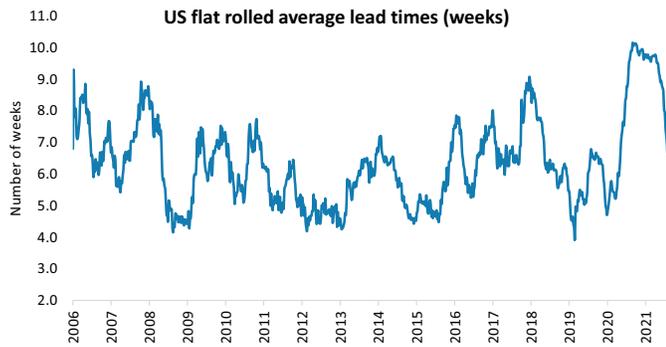
Source: Datastream, Morgan Stanley Research

Exhibit 137: US Crude steel production and plant utilization



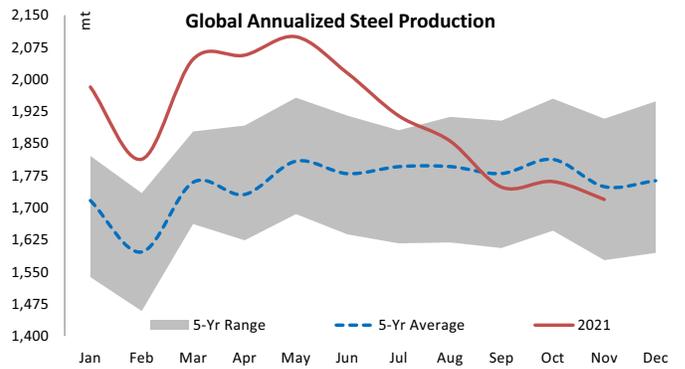
Source: AISI, Morgan Stanley Research

Exhibit 138: US flat rolled steel average lead times (weeks)



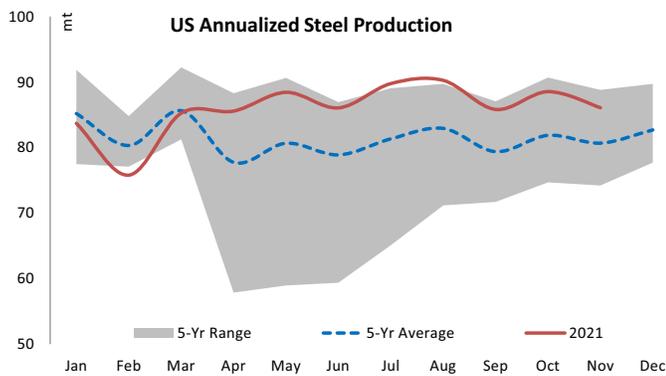
Source: S&P Global Platts

Exhibit 139: Global steel annualised production



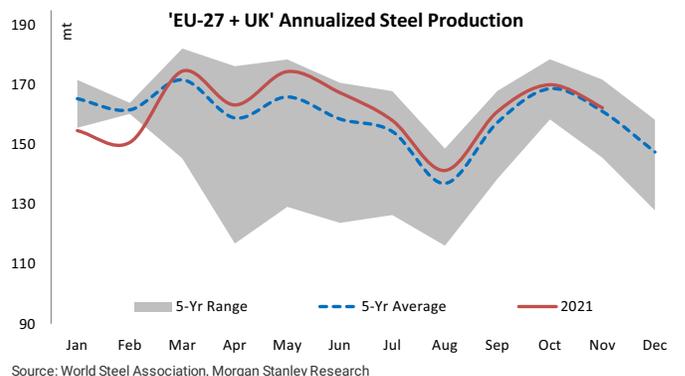
Source: World Steel Association, Morgan Stanley Research

Exhibit 140: US steel annualised production



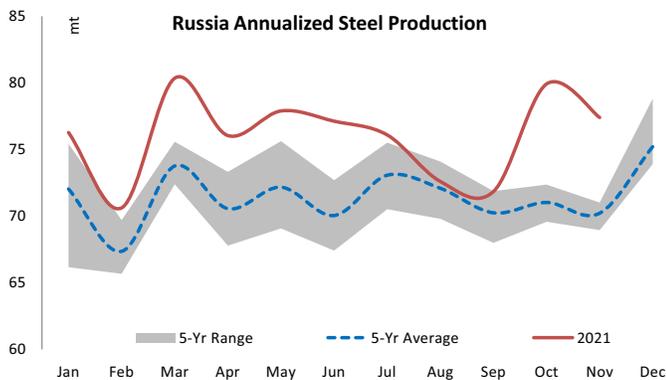
Source: World Steel Association, Morgan Stanley Research

Exhibit 141: EU-28 steel annualised production



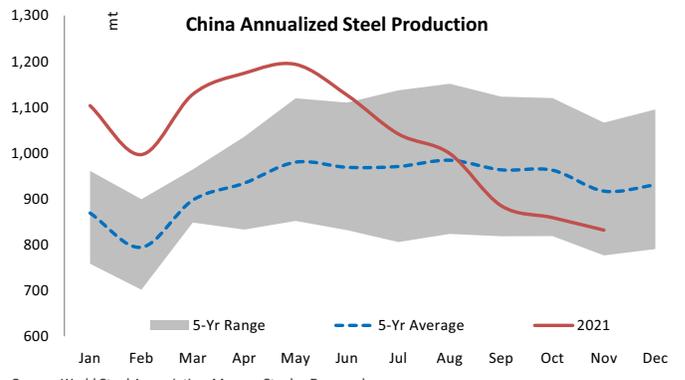
Source: World Steel Association, Morgan Stanley Research

Exhibit 142: Russia steel annualised production



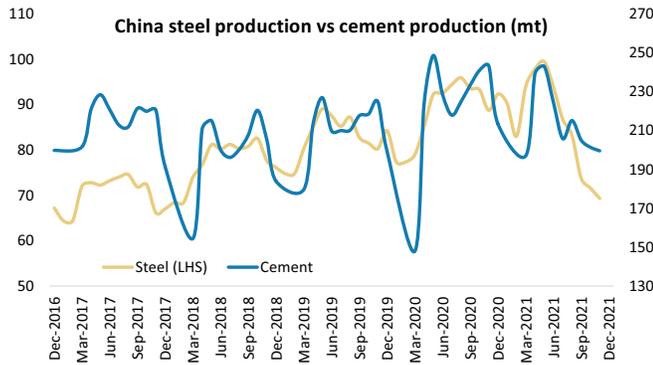
Source: World Steel Association, Morgan Stanley Research

Exhibit 143: China steel annualised production



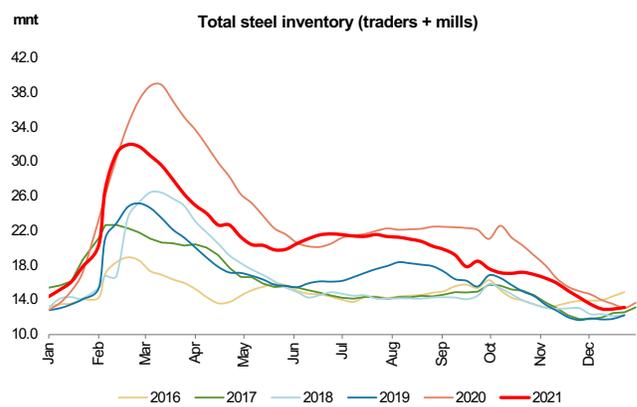
Source: World Steel Association, Morgan Stanley Research.

Exhibit 144: China Steel and Cement production



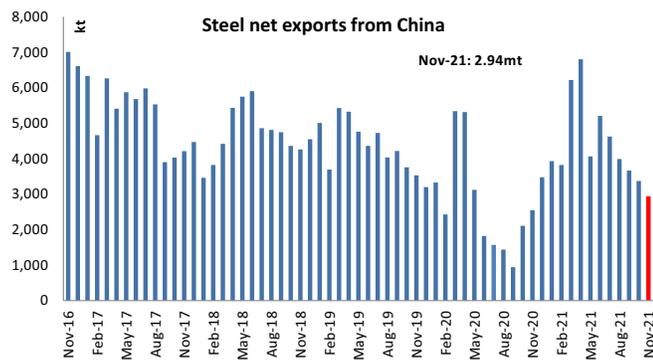
Source: NBS, DataStream, Morgan Stanley Research. Data for January and February is not available on datastream

Exhibit 145: Total steel inventory (traders + mills)



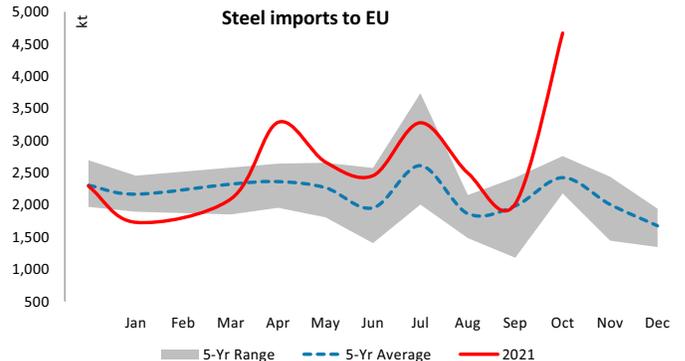
Source: Mysteel, Morgan Stanley Research

Exhibit 146: Steel net exports from China



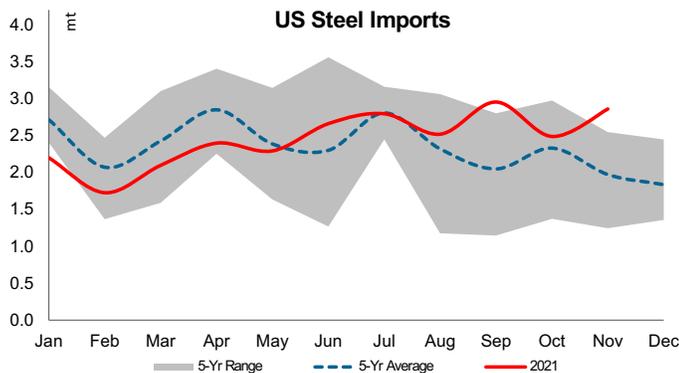
Source: CEIC, Morgan Stanley Research

Exhibit 147: Steel imports to EU



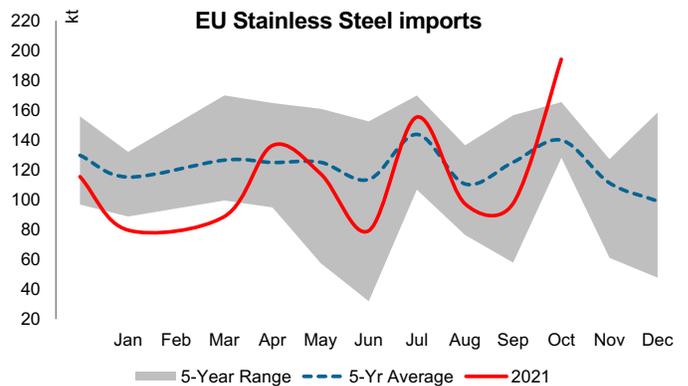
Source: Eurofer, Morgan Stanley Research

Exhibit 148: Steel imports to US



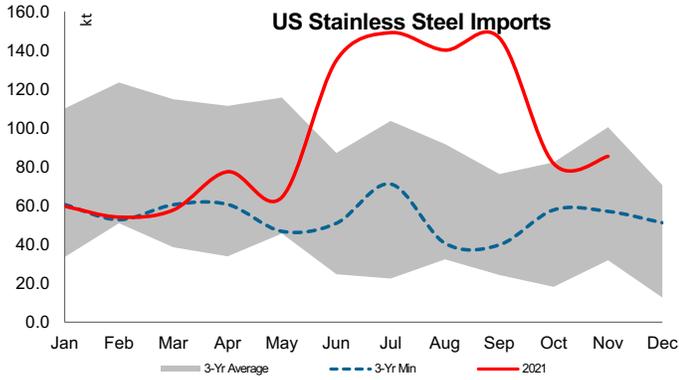
Source: US Census Bureau, Morgan Stanley Research

Exhibit 149: Stainless steel imports to EU



Source: Eurofer, Morgan Stanley Research

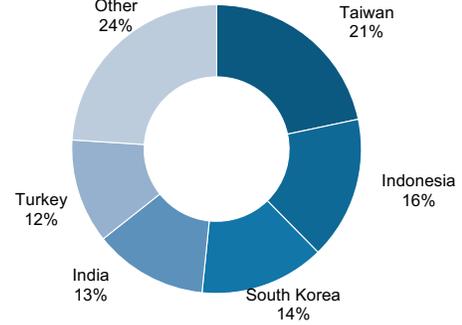
Exhibit 150: Stainless steel imports to US



Source: US Census Bureau, Morgan Stanley Research

Exhibit 151: Stainless steel imports by country (2021 YTD)

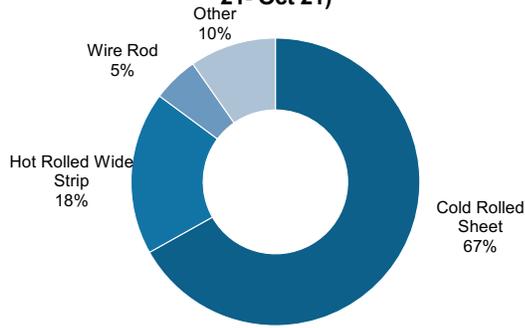
EU total stainless steel imports by country (Jan 21- Oct 21)



Source: Eurofer, Morgan Stanley Research

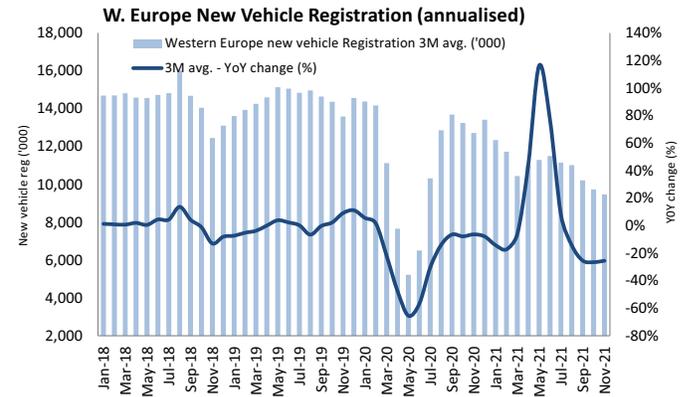
Exhibit 152: Stainless steel imports by product (2021 YTD)

EU total stainless steel imports by product (Jan 21- Oct 21)



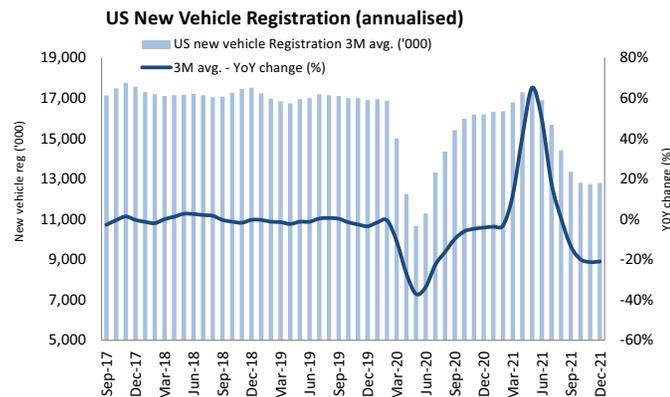
Source: Eurofer, Morgan Stanley Research

Exhibit 153: W. Europe new vehicle registration



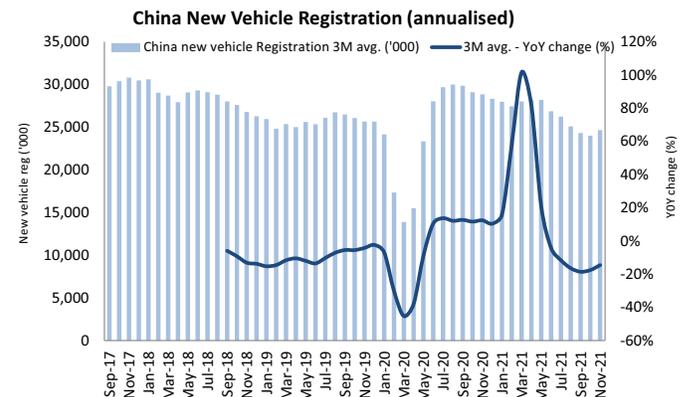
Source: ACEA, Morgan Stanley Research

Exhibit 154: US new vehicle registration



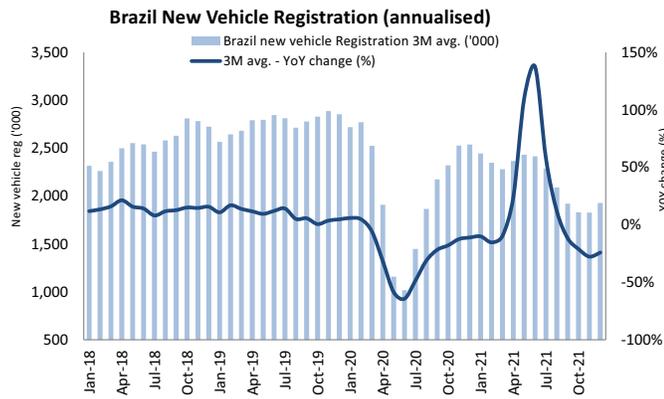
Source: SAAR, Morgan Stanley Research

Exhibit 155: China new vehicle registration



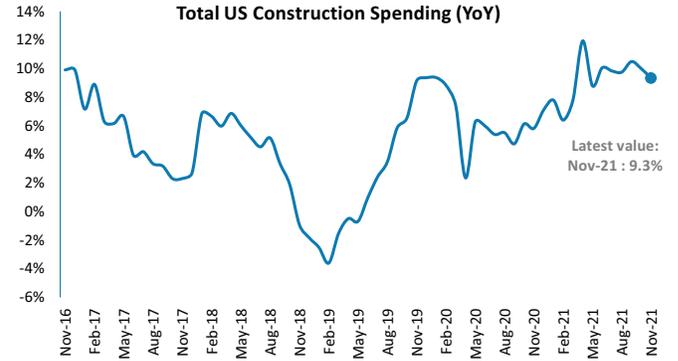
Source: CAAM, Morgan Stanley Research

Exhibit 156: Brazil new vehicle registration



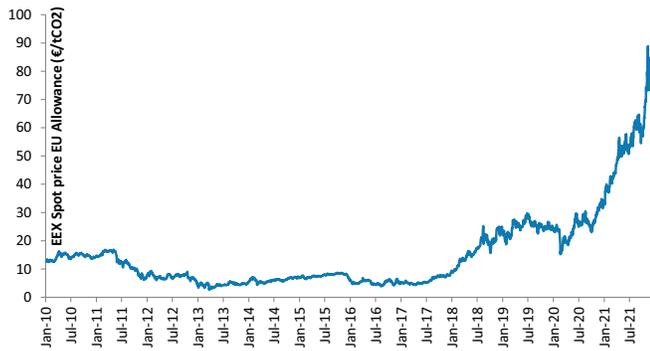
Source: ANFAVEA, Morgan Stanley Research

Exhibit 157: Total US construction spending (YoY)



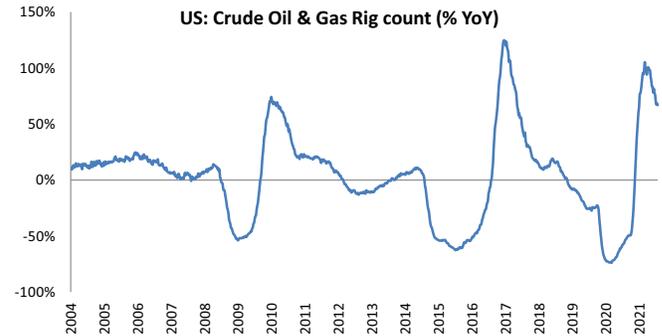
Source: Datastream, Morgan Stanley Research

Exhibit 158: EU CO₂ emission allowance



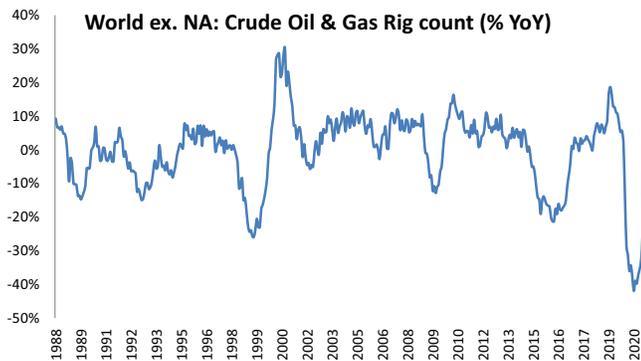
Source: EEX, Morgan Stanley Research

Exhibit 159: US: crude oil & gas rig count (% YoY)



Source: Baker Hughes, Morgan Stanley Research

Exhibit 160: World ex. NA: crude oil & gas rig count (% YoY)



Source: Baker Hughes, Morgan Stanley Research

Key Morgan Stanley Forecasts

Exhibit 161: Base Metal Forecasts

Period	Aluminium (US\$/lb)			Nickel (US\$/lb)			Copper (US\$/lb)			Zinc (US\$/lb)		
	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull
2022e	1.15	1.27	1.46	6.87	9.81	13.74	3.25	4.06	4.79	0.99	1.16	1.57
2023e	1.00	1.12	1.36	5.78	8.25	12.38	2.87	3.38	4.39	0.95	1.05	1.32
2024e	0.94	1.11	1.38	5.28	7.54	11.31	3.29	3.65	4.75	0.97	1.08	1.40
2025e	0.98	1.15	1.44	5.46	7.80	10.92	3.42	3.80	5.13	0.99	1.10	1.42
2026e	0.95	1.12	1.40	5.53	7.90	10.27	3.42	3.80	5.32	1.05	1.17	1.46
2027e	0.95	1.12	1.40	5.46	7.80	9.36	3.33	3.70	4.81	1.03	1.21	1.45
LT Nominal	1.02	1.13	1.30	5.52	7.89	9.46	2.94	3.46	4.49	0.96	1.21	1.33

Source: Morgan Stanley Commodities Research estimates (e)

Exhibit 162: Bulks Metal Forecasts

Period	Fe Fines (CFR China) (US\$/t)			Fe Lumps (CFR China) (US\$/t)			Alumina spot (US\$/t)		
	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull
2022e	80	100	170	92	115	195	309	344	395
2023e	65	81	130	76	95	153	259	288	351
2024e	53	66	133	64	80	161	258	304	380
2025e	54	68	149	65	82	180	272	320	400
2026e	56	70	140	67	84	168	289	340	425
2027e	58	73	131	69	87	156	315	370	463
LT Nominal	53	75	130	66	94	161	316	372	447

Source: Morgan Stanley Commodities Research estimates (e)

Exhibit 163: Bulks Forecasts: Coal

Period	Hard Coking Coal (US\$/t)			Thermal Coal - Newcastle			PCI Coal (US\$/t)			Semi Soft Coal (US\$/t)		
	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull
2022e	147	245	417	91	130	195	115	192	327	108	181	307
2023e	125	156	313	71	95	162	97	121	243	89	112	223
2024e	115	144	259	56	75	128	87	109	196	80	100	181
2025e	119	149	238	60	80	120	90	113	203	83	104	187
2026e	123	154	215	64	85	119	93	117	210	86	107	193
2027e	130	163	211	68	90	117	98	123	221	91	113	204
LT Nominal	134	167	217	70	93	121	102	127	165	94	117	152

Source: Morgan Stanley Commodities Research estimates (e)

Exhibit 164: Precious Metals and PGM Forecasts

Period	Gold (US\$/oz)			Platinum (US\$/oz)			Palladium (US\$/oz)			Silver (US\$/oz)		
	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull	Bear	Base	Bull
2022e	1,471	1,730	2,076	840	1,050	1,260	1,470	2,100	2,520	18	23	27
2023e	1,406	1,563	1,875	924	1,155	1,386	1,295	1,850	2,405	19	22	31
2024e	1,328	1,475	1,844	1,232	1,369	1,779	1,024	1,463	1,755	18	21	30
2025e	1,302	1,400	1,820	1,283	1,425	1,853	951	1,359	1,631	20	22	33
2026e	1,330	1,400	1,960	1,273	1,415	1,839	961	1,373	1,648	20	23	33
2027e	1,330	1,400	1,960	1,259	1,399	1,818	1,110	1,387	1,665	20	23	33
LT Nominal	1,223	1,358	1,902	1,263	1,403	1,824	1,122	1,403	1,684	20	23	30

Source: Morgan Stanley Commodities Research estimates (e)

Global Metals & Mining Team

Exhibit 165: Global team and contact details

GLOBAL METALS & MINING TEAM					
Global Metals & Mining – Commodity Strategists					
Amy Sergeant ¹ , EQUITY ANALYST & COMMODITIES STRATEGIST	Amy.Sergeant@morganstanley.com	+44 20 7677 6937	Rahul Anand ⁴ , EQUITY ANALYST	R.Anand@morganstanley.com	+61 2 9770 1136
Marius van Straaten ¹ , COMMODITIES STRATEGIST	Marius.Van.Straaten@morganstanley.com	+44 20 7677 5632	Shannon Sinha ⁴ , RESEARCH ASSOCIATE	Shannon.Sinha@morganstanley.com	+61 2 9770 1334
EMEA Metals & Mining, Steel (London)					
Alain Gabriel ¹ , EQUITY ANALYST	Alain.Gabriel@morganstanley.com	+44 20 7425 8969	Rachel Zhang ⁹ , EQUITY ANALYST	Rachel.Zhang@morganstanley.com	+852 2239 1520
Ioannis Masvoulas ¹ , EQUITY ANALYST	Ioannis.Masvoulas@morganstanley.com	+44 20 7425 0427	Sara Chan ¹ , EQUITY ANALYST	Sara.Chan@morganstanley.com	+852 2848 5292
Dan Shaw ¹ , EQUITY ANALYST	Dan.Shaw@morganstanley.com	+44 20 7425 5853	Hannah Yang ¹ , RESEARCH ASSOCIATE	Hannah.Yang1@morganstanley.com	+852 2239 7079
Sandeep Peety ¹ , EQUITY ANALYST	Sandeep.Peety@morganstanley.com	+44 20 7677 6242	Sean Xiang ¹ , RESEARCH ASSOCIATE	Sean.Xiang@morganstanley.com	+852 2848 8154
South Africa Metals & Mining, Steel (Johannesburg)					
Christopher Nicholson ¹⁰ , EQUITY ANALYST	Christopher.Nicholson@morganstanley.com	+27 11 282 1154	Mukund Sarawogi ¹¹ , EQUITY ASSOCIATE	Mukund.Sarawogi@morganstanley.com	+91 22 6118 2211
Brian Morgan ¹⁰ , EQUITY ANALYST	Brian.Morgan3@morganstanley.com	+27 11 282 8969			
Jared Hoover ¹⁰ , EQUITY ANALYST	Jared.Hoover@morganstanley.com	+27 11 282 1082			
Americas Steel, Metals & Mining, Pulp & Paper (New York/São Paulo/Mexico)					
Carlos de Alba ¹ , EQUITY ANALYST	Carlos.de.Alba@morganstanley.com	+1 212 761 4927			
Jens Spiess ¹¹ , RESEARCH ANALYST	Jens.Spiess@morganstanley.com	+52 55 5282 6614			
Eduardo Bordalo ⁷ , RESEARCH ASSOCIATE	Eduardo.Bordalo@morganstanley.com	+55 11 3048 6081			
Serena Rocha ¹ , EQUITY ASSOCIATE	Serena.Rocha.Calejon@morganstanley.com	+1 212 761 0144			
Japan Metals & Mining, Steel (Tokyo)					
Takato Watabe ⁷ , EQUITY ANALYST	Takato.Watabe@morganstanleymufg.com	+81 3 6836 5436			
Yu Shirakawa ¹ , EQUITY ANALYST	Yu.Shirakawa@morganstanleymufg.com	+81 3 6836 5432			
Asia Oil & Gas & Coal (Hong Kong/Jakarta)					
Andy Meng ¹ , EQUITY ANALYST	Andy.Meng@morganstanley.com	+852 2239 7689			
Jack Lu ¹ , EQUITY ANALYST	Jack.Lu@morganstanley.com	+852 2848 5044			
Albert Li ¹ , RESEARCH ASSOCIATE	Albert.Li@morganstanley.com	+852 3963 3610			
Source: Morgan Stanley Research			<p>1 Morgan Stanley & Co. LLC 2 Morgan Stanley C.T.V.M. S.A.+ 3 Morgan Stanley & Co. International plc+ 4 Morgan Stanley India Company Private Limited+ 5 Morgan Stanley Asia Limited + 6 Morgan Stanley Australia Ltd+ 7 Morgan Stanley MUFJG Securities Co., Ltd+ 9 OOO Morgan Stanley Bank 10 RMB Morgan Stanley (Proprietary) Ltd+ 11 Morgan Stanley & Co. International plc, Seoul Branch+ 12 PT. Morgan Stanley Asia Indonesia+ 13 Morgan Stanley Mexico, Casa de bolsa, S.A. de C.V.+</p> <p>+ Analysts employed by non-U.S. affiliates are not registered with FINRA, may not be associated persons of the member and may not be subject to NASD/NYSE restrictions on communications with a subject company, public appearances and trading securities held by a research analyst account.</p>		

Morgan Stanley Australia Limited ("Morgan Stanley") is acting as financial advisor to Woodside Energy Ltd, a subsidiary of Woodside Petroleum Ltd ("Woodside") in relation to the proposed merger between Woodside and BHP Group ("BHP")'s oil and gas business by an all-stock merger, as announced on 17 August 2021. The Transaction is subject to confirmatory due diligence, negotiation and execution of full form transaction documents, and satisfaction of conditions precedent including shareholder, regulatory and other approvals. This report and the information provided herein is not intended to (i) provide voting advice, (ii) serve as an endorsement of the proposed transaction, or (iii) result in the procurement, withholding or revocation of a proxy or any other action by a security holder. Woodside has agreed to pay fees to Morgan Stanley for its financial services. Please refer to the notes at the end of the report.

Important note regarding economic sanctions. This research references country/ies which are generally the subject of comprehensive sanctions programs administered or enforced by the U.S. Department of the Treasury's Office of Foreign Assets Control ("OFAC"), the European Union and/or by other countries and multi-national bodies. Users of this report are solely responsible for ensuring that their investment activities in relation to any sanctioned country/ies are carried out in compliance with applicable sanctions.

Disclosure Section

The information and opinions in Morgan Stanley Research were prepared or are disseminated by Morgan Stanley Europe S.E., regulated by Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin) and/or Morgan Stanley & Co. International plc, authorized by the Prudential Regulatory Authority and regulated by the Financial Conduct Authority and the Prudential Regulatory Authority. Morgan Stanley & Co. International plc disseminates in the UK research that it has prepared, and approves solely for the purposes of section 21 of the Financial Services and Markets Act 2000, research which has been prepared by any of its affiliates. As used in this disclosure section, Morgan Stanley includes RMB Morgan Stanley Proprietary Limited, Morgan Stanley Europe S.E., Morgan Stanley & Co International plc and its affiliates.

For important disclosures, stock price charts and equity rating histories regarding companies that are the subject of this report, please see the Morgan Stanley Research Disclosure Website at www.morganstanley.com/researchdisclosures, or contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Research Management), New York, NY, 10036 USA.

For valuation methodology and risks associated with any recommendation, rating or price target referenced in this research report, please contact the Client Support Team as follows: US/Canada +1 800 303-2495; Hong Kong +852 2848-5999; Latin America +1 718 754-5444 (U.S.); London +44 (0)20-7425-8169; Singapore +65 6834-6860; Sydney +61 (0)2-9770-1505; Tokyo +81 (0)3-6836-9000. Alternatively you may contact your investment representative or Morgan Stanley Research at 1585 Broadway, (Attention: Research Management), New York, NY 10036 USA.

Analyst Certification

The following analysts hereby certify that their views about the companies and their securities discussed in this report are accurately expressed and that they have not received and will not receive direct or indirect compensation in exchange for expressing specific recommendations or views in this report: Jared Hoover; Brian Morgan; Christopher Nicholson.

Global Research Conflict Management Policy

Morgan Stanley Research has been published in accordance with our conflict management policy, which is available at www.morganstanley.com/institutional/research/conflictolicies. A Portuguese version of the policy can be found at www.morganstanley.com.br

Important Regulatory Disclosures on Subject Companies

The analyst or strategist (or a household member) identified below owns the following securities (or related derivatives): Christopher Nicholson - BHP GROUP PLC (common or preferred stock).

As of December 31, 2021, Morgan Stanley beneficially owned 1% or more of a class of common equity securities of the following companies covered in Morgan Stanley Research: Acerinox SA, Alcoa Corp, Anglo American, ArcelorMittal SA, BHP GROUP PLC, Centamin PLC, Exxaro Resources Limited, Fortescue Metals Group Ltd., Glencore PLC, Harmony Gold Mining Company Ltd, MMC NORILSK NICKEL PJSC, Rio Tinto Plc, South32 Ltd, SSAB AB, Thungela Resources Ltd, thyssenkrupp AG, US Steel.

Within the last 12 months, Morgan Stanley managed or co-managed a public offering (or 144A offering) of securities of Alcoa Corp, Fortescue Metals Group Ltd., Glencore PLC, Sibanye-Stillwater, SSAB AB, US Steel.

Within the last 12 months, Morgan Stanley has received compensation for investment banking services from Alcoa Corp, Anglo American, Exxaro Resources Limited, Fortescue Metals Group Ltd., Glencore PLC, Rio Tinto Plc, South32 Ltd, US Steel, Vale.

In the next 3 months, Morgan Stanley expects to receive or intends to seek compensation for investment banking services from AK Alrosa PAO, Alcoa Corp, Anglo American, Anglo Platinum Limited, AngloGold Ashanti Ltd, ArcelorMittal SA, Centamin PLC, Endeavour Mining, EVRAZ plc, Exxaro Resources Limited, Fortescue Metals Group Ltd., Glencore PLC, Gold Fields Limited, Harmony Gold Mining Company Ltd, Implats Limited, MMC NORILSK NICKEL PJSC, Norsk Hydro ASA, Novolipetsk Steel PAO, Outokumpu Oyj, Polymetal International PLC, Polyus Gold, POSCO, Rio Tinto Plc, Royal Bafokeng Platinum Ltd, Severstal' PAO, Sibanye-Stillwater, South32 Ltd, SSAB AB, Sumitomo Metal Mining, thyssenkrupp AG, US Steel, Vale, Yanzhou Coal, Zijin Mining Group. Within the last 12 months, Morgan Stanley has received compensation for products and services other than investment banking services from AK Alrosa PAO, Alcoa Corp, Anglo American, Anglo Platinum Limited, AngloGold Ashanti Ltd, ArcelorMittal SA, Glencore PLC, Gold Fields Limited, Implats Limited, MMC NORILSK NICKEL PJSC, Norsk Hydro ASA, Outokumpu Oyj, Polymetal International PLC, Rio Tinto Plc, Sibanye-Stillwater, South32 Ltd, thyssenkrupp AG, US Steel, Vale, voestalpine AG, Zijin Mining Group.

Within the last 12 months, Morgan Stanley has provided or is providing investment banking services to, or has an investment banking client relationship with, the following company: AK Alrosa PAO, Alcoa Corp, Anglo American, Anglo Platinum Limited, AngloGold Ashanti Ltd, ArcelorMittal SA, Centamin PLC, Endeavour Mining, EVRAZ plc, Exxaro Resources Limited, Fortescue Metals Group Ltd., Glencore PLC, Gold Fields Limited, Harmony Gold Mining Company Ltd, Implats Limited, MMC NORILSK NICKEL PJSC, Norsk Hydro ASA, Novolipetsk Steel PAO, Outokumpu Oyj, Polymetal International PLC, Polyus Gold, POSCO, Rio Tinto Plc, Royal Bafokeng Platinum Ltd, Severstal' PAO, Sibanye-Stillwater, South32 Ltd, SSAB AB, Sumitomo Metal Mining, thyssenkrupp AG, US Steel, Vale, Yanzhou Coal, Zijin Mining Group.

Within the last 12 months, Morgan Stanley has either provided or is providing non-investment banking, securities-related services to and/or in the past has entered into an agreement to provide services or has a client relationship with the following company: AK Alrosa PAO, Alcoa Corp, Anglo American, Anglo Platinum Limited, AngloGold Ashanti Ltd, ArcelorMittal SA, Glencore PLC, Gold Fields Limited, Implats Limited, MMC NORILSK NICKEL PJSC, Norsk Hydro ASA, Outokumpu Oyj, Polymetal International PLC, Rio Tinto Plc, Sibanye-Stillwater, South32 Ltd, thyssenkrupp AG, US Steel, Vale, voestalpine AG, Yanzhou Coal, Zijin Mining Group.

Within the last 12 months, an affiliate of Morgan Stanley & Co. LLC has received compensation for products and services other than investment banking services from AK Alrosa PAO, MMC NORILSK NICKEL PJSC.

Morgan Stanley & Co. LLC makes a market in the securities of Alcoa Corp, Aluminum Corp. of China Ltd., AngloGold Ashanti Ltd, ArcelorMittal SA, BHP GROUP PLC, Gold Fields Limited, Harmony Gold Mining Company Ltd, POSCO, Rio Tinto Plc, US Steel, Vale.

Morgan Stanley & Co. International plc is a corporate broker to Anglo American, Endeavour Mining, EVRAZ plc, Polymetal International PLC.

The equity research analysts or strategists principally responsible for the preparation of Morgan Stanley Research have received compensation based upon various factors, including quality of research, investor client feedback, stock picking, competitive factors, firm revenues and overall investment banking revenues. Equity Research analysts' or strategists' compensation is not linked to investment banking or capital markets transactions performed by Morgan Stanley or the profitability or revenues of particular trading desks.

Morgan Stanley and its affiliates do business that relates to companies/instruments covered in Morgan Stanley Research, including market making, providing liquidity, fund management, commercial banking, extension of credit, investment services and investment banking. Morgan Stanley sells to and buys from customers the securities/instruments of companies covered in Morgan Stanley Research on a principal basis. Morgan Stanley may have a position in the debt of the Company or instruments discussed in this report. Morgan Stanley trades or may trade as principal in the debt securities (or in related derivatives) that are the subject of the debt research report.

Certain disclosures listed above are also for compliance with applicable regulations in non-US jurisdictions.

STOCK RATINGS

Morgan Stanley uses a relative rating system using terms such as Overweight, Equal-weight, Not-Rated or Underweight (see definitions below). Morgan Stanley does not assign ratings of Buy, Hold or Sell to the stocks we cover. Overweight, Equal-weight, Not-Rated and Underweight are not the equivalent of

buy, hold and sell. Investors should carefully read the definitions of all ratings used in Morgan Stanley Research. In addition, since Morgan Stanley Research contains more complete information concerning the analyst's views, investors should carefully read Morgan Stanley Research, in its entirety, and not infer the contents from the rating alone. In any case, ratings (or research) should not be used or relied upon as investment advice. An investor's decision to buy or sell a stock should depend on individual circumstances (such as the investor's existing holdings) and other considerations.

Global Stock Ratings Distribution

(as of December 31, 2021)

The Stock Ratings described below apply to Morgan Stanley's Fundamental Equity Research and do not apply to Debt Research produced by the Firm. For disclosure purposes only (in accordance with FINRA requirements), we include the category headings of Buy, Hold, and Sell alongside our ratings of Overweight, Equal-weight, Not-Rated and Underweight. Morgan Stanley does not assign ratings of Buy, Hold or Sell to the stocks we cover. Overweight, Equal-weight, Not-Rated and Underweight are not the equivalent of buy, hold, and sell but represent recommended relative weightings (see definitions below). To satisfy regulatory requirements, we correspond Overweight, our most positive stock rating, with a buy recommendation; we correspond Equal-weight and Not-Rated to hold and Underweight to sell recommendations, respectively.

STOCK RATING CATEGORY	COVERAGE UNIVERSE		INVESTMENT BANKING CLIENTS (IBC)			OTHER MATERIAL INVESTMENT SERVICES CLIENTS (MISC)	
	COUNT	% OF TOTAL	COUNT	% OF TOTAL IBC	% OF RATING CATEGORY	COUNT	% OF TOTAL OTHER MISC
Overweight/Buy	1505	42%	403	45%	27%	671	42%
Equal-weight/Hold	1547	43%	402	45%	26%	695	44%
Not-Rated/Hold	0	0%	0	0%	0%	0	0%
Underweight/Sell	544	15%	90	10%	17%	220	14%
TOTAL	3,596		895			1586	

Data include common stock and ADRs currently assigned ratings. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months. Due to rounding off of decimals, the percentages provided in the "% of total" column may not add up to exactly 100 percent.

Analyst Stock Ratings

Overweight (O). The stock's total return is expected to exceed the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Equal-weight (E). The stock's total return is expected to be in line with the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Not-Rated (NR). Currently the analyst does not have adequate conviction about the stock's total return relative to the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Underweight (U). The stock's total return is expected to be below the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

Unless otherwise specified, the time frame for price targets included in Morgan Stanley Research is 12 to 18 months.

Analyst Industry Views

Attractive (A): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be attractive vs. the relevant broad market benchmark, as indicated below.

In-Line (I): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be in line with the relevant broad market benchmark, as indicated below.

Cautious (C): The analyst views the performance of his or her industry coverage universe over the next 12-18 months with caution vs. the relevant broad market benchmark, as indicated below.

Benchmarks for each region are as follows: North America - S&P 500; Latin America - relevant MSCI country index or MSCI Latin America Index; Europe - MSCI Europe; Japan - TOPIX; Asia - relevant MSCI country index or MSCI sub-regional index or MSCI AC Asia Pacific ex Japan Index.

Stock Price, Price Target and Rating History (See Rating Definitions)

POSCO (005490.KS) - As of 1/13/22 in KRW
Industry : S. Korea Energy & Materials



Stock Rating History: 1/1/17 : O/A; 9/13/18 : NA/A; 11/7/18 : E/A; 10/23/20 : O/A

Price Target History: 12/1/16 : 290000; 8/23/17 : 400000; 1/25/18 : 450000; 9/13/18 : NA; 11/7/18 : 300000; 3/26/19 : 280000; 5/28/19 : 260000; 10/3/19 : 250000; 3/18/20 : 180000; 7/21/20 : 210000; 10/23/20 : 280000; 12/7/20 : 360000; 3/24/21 : 420000; 4/26/21 : 460000; 7/22/21 : 470000; 9/8/21 : 520000; 10/25/21 : 420000; 1/7/22 : 410000

Source: Morgan Stanley Research Date Format: MM/DD/YY Price Target -- No Price Target Assigned (NA)
 Stock Price (Not Covered by Current Analyst) — Stock Price (Covered by Current Analyst) ■
 Stock and Industry Ratings (abbreviations below) appear as ♦ Stock Rating/Industry View
 Stock Ratings: Overweight (O) Equal-weight (E) Underweight (U) Not-Rated (NR) No Rating Available (NA)
 Industry View: Attractive (A) In-line (I) Cautious (C) No Rating (NR)

Effective January 13, 2014, the stocks covered by Morgan Stanley Asia Pacific will be rated relative to the analyst's industry (or industry team's) coverage.

Effective January 13, 2014, the industry view benchmarks for Morgan Stanley Asia Pacific are as follows: relevant MSCI country index or MSCI sub-regional index or MSCI AC Asia Pacific ex Japan Index.

Important Disclosures for Morgan Stanley Smith Barney LLC & E*TRADE Securities LLC Customers

Important disclosures regarding the relationship between the companies that are the subject of Morgan Stanley Research and Morgan Stanley Smith Barney LLC or Morgan Stanley or any of their affiliates, are available on the Morgan Stanley Wealth Management disclosure website at www.morganstanley.com/online/researchdisclosures. For Morgan Stanley specific disclosures, you may refer to www.morganstanley.com/researchdisclosures.

Each Morgan Stanley research report is reviewed and approved on behalf of Morgan Stanley Smith Barney LLC and E*TRADE Securities LLC. This review and approval is conducted by the same person who reviews the research report on behalf of Morgan Stanley. This could create a conflict of interest.

Other Important Disclosures

Morgan Stanley & Co. International PLC and its affiliates have a significant financial interest in the debt securities of Anglo American, ArcelorMittal SA, POSCO, Sibanye-Stillwater, South32 Ltd, Sumitomo Metal Mining, thyssenkrupp AG, US Steel.

Morgan Stanley Research policy is to update research reports as and when the Research Analyst and Research Management deem appropriate, based on developments with the issuer, the sector, or the market that may have a material impact on the research views or opinions stated therein. In addition, certain Research publications are intended to be updated on a regular periodic basis (weekly/monthly/quarterly/annual) and will ordinarily be updated with that frequency, unless the Research Analyst and Research Management determine that a different publication schedule is appropriate based on current conditions. Morgan Stanley is not acting as a municipal advisor and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of Section 975 of the Dodd-Frank Wall Street Reform and Consumer Protection Act.

Morgan Stanley produces an equity research product called a "Tactical Idea." Views contained in a "Tactical Idea" on a particular stock may be contrary to the recommendations or views expressed in research on the same stock. This may be the result of differing time horizons, methodologies, market events, or other factors. For all research available on a particular stock, please contact your sales representative or go to Matrix at <http://www.morganstanley.com/matrix>. Morgan Stanley Research is provided to our clients through our proprietary research portal on Matrix and also distributed electronically by Morgan Stanley to clients. Certain, but not all, Morgan Stanley Research products are also made available to clients through third-party vendors or redistributed to clients through alternate electronic means as a convenience. For access to all available Morgan Stanley Research, please contact your sales representative or go to Matrix at <http://www.morganstanley.com/matrix>.

Any access and/or use of Morgan Stanley Research is subject to Morgan Stanley's Terms of Use (<http://www.morganstanley.com/terms.html>). By accessing and/or using Morgan Stanley Research, you are indicating that you have read and agree to be bound by our Terms of Use (<http://www.morganstanley.com/terms.html>). In addition you consent to Morgan Stanley processing your personal data and using cookies in accordance with our Privacy Policy and our Global Cookies Policy (http://www.morganstanley.com/privacy_pledge.html), including for the purposes of setting your preferences and to collect readership data so that we can deliver better and more personalized service and products to you. To find out more information about how Morgan Stanley processes personal data, how we use cookies and how to reject cookies see our Privacy Policy and our Global Cookies Policy (http://www.morganstanley.com/privacy_pledge.html).

If you do not agree to our Terms of Use and/or if you do not wish to provide your consent to Morgan Stanley processing your personal data or using cookies please do not access our research.

Morgan Stanley Research does not provide individually tailored investment advice. Morgan Stanley Research has been prepared without regard to the circumstances and objectives of those who receive it. Morgan Stanley recommends that investors independently evaluate particular investments and strategies, and encourages investors to seek the advice of a financial adviser. The appropriateness of an investment or strategy will depend on an investor's circumstances and objectives. The securities, instruments, or strategies discussed in Morgan Stanley Research may not be suitable for all investors, and certain investors may not be eligible to purchase or participate in some or all of them. Morgan Stanley Research is not an offer to buy or sell or the solicitation of an offer to buy or sell any security/instrument or to participate in any particular trading strategy. The value of and income from your investments may vary because of changes in interest rates, foreign exchange rates, default rates, prepayment rates, securities/instruments prices, market indexes, operational or

financial conditions of companies or other factors. There may be time limitations on the exercise of options or other rights in securities/instruments transactions. Past performance is not necessarily a guide to future performance. Estimates of future performance are based on assumptions that may not be realized. If provided, and unless otherwise stated, the closing price on the cover page is that of the primary exchange for the subject company's securities/instruments.

The fixed income research analysts, strategists or economists principally responsible for the preparation of Morgan Stanley Research have received compensation based upon various factors, including quality, accuracy and value of research, firm profitability or revenues (which include fixed income trading and capital markets profitability or revenues), client feedback and competitive factors. Fixed Income Research analysts', strategists' or economists' compensation is not linked to investment banking or capital markets transactions performed by Morgan Stanley or the profitability or revenues of particular trading desks.

The "Important Regulatory Disclosures on Subject Companies" section in Morgan Stanley Research lists all companies mentioned where Morgan Stanley owns 1% or more of a class of common equity securities of the companies. For all other companies mentioned in Morgan Stanley Research, Morgan Stanley may have an investment of less than 1% in securities/instruments or derivatives of securities/instruments of companies and may trade them in ways different from those discussed in Morgan Stanley Research. Employees of Morgan Stanley not involved in the preparation of Morgan Stanley Research may have investments in securities/instruments or derivatives of securities/instruments of companies mentioned and may trade them in ways different from those discussed in Morgan Stanley Research. Derivatives may be issued by Morgan Stanley or associated persons.

With the exception of information regarding Morgan Stanley, Morgan Stanley Research is based on public information. Morgan Stanley makes every effort to use reliable, comprehensive information, but we make no representation that it is accurate or complete. We have no obligation to tell you when opinions or information in Morgan Stanley Research change apart from when we intend to discontinue equity research coverage of a subject company. Facts and views presented in Morgan Stanley Research have not been reviewed by, and may not reflect information known to, professionals in other Morgan Stanley business areas, including investment banking personnel.

Morgan Stanley Research personnel may participate in company events such as site visits and are generally prohibited from accepting payment by the company of associated expenses unless pre-approved by authorized members of Research management.

Morgan Stanley may make investment decisions that are inconsistent with the recommendations or views in this report.

To our readers based in Taiwan or trading in Taiwan securities/instruments: Information on securities/instruments that trade in Taiwan is distributed by Morgan Stanley Taiwan Limited ("MSTL"). Such information is for your reference only. The reader should independently evaluate the investment risks and is solely responsible for their investment decisions. Morgan Stanley Research may not be distributed to the public media or quoted or used by the public media without the express written consent of Morgan Stanley. Any non-customer reader within the scope of Article 7-1 of the Taiwan Stock Exchange Recommendation Regulations accessing and/or receiving Morgan Stanley Research is not permitted to provide Morgan Stanley Research to any third party (including but not limited to related parties, affiliated companies and any other third parties) or engage in any activities regarding Morgan Stanley Research which may create or give the appearance of creating a conflict of interest. Information on securities/instruments that do not trade in Taiwan is for informational purposes only and is not to be construed as a recommendation or a solicitation to trade in such securities/instruments. MSTL may not execute transactions for clients in these securities/instruments.

Morgan Stanley is not incorporated under PRC law and the research in relation to this report is conducted outside the PRC. Morgan Stanley Research does not constitute an offer to sell or the solicitation of an offer to buy any securities in the PRC. PRC investors shall have the relevant qualifications to invest in such securities and shall be responsible for obtaining all relevant approvals, licenses, verifications and/or registrations from the relevant governmental authorities themselves. Neither this report nor any part of it is intended as, or shall constitute, provision of any consultancy or advisory service of securities investment as defined under PRC law. Such information is provided for your reference only.

Morgan Stanley Research is disseminated in Brazil by Morgan Stanley C.T.V.M. S.A. located at Av. Brigadeiro Faria Lima, 3600, 6th floor, São Paulo - SP, Brazil; and is regulated by the Comissão de Valores Mobiliários; in Mexico by Morgan Stanley México, Casa de Bolsa, S.A. de C.V which is regulated by Comisión Nacional Bancaria y de Valores. Paseo de los Tamarindos 90, Torre 1, Col. Bosques de las Lomas Floor 29, 05120 Mexico City; in Japan by Morgan Stanley MUFG Securities Co., Ltd. and, for Commodities related research reports only, Morgan Stanley Capital Group Japan Co., Ltd; in Hong Kong by Morgan Stanley Asia Limited (which accepts responsibility for its contents) and by Morgan Stanley Asia International Limited, Hong Kong Branch; in Singapore by Morgan Stanley Asia (Singapore) Pte. (Registration number 199206298Z) and/or Morgan Stanley Asia (Singapore) Securities Pte Ltd (Registration number 200008434H), regulated by the Monetary Authority of Singapore (which accepts legal responsibility for its contents and should be contacted with respect to any matters arising from, or in connection with, Morgan Stanley Research) and by Morgan Stanley Asia International Limited, Singapore Branch (Registration number T11FC0207F); in Australia to "wholesale clients" within the meaning of the Australian Corporations Act by Morgan Stanley Australia Limited A.B.N. 67 003 734 576, holder of Australian financial services license No. 233742, which accepts responsibility for its contents; in Australia to "wholesale clients" and "retail clients" within the meaning of the Australian Corporations Act by Morgan Stanley Wealth Management Australia Pty Ltd (A.B.N. 19 009 145 555, holder of Australian financial services license No. 240813, which accepts responsibility for its contents; in Korea by Morgan Stanley & Co International plc, Seoul Branch; in India by Morgan Stanley India Company Private Limited; in Canada by Morgan Stanley Canada Limited, which has approved of and takes responsibility for its contents in Canada; in Germany and the European Economic Area where required by Morgan Stanley Europe S.E., authorised and regulated by Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin) under the reference number 149169; in the US by Morgan Stanley & Co. LLC, which accepts responsibility for its contents. Morgan Stanley & Co. International plc, authorized by the Prudential Regulatory Authority and regulated by the Financial Conduct Authority and the Prudential Regulatory Authority, disseminates in the UK research that it has prepared, and approves solely for the purposes of section 21 of the Financial Services and Markets Act 2000, research which has been prepared by any of its affiliates. RMB Morgan Stanley Proprietary Limited is a member of the JSE Limited and A2X (Pty) Ltd. RMB Morgan Stanley Proprietary Limited is a joint venture owned equally by Morgan Stanley International Holdings Inc. and RMB Investment Advisory (Proprietary) Limited, which is wholly owned by FirstRand Limited. The information in Morgan Stanley Research is being disseminated by Morgan Stanley Saudi Arabia, regulated by the Capital Market Authority in the Kingdom of Saudi Arabia, and is directed at Sophisticated investors only.

Morgan Stanley Hong Kong Securities Limited is the liquidity provider/market maker for securities of Aluminum Corp. of China Ltd., Yanzhou Coal, Zijin Mining Group listed on the Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: <http://www.hkex.com.hk>.

FirstRand Limited and Rand Merchant Bank (a division of FirstRand Limited) may presently hold a 1% or more of a class of common equity securities, in any companies covered in this report. This may include holding a net long or short position of US\$1 million or more of Debt securities. Within the last 12 months, FirstRand Limited may have co-managed a public offering, received compensation for investment services, or services other than investment services, or expects to receive or intends to seek compensation for investment services not disclosed in this report. Additionally, FirstRand limited does make a market in securities or acts as a corporate broker not disclosed in this report. FirstRand Limited (or its directors, officers or employees) may, to the extent permitted by law, own or have a position in the securities of any company or related company referred to herein, and may add to or dispose of any such position or may make a market or act as a principle in any transaction in such securities or financial instruments. Directors of FirstRand Limited may also be directors of any of the companies mentioned in this report. FirstRand Limited may from time to time provide or solicit investment banking underwriting or other financial services to, for, or from any company referred to herein. FirstRand Limited (or its directors, officers or employees) may, to the extent permitted by law, act upon or use the information or opinions presented herein, research or analysis on which they are based prior to the material being published. FirstRand Limited may have issued, or may in the future issue other advice, which is inconsistent with, and reaches different conclusions from the information presented in this report.

The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (DIFC Branch), regulated by the Dubai Financial Services Authority (the DFSA), and is directed at Professional Clients only, as defined by the DFSA. The financial products or financial services to

which this research relates will only be made available to a customer who we are satisfied meets the regulatory criteria to be a Professional Client. The information in Morgan Stanley Research is being communicated by Morgan Stanley & Co. International plc (QFC Branch), regulated by the Qatar Financial Centre Regulatory Authority (the QFCRA), and is directed at business customers and market counterparties only and is not intended for Retail Customers as defined by the QFCRA.

As required by the Capital Markets Board of Turkey, investment information, comments and recommendations stated here, are not within the scope of investment advisory activity. Investment advisory service is provided exclusively to persons based on their risk and income preferences by the authorized firms. Comments and recommendations stated here are general in nature. These opinions may not fit to your financial status, risk and return preferences. For this reason, to make an investment decision by relying solely to this information stated here may not bring about outcomes that fit your expectations.

The trademarks and service marks contained in Morgan Stanley Research are the property of their respective owners. Third-party data providers make no warranties or representations relating to the accuracy, completeness, or timeliness of the data they provide and shall not have liability for any damages relating to such data. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and S&P.

Morgan Stanley Research, or any portion thereof may not be reprinted, sold or redistributed without the written consent of Morgan Stanley.

Indicators and trackers referenced in Morgan Stanley Research may not be used as, or treated as, a benchmark under Regulation EU 2016/1011, or any other similar framework.

The issuers and/or fixed income products recommended or discussed in certain fixed income research reports may not be continuously followed. Accordingly, investors should regard those fixed income research reports as providing stand-alone analysis and should not expect continuing analysis or additional reports relating to such issuers and/or individual fixed income products.

INDUSTRY COVERAGE: EEMEA - Metals & Mining

COMPANY (TICKER)	RATING (AS OF)	PRICE* (01/13/2022)
Alain Gabriel, CFA		
Anglo American (AGLJ.J)	E (09/17/2021)	ZAc 70,588
BHP GROUP PLC (BHPJ.J)	++	ZAc 50,724
Brian Morgan		
African Rainbow Minerals (ARIJ.J)	O (01/13/2020)	ZAc 24,599
Exaro Resources Limited (EXXJ.J)	U (12/08/2021)	ZAc 17,186
Kumba Iron Ore (KIOJ.J)	U (02/16/2015)	ZAc 51,984
Thungela Resources Ltd (TGAJ.J)	O (09/28/2021)	ZAc 8,950
Christopher Nicholson		
Anglo Platinum Limited (AMSJ.J)	U (11/17/2021)	ZAc 186,269
Implats Limited (IMPJ.J)	O (11/17/2021)	ZAc 23,329
Northam Platinum Limited (NPHJ.J)	O (07/07/2016)	ZAc 22,055
Royal Bafokeng Platinum Ltd (RBPJ.J)	E (11/17/2021)	ZAc 16,600
Sibanye-Stillwater (SSWJ.J)	E (11/06/2019)	ZAc 5,707
Dan Shaw		
AK Alrosa PAO (ALRS.MM)	U (06/22/2021)	RUB 118.20
Endeavour Mining (EDV.L)	E (09/10/2021)	1,600p
Erdemir (EREGL.IS)	O (12/02/2019)	TL 31.62
EVRAZ plc (EVRE.L)	O (09/17/2021)	604p
MMC NORILSK NICKEL PJSC (NKELYq.L)	E (12/08/2021)	US\$29.94
Novolipetsk Steel PAO (NLMKq.L)	E (05/28/2021)	US\$28.90
Polymetal International PLC (POLYP.L)	O (12/08/2021)	1,198p
Severstal' PAO (SVSTq.L)	E (03/24/2020)	US\$20.22
Jared Hoover		
AngloGold Ashanti Ltd (ANGJ.J)	E (03/23/2021)	ZAc 31,678
Gold Fields Limited (GFJ.J)	E (10/25/2019)	ZAc 16,735
Harmony Gold Mining Company Ltd (HARJ.J)	U (06/22/2021)	ZAc 5,995

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Carbon Steel

COMPANY (TICKER)	RATING (AS OF)	PRICE* (01/13/2022)
Alain Gabriel, CFA		
ArcelorMittal SA (MT.AS)	O (03/10/2016)	€32.94
Salzgitter AG (SZGG.DE)	U (12/08/2021)	€36.88
SSAB AB (SSABa.ST)	O (03/23/2021)	SKr 61.32
thyssenkrupp AG (TKAG.DE)	E (05/23/2021)	€10.76
voestalpine AG (VOES.V)	U (01/09/2020)	€34.84

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Gold and Precious Metals

COMPANY (TICKER)	RATING (AS OF)	PRICE* (01/13/2022)
Dan Shaw		
Centamin PLC (CEY.L)	E (03/07/2019)	91p
Polyus Gold (PLZLq.L)	E (12/08/2021)	US\$79.90

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Stainless Steel

COMPANY (TICKER)	RATING (AS OF)	PRICE* (01/13/2022)
Ioannis Masvoulas, CFA		
Acerinox SA (ACX.MC)	O (02/01/2021)	€12.80
Aperam SA (APAM.LS)	E (02/01/2021)	€55.50
Outokumpu Oyj (OUT1V.HE)	O (03/23/2021)	€6.48

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.