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metal&ROCK

The Price Deck – 1Q 2019

Landing lights

Supply split: Our 2019 price deck features price upside for most of the base metals through the first half, contingent upon a soft landing in China. Our economists expect policy easing (i.e. tax/RRR cuts; infrastructure capex) to generate results from 2Q19, supporting demand at a level sufficient to keep these supply-constrained markets tight. This contrasts with our bulk commodity forecasts, which feature declining prices through the year on strengthening seaborne supply and falling China steel output vs 2018's highs. We also see upside for precious metals markets – particularly gold – based on our economists' view of a weakening US dollar through 2019.

Commodity picks: On a 12-month view, copper remains our top commodity pick on zero supply growth which will be unable to keep pace even with slowing growth in demand (Exhibit 1). At the opposite end of the spectrum, metallurgical coal is our most bearish call – although it also features the biggest uplift in this price deck vs our previous view (+16%). We expect ongoing supply/logistics constraints to remain supportive through 1H19, before a recovery through the second half brings a sharp correction by year-end. Shorter-term, we see significant upside in 1Q19 vs spot for copper (on supply constraints); most near-term downside risk to alumina (on weak winter demand + strengthening supply). Of the other metals, weakness in aluminium and nickel market fundamentals now appears priced in, with upside emerging as inventories are drawn down through 2019; while zinc's return to surplus will weigh on its price later in the year.

Long-term prices, updated: We also adjust our long-term prices, which now apply in our deck from 2025. The result is a large uplift to our alumina, palladium and iron ore long-term price forecasts – the latter now based on a marginal cost analysis rather than incentive price, since we consider seaborne demand to be ex-growth. We downgrade our nickel, met coal and gold prices, on the inclusion of additional, lower-cost projects vs last year. Against consensus, we are most bullish on palladium in the long term; most bearish on iron ore and platinum (Exhibit 5). Full details are published today in MS metal&ROCK: Long-term prices – stimulating supply.

Key risks: A failure of MS economists' forecast soft landing in China and the absence of a trade agreement with the US would result in a severe downturn in global demand, driving prices to lows deep in the cost curves. Downside risk in this scenario is limited for aluminium and nickel, which are already trading below marginal cost, but pronounced across the rest of the space (Exhibit 118). Awareness of this potential bear case is likely, we think, to deter investor inflows until the impact of China's policy easing emerges, together with evidence of progress in trade talks. Upside risk stems from the opposite scenario – a trade agreement plus China stimulus, which lifts demand beyond current expectations.

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Exhibit 1: Commodity Thermometer: 12-month outlook

commodity	bearish		neutral			bullish	
Copper							
Gold/silver							
Nickel							
Aluminium							
Palladium							
Platinum							
Diamonds							
Cobalt							
Iron ore							
Steel							
Zinc/lead							
Alumina - spot							
Thermal coal							
Manganese ore							
Lithium							
Hard coking coal							

Source: Morgan Stanley Research

Note: Order of preference based on 4Q19 forecasts vs spot.

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Sector Outlook

Commodity preference, 12-month view

Rank	Commodity	MS comment
1	**Copper**	Flat mine supply growth will likely offset slower demand, resulting in a tighter market in 2019, which underpins our bullish price outlook.
2	**Gold/silver**	Morgan Stanley's macroeconomic forecasts of a weakening US dollar in 2019; a pause in US rate hikes in 2H19; and rising inflation are all bull factors for gold and silver prices.
3	**Nickel**	We don't foresee a quick recovery in nickel's price, but on a 12-month view the lack of mine investment and steady demand growth should tighten the market and drive upside from current lows.
4	**Aluminium**	Some supply-side reaction to low prices from China's smelters increases confidence in a modest price recovery by the end of 2019, despite weak autos demand.
5	**Palladium**	Tightening China emission standards add an extra boost to strong palladium demand, widening the market deficit and keeping price elevated through 2019.
6	**Platinum**	Soft demand and a lack of production cuts until 2020 mean the market will record another sizeable surplus in 2019, keeping the price low.
7	**Diamonds**	Slowing demand growth and midstream credit tightness take the shine off near-term, but long-term supply/demand balance remains attractive.
8	**Cobalt**	Supply troubles at Katanga may lend some price support through 1H19, but the broader ramp-up will outweigh demand growth – we expect a further correction through the second half of the year.
9	**Iron ore**	Growing seaborne supply will likely tip the market into surplus and put downward pressure on pricing through 2019.
10	**Steel**	Steel price dynamics have changed markedly in 2H18. Regional prices have pulled back amid supply/demand concerns. Cyclical risks increased as automotive sales appear to have peaked, while supply discipline is in the spotlight with the pace of capacity restarts/additions accelerating (notably US and Russia). However, spreads between steel prices and raw material costs are now at/below long-term averages, thus incentivising swing producers to scale back output. Our base case of a 'soft landing' calls for stabilising prices, as spreads are now close to their normalised levels.
11	**Zinc/lead**	By the end of 2019, we expect ramping zinc supply to have tipped the market back into surplus, bringing price to fresh lows.
12	**Alumina**	The restart of Alunorte should bring alumina's market back to balance in 2019, taking price back to the mid-$300s/t.
13	**Thermal coal**	We still see downside from spot, as seaborne market tightness eases in 2019 on lower imports from China and rising supplies from Australia.
14	**Manganese**	Supply/demand remain balanced, with some new supply toward the end of 2019 expected to loosen the market somewhat.
15	**Lithium**	Growing hardrock supply from Australia and brine expansions in Chile and China will continue to weigh on price through 2019, we believe, with any restocking-driven recovery in 1H19 giving way to weaker prices by year-end.
16	**Hard coking coal**	The seaborne market will return to balance in 2019, on rising supply from Australia + weaker demand from China. We expect a sharp correction in 2H19 from today's elevated price level.

Note: Commodities ranked 1 = most preferred to 16 = least preferred. Source: Morgan Stanley Research

Key Changes

Exhibit 2: Key changes to our commodity price forecasts

commodity group	unit	3Q 18	4Q 18e	1Q 19e	2Q 19e	2018e	2019e	2020e	2021e	LT real	LT nom.
Base Metals											
Aluminium	US$/lb	0.93	0.90	0.92	0.95	0.96	0.94	0.97	1.01	0.95	1.08
	US$/t	2,055	1,984	2,028	2,094	2,113	2,072	2,127	2,227	2,083	2,377
vs. previous forecast	%		*-6%*	*-5%*	*-2%*	*-2%*	*-4%*	*-2%*	*0%*	*2%*	*3%*
Copper	US$/lb	2.78	2.82	2.98	3.14	2.97	3.09	2.96	2.90	2.80	3.19
	US$/t	6,119	6,217	6,570	6,923	6,543	6,801	6,531	6,393	6,173	7,043
vs. previous forecast	%		*1%*	*-1%*	*0%*	*0%*	*0%*	*0%*	*0%*	*2%*	*3%*
Nickel	US$/lb	6.02	5.10	4.90	5.10	5.92	5.31	6.40	7.51	7.40	8.44
	US$/t	13,262	11,244	10,803	11,244	13,056	11,712	14,110	16,562	16,314	18,613
vs. previous forecast	%		*-15%*	*-18%*	*-16%*	*-3%*	*-12%*	*-1%*	*0%*	*-1%*	*0%*
Zinc	US$/lb	1.15	1.21	1.21	1.20	1.33	1.14	1.00	1.08	1.05	1.20
	US$/t	2,537	2,668	2,668	2,646	2,932	2,513	2,205	2,370	2,315	2,641
vs. previous forecast	%		*-2%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*1%*
Precious Metals											
Gold	US$/oz	1,213	1,225	1,250	1,280	1,268	1,295	1,295	1,290	1,140	1,301
vs. previous forecast	%		*0%*	*0%*	*0%*	*0%*	*2%*	*1%*	*0%*	*-3%*	*-1%*
Platinum	US$/oz	816	836	840	820	885	815	863	962	1,112	1,269
vs. previous forecast	%		*4%*	*2%*	*-4%*	*1%*	*-4%*	*-1%*	*-3%*	*-13%*	*-11%*
Bulks											
Iron Ore (fines 62% Fe, cfr N.China)	US$/t	67	71	66	63	69	62	58	60	55	63
vs. previous forecast	%		*14%*	*3%*	*2%*	*3%*	*2%*	*-3%*	*3%*	*10%*	*12%*
Hard Coking Coal (premium contract fob Aust.)	US$/t	190	214	209	207	210	192	145	132	124	141
vs. previous forecast	%		*13%*	*16%*	*22%*	*3%*	*16%*	*3%*	*-3%*	*-2%*	*-1%*
Thermal coal (spot, fob Newc)	US$/t	118	103	100	95	108	93	81	76	75	86
vs. previous forecast	%		*-2%*	*0%*	*6%*	*0%*	*7%*	*18%*	*15%*	*18%*	*16%*
Other											
Uranium (spot)		26	25	25	25	24	26	28	30	28	32
vs. previous forecast	%		*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*3%*	*1%*
Alumina (spot, fob Aust.)		542	440	410	380	471	375	343	348	355	405
vs. previous forecast	%		*-24%*	*2%*	*0%*	*-8%*	*3%*	*0%*	*0%*	*9%*	*10%*
Lithium (contract, fob Chile)		14,880	13,535	13,000	12,500	14,611	12,000	8,524	7,332	7,030	8,021
vs. previous forecast	%		*-6%*	*-5%*	*-2%*	*-1%*	*7%*	*0%*	*0%*	*0%*	*-1%*

Source: LME, Bloomberg, Platts, Morgan Stanley Research estimates (e)

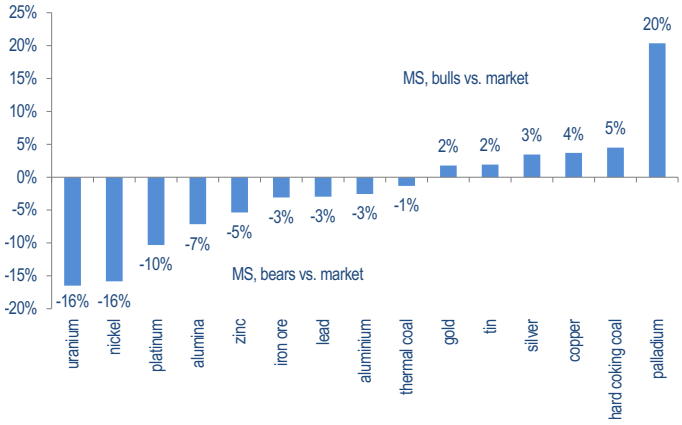
Price Forecasts versus Consensus

Exhibit 3: Morgan Stanley commodity price forecasts versus consensus

	unit	CY2019e MS	CY2019e consensus	CY2019e % diff	CY2020e MS	CY2020e consensus	CY2020e % diff	long-term REAL MS	long-term REAL consensus	long-term REAL % diff
Base Metals										
Aluminium	US$/t	**2,072**	2,127	-3%	**2,127**	2,152	-1%	**2,083**	2,112	-1%
Copper	US$/t	**6,801**	6,559	4%	**6,531**	6,877	-5%	**6,173**	6,369	-3%
Nickel	US$/t	**11,712**	13,915	-16%	**14,110**	14,604	-3%	**16,314**	15,303	7%
Zinc	US$/t	**2,513**	2,656	-5%	**2,205**	2,566	-14%	**2,315**	2,239	3%
Lead	US$/t	**2,111**	2,175	-3%	**2,094**	2,093	0%	**1,940**	1,881	3%
Tin	US$/t	**20,944**	20,552	2%	**23,700**	20,746	14%	**22,046**	18,785	17%
Alumina	US$/t	**375**	404	-7%	**343**	366	-7%	**355**	344	3%
Precious Metals										
Gold	US$/oz	**1,295**	1,272	2%	**1,295**	1,317	-2%	**1,140**	1,203	-5%
Silver	US$/oz	**16.75**	16.19	3%	**17.20**	17.22	0%	**19.50**	16.93	15%
Platinum	US$/oz	**815**	909	-10%	**863**	1,021	-16%	**1,112**	1,205	-8%
Palladium	US$/oz	**1,240**	1,030	20%	**1,215**	1,028	18%	**1,011**	712	42%
Bulks										
Iron Ore	US$/t	**62**	64	-3%	**58**	65	-10%	**55**	63	-13%
Hard Coking Coal	US$/t	**173**	165	5%	**145**	147	-2%	**124**	128	-3%
Thermal Coal	US$/t	**93**	94	-1%	**81**	79	2%	**75**	69	9%
Other Metals										
Uranium	US$/lb	**26**	31	-16%	**28**	34	-18%	**28**	34	-17%

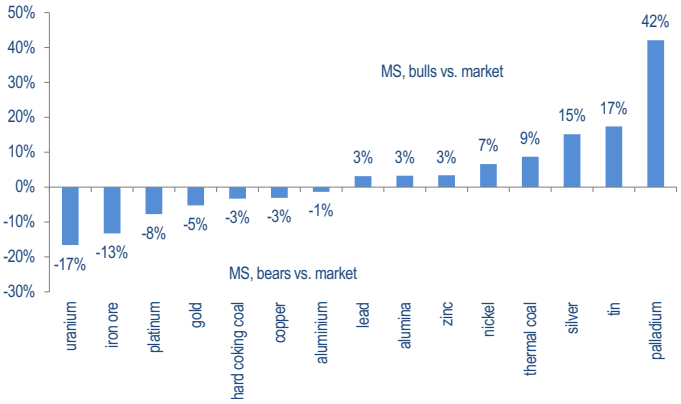
All prices are nominal, unless otherwise indicated; Bloomberg and Consensus Economics for market consensus estimates, Morgan Stanley Research estimates

Exhibit 4: Morgan Stanley vs consensus CY2019e



Source: All prices are nominal, unless otherwise indicated; Bloomberg and Consensus Economics for market consensus estimates; e = Morgan Stanley Research estimates

Exhibit 5: Morgan Stanley vs consensus LT real



Source: All prices are nominal, unless otherwise indicated; Bloomberg and Consensus Economics for market consensus estimates; e = Morgan Stanley Research estimates

Price Forecasts – Quarterly & Annual

Exhibit 6: Price forecasts – quarterly & annual

commodity group	unit	1Q 18	2Q 18	3Q 18	4Q 18	1Q 19e	2Q 19e	3Q 19e	4Q 19e	2018	2019e	2020e	2021e	2022e	2023e	LT real	LT nom.
Base Metals																	
Aluminium	US$/lb	0.98	1.03	0.93	0.90	0.92	0.95	0.94	0.95	0.96	0.94	0.97	1.01	1.03	1.05	0.95	1.08
	US$/t	2,153	2,261	2,055	1,984	2,028	2,094	2,072	2,094	2,113	2,072	2,127	2,227	2,271	2,315	2,083	2,377
Copper	US$/lb	3.16	3.12	2.78	2.82	2.98	3.14	3.12	3.10	2.97	3.09	2.96	2.90	3.04	3.10	2.80	3.19
	US$/t	6,958	6,877	6,119	6,217	6,570	6,923	6,878	6,834	6,543	6,801	6,531	6,393	6,697	6,834	6,173	7,043
Nickel	US$/lb	6.02	6.56	6.02	5.10	4.90	5.10	5.50	5.75	5.92	5.31	6.40	7.51	7.80	8.18	7.40	8.44
	US$/t	13,264	14,456	13,262	11,244	10,803	11,244	12,125	12,677	13,056	11,712	14,110	16,562	17,196	18,023	16,314	18,613
Zinc	US$/lb	1.55	1.41	1.15	1.21	1.21	1.20	1.10	1.05	1.33	1.14	1.00	1.08	1.14	1.16	1.05	1.20
	US$/t	3,410	3,112	2,537	2,668	2,668	2,646	2,425	2,315	2,932	2,513	2,205	2,370	2,502	2,557	2,315	2,641
Lead	US$/lb	1.14	1.08	0.95	0.90	0.98	0.95	0.95	0.95	1.02	0.96	0.95	0.95	0.98	0.98	0.88	1.00
	US$/t	2,516	2,383	2,096	1,984	2,161	2,094	2,094	2,094	2,245	2,111	2,094	2,094	2,161	2,161	1,940	2,213
Tin	US$/lb	9.60	9.49	8.76	9.00	9.50	9.50	9.50	9.50	9.21	9.50	10.75	11.00	11.00	11.00	10.00	11.41
	US$/t	21,155	20,930	19,315	19,842	20,944	20,944	20,944	20,944	20,310	20,944	23,700	24,251	24,251	24,251	22,046	25,153
Precious Metals																	
Gold	US$/oz	1,329	1,306	1,213	1,225	1,250	1,280	1,300	1,350	1,268	1,295	1,295	1,290	1,300	1,300	1,140	1,301
Silver	US$/oz	16.8	16.5	15.0	14.5	16.5	16.8	16.8	17.0	15.70	16.75	17.20	18.0	19.0	20.0	19.5	22.2
Platinum	US$/oz	979	907	816	836	840	820	800	800	885	815	863	962	1,062	1,162	1,112	1,269
Palladium	US$/oz	1,038	981	956	1,132	1,230	1,240	1,250	1,240	1,027	1,240	1,215	1,205	1,196	1,189	1,011	1,153
Bulks																	
Iron Ore (fines 62% Fe, cfr N.China)	US$/t	74	65	67	71	66	63	60	60	69	62	58	60	60	60	55	63
Hard Coking Coal (premium contract, fob Aust.)	US$/t	238	197	190	214	209	207	187	167	210	192	145	132	130	133	124	141
Thermal coal (spot, fob Newc)	US$/t	104	106	118	103	100	95	90	85	108	93	81	76	75	76	75	86
Other																	
Uranium (spot)	US$/lb	22	22	26	25	25	25	26	27	24	26	28	30	30	30	28	32
Alumina (spot, fob Aust.)	US$/t	384	519	542	440	410	380	360	350	471	375	343	348	350	392	355	405
Lithium (contract, fob Chile)	US$/t	14,607	15,422	14,880	13,535	13,000	12,500	11,500	11,000	14,611	12,000	8,524	7,332	7,699	7,861	7,030	8,021
Cobalt	US$/lb	37	40	30	33	33	30	26	24	35	28	22	20	18	20	23	26
Exchange Rates																	
1 AUD = USD		0.79	0.76	0.73	0.72	0.70	0.67	0.70	0.71	0.75	0.70	0.74	0.74	0.73	0.71	0.70	0.69
1 USD = BRL		3.25	3.60	3.94	3.92	3.70	3.70	3.75	3.58	3.68	3.68	3.55	3.63	3.70	3.77	3.40	3.88
1 USD = CAD		1.26	1.29	1.31	1.31	1.33	1.35	1.33	1.32	1.29	1.33	1.30	1.28	1.27	1.27	1.28	1.26
1 USD = ZAR		11.95	12.63	14.03	14.20	13.60	13.50	13.71	13.92	13.20	13.68	14.45	15.30	16.15	17.00	14.50	18.90
1 EUR = USD		1.23	1.19	1.16	1.14	1.14	1.15	1.15	1.16	1.18	1.15	1.17	1.18	1.20	1.22	1.29	1.24
1 USD = CNY		6.36	6.38	6.81	6.92	7.05	7.03	6.92	6.85	6.62	6.96	6.78	6.78	6.82	6.86	6.81	6.92

Source: LME, Bloomberg, Platts, Morgan Stanley Research estimates (e). Exchange rate forecasts are the assumptions that are compiled and used by Global Resources Equity Team; all prices are nominal, unless otherwise indicated.

Beyond Our Base Case

Bear Case

- As the economic cycle is matures, risks are skewed to the downside, with a possibility of global recession.
- China's private sector-focused policy easing is ineffective and doesn't result in a rebound in broad credit growth, translating into weaker demand in 2019.
- Trade tensions build, resulting in a 25% universal tariff from the US on all Chinese goods, weakening demand and disrupting global supply chains.
- China's supply reform programme isn't consistently enforced. This drives a return to capacity growth ahead of domestic demand.
- China's pollution control programme becomes less effective. Lack of enforcement at a local level means capacity/production expansions continue.

Bull Case

- China implements a stimulus package to counter the impact of US import tariffs on its domestic demand.
- China's supply reforms are effective and rolled out across its domestic industries.
- Significant easing of trade tensions, such as removal of tariffs, results in improved business confidence in China.
- The US delivers an effective, fully-funded infrastructure rebuild programme.
- China's pollution control programme is strongly enforced and further extended in future.

Exhibit 7: Beyond our base case

period	Aluminium			Copper			Nickel			Zinc			Lead			Tin		
	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear	Bull	Base US$/lb	Bear	Bull	Base US$/lb	Bear
2019	1.03	**0.94**	0.85	3.39	**3.09**	2.47	6.11	**5.31**	4.52	1.37	**1.14**	1.03	1.15	**0.96**	0.86	11.40	**9.50**	7.60
	2,280	**2,072**	1,865	7,481	**6,801**	5,441	13,469	**11,712**	9,955	3,016	**2,513**	2,262	2,533	**2,111**	1,900	25,133	**20,944**	16,755
2020	1.16	**0.97**	0.87	3.56	**2.96**	2.37	7.68	**6.40**	5.12	1.20	**1.00**	0.90	1.14	**0.95**	0.86	12.90	**10.75**	8.60
	2,553	**2,127**	1,915	7,837	**6,531**	5,225	16,931	**14,110**	11,288	2,646	**2,205**	1,984	2,513	**2,094**	1,885	28,440	**23,700**	18,960

period	Gold			Silver			Platinum			Palladium		
	Bull	Base US$/oz	Bear	Bull	Base US$/oz	Bear	Bull	Base US$/oz	Bear	Bull	Base US$/oz	Bear
2019	1,554	**1,295**	1,036	20.10	**16.75**	13.40	978	**815**	652	1,488	**1,240**	992
2020	1,554	**1,295**	1,036	20.64	**17.20**	13.76	1,035	**863**	690	1,459	**1,215**	972

period	Iron Ore (spot)			Hard Coking Coal (cont.)			Thermal Coal (spot)			Uranium (spot)		
	Bull	Base US$/t	Bear	Bull	Base US$/t	Bear	Bull	Base US$/t	Bear	Bull	Base US$/lb	Bear
2019	78	**62**	47	244	**192**	140	117	**93**	80	31	**26**	21
2020	73	**58**	44	188	**145**	116	106	**81**	73	34	**28**	22

Note: The 'case' refers to general scale/duration of economic growth; implied in any case for growth is the rate of industrial commodities consumption;
- for example, a bull case for economic growth implies a similarly bullish case for the rate of industrial commodities consumption;
- such a bullish outlook would typically (but not always) be inherently bearish for gold/silver, since the value of these metals relate primarily to changes in, and relative levels of, prevailing real interest rates/USD.
Source: Morgan Stanley Research estimates

Macro Outlook

Emerging Markets to the fore

Morgan Stanley's macroeconomists expect global growth to moderate to 3.6% in 2019, with the growth differential swinging back in favour of emerging markets (see 2019 Global Macro Outlook: Emerging Markets Retake the Lead, 25 Nov 2018). They expect developed market growth to slow in 2019, mainly driven by the US; while easing measures in China work, stabilising growth. They believe risks are skewed to the downside, with a bear case possibility of global recession. US corporate credit and trade tensions remain key concerns.

Morgan Stanley's **China** economists expect policy easing to kick in fully by 2Q19, supporting the private sector and infrastructure, stabilising growth from there following the 3Q18-1Q19 slowdown. This will take full-year growth from 6.6% year on year (YoY) in 2018 to 6.3% in 2019 (see 2019 China Economic Outlook: A Different Easing Cycle, 25 Nov 2018). Policy easing measures could lead to a modest rebound in broad credit growth, to 12.5% YoY by the end of 2019 (vs 11% YoY now), significantly milder than the 8ppt in previous easing cycles. A weaker USD could help contain CNY depreciation pressures, supporting USDCNY to reach 6.85 by end-2019. Over the longer term, our economists expect China to stay on the path of a soft landing and journey to high income, with GDP growth slowing to 6.1% YoY in 2020 and 5.5% YoY in 2021-23. The bear case is dictated by trade tensions, with a 25% universal tariff from the US on all Chinese goods dragging down growth by 1.3ppt, partly offset by more meaningful domestic easing.

In the **US,** fading tailwinds from tax stimulus and government spending account for a slowdown in our economists' forecast GDP growth from 2.9% YoY in 2018 to 2.3% in 2019 (2019 US Economic Outlook: Managing Neutral, 25-Nov 2018). Interest rate sensitive sectors of housing and autos aren't expected to contribute to GDP growth, while business investment remains sluggish and net trade is a drag. Further ahead, GDP is expected to re-accelerate in 2020 to an above-trend 1.9% YoY. The Fed manages monetary policy around neutral, hiking in March and June, but pausing by September 2019 in response to a slowing economy. In 2020, an overheating economy compels the Committee to move rates into restrictive territory, hiking four additional times, which brings the terminal rate to 3.875% by end-2020.

Our **Japan** economists trim their 2019 GDP forecast from 1.5% YoY to 1.3% YoY on slower growth in exports and a consumption tax hike from 8% to 10%, expected in Oct-19. After the tax hike, they expect real GDP growth to slow to +0.6% growth in 2020 (2019 Japan Economic Outlook: C-tax Hike to Bring Ups and Downs, 26-Nov 2018).

In **Europe**, Morgan Stanley's economists expect growth to moderate towards trend. Although they expect a short-term rebound as the temporary effect of auto industry weakness peters out, beyond that growth moderates on tighter capacity constraints and a worsening export outlook. They revise their GDP forecast down to 1.6% in 2019 (from 1.9%) and project a further slowdown in 2020 (1.5%). 2019 European Economic Outlook: Reverting to Trend, 25-Nov 2018.

Aluminium

Weighing weak demand

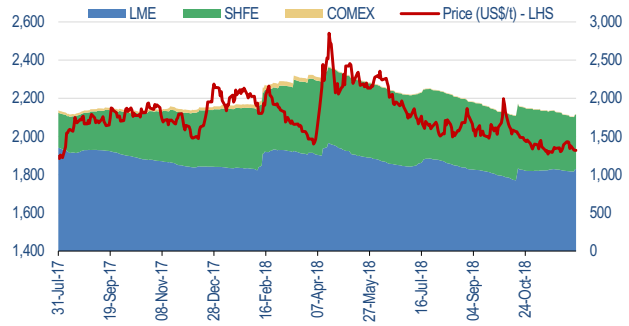
Cans kicked: Key policy concerns remain unresolved, but progress on US-China negotiations has bought extra time, raising hopes of resolution and easing pressure on the market. That should support the aluminium price, which has remained below marginal cost for much of 4Q18 ($1,980/t quarter to date (qtd)).

Smelters react: High closure costs, optimism for lower input prices and a tighter market in 2019 have prevented a large-scale supply reaction to the weak price. But 4Q18 saw some signs that China's smelters in particular were feeling the pinch, with a number of 'extended maintenance' closures announced and a fall in China's production rate to 36Mtpa (-1.1% YoY). Globally, though, US restarts and smelter expansions in India/ Norway/Middle East mean that output has continued to expand. These will be joined by start-ups of relocated smelters in China in 2019, such that output growth of 5.6% in 2019 (our estimate) is likely to outpace demand.

Inventory draw: The lower production rate has helped to absorb some of the market's excess inventory – both visible and hidden. The trouble is, demand has weakened too – the slowing global autos sector and weak China grid investment have contributed to softer demand growth in 2018 (we model 3.1%). A potential US-China trade deal and approval of new high-voltage state grid projects in China lend possible upside to our 2019 demand outlook (we assume 4.8%).

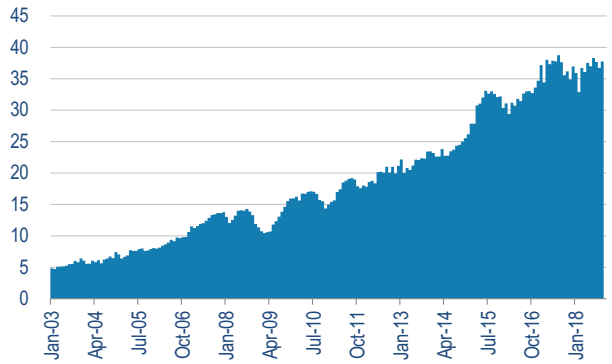
MS outlook: We believe 2018's market has been in modest deficit (we estimate -450kt), which has tightened the market. Visible inventory now totals 22 days' consumption, but we suspect there is still 3-4Mt of 'hidden' inventory, bringing the total stock:consumption ratio to 40 days (5.5 weeks). Without a strong rebound in demand, price is likely to remain close to marginal cost through 2019 (we forecast $2,072/t). We increase our long-term forecast to $2,083/t (real 2018$).

Exhibit 8: Aluminium exchange inventories vs LME price (kt, US$/t)



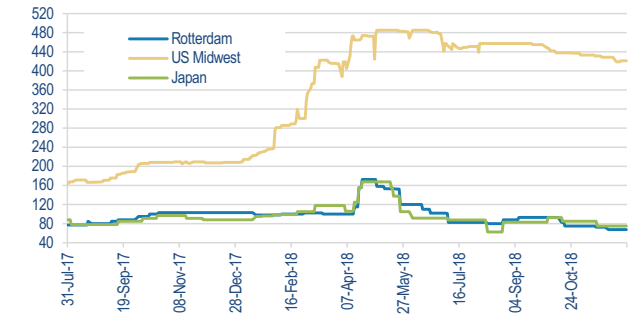
Source: Bloomberg, LME, SHFE, Comex, Morgan Stanley Research

Exhibit 9: China's monthly annualised aluminium production (Mt)



Source: China customs, Antaike, Morgan Stanley Research

Exhibit 10: Aluminium merchant premia ($/t)



Source: Bloomberg, Metal Bulletin, Morgan Stanley Research

Alumina

Supply constraints ease

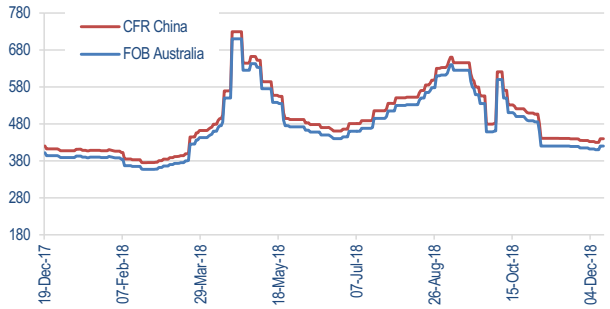
Back to earth: Smelter cutbacks and recovering bauxite supply eased pressure on alumina's market, bringing price back to $420/t (fob Aus), even before a restart of Alunorte's 3Mtpa of idled capacity, which we expect to begin ramping from 2Q18.

Balancing bauxite: The rise in China's domestic bauxite price (+40% year to date (ytd)) has seen its alumina refineries increasingly turn to imports for supply (+22% ytd) – and as high-quality alumina from Guinea continues to increase, the pressure on China's domestic refiners should be eased. Chalco has started construction of its Boffa mine in Guinea, which now accounts for almost 50% of China's total bauxite imports, and 10% of its total requirement. Nonetheless, China's domestic refiners have remained highly price-sensitive, cutting output further during 4Q18 as the price has fallen. Their responsiveness is likely to help form a floor under alumina's price as the market returns to balance in 2019.

China exports alumina: Despite production cuts, China's alumina exports have continued to rise (998kt ytd), replacing some of the shortfall from Alunorte in the rest of the world. Once Alunorte ramps in 2019, easing the ex-China deficit, we expect this trend to reverse, with China again becoming a net importer of alumina.

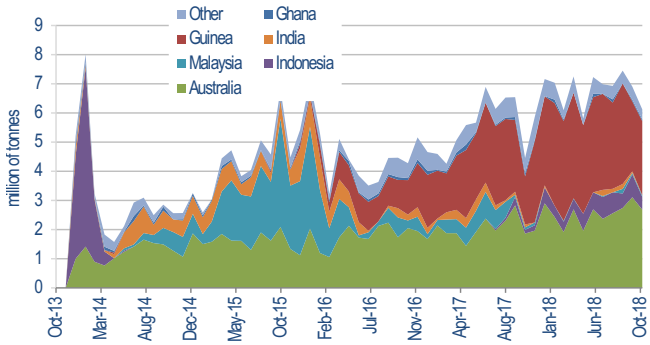
MS outlook: Following a substantial market deficit in 2018, we expect 2019 to bring alumina's market back to balance, with price falling to $350/t by the end of 2019 (we estimate $375/t 2019 average). We have also revisited our long-run price outlook, lifting our incentive price forecast to $355/t in real terms; $405/t nominal 2025.

Exhibit 11: Alumina spot price (US$/t)



Source: Bloomberg, Morgan Stanley Research

Exhibit 12: China bauxite imports by source (Mt)



Source: Bloomberg, Morgan Stanley Research

Exhibit 13: Alumina:aluminium price ratio (%)

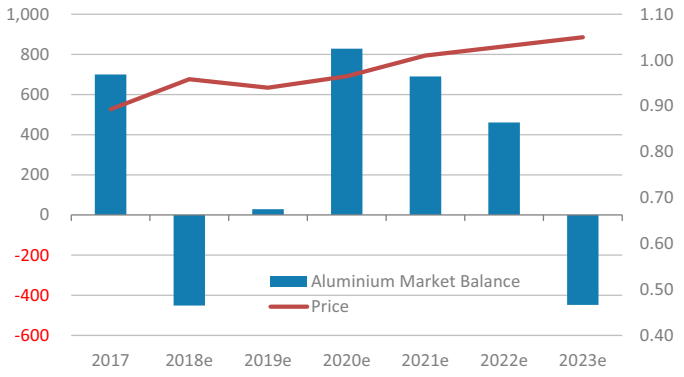
Source: Bloomberg, Morgan Stanley Research

Exhibit 14: Aluminium and alumina global supply-demand outlook

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
World Bauxite Production	Mt	**310**	**277**	**313**	**302**	**325**	**355**	**405**	**422**	**446**	**456**	**460**
World Smelter Grade Alumina Production	Mt	**101**	**105**	**111**	**112**	**124**	**123**	**135**	**144**	**154**	**158**	**162**
Chemical-grade production	Mt	6.8	7.0	6.8	7.4	7.8	7.2	7.1	7.6	8.1	8.3	8.5
total production	Mt	108	112	117	120	132	131	142	151	162	166	170
YoY change	%	*4.7%*	*3.9%*	*4.8%*	*2.0%*	*10.2%*	*-1.1%*	*8.9%*	*6.6%*	*6.7%*	*2.9%*	*2.4%*
World Metallurgical Alumina Consumption	Mt	**99**	**104**	**111**	**114**	**123**	**125**	**132**	**139**	**145**	**150**	**154**
YoY change	%	*5.0%*	*5.3%*	*6.4%*	*3.0%*	*8.0%*	*1.2%*	*5.6%*	*5.6%*	*4.1%*	*3.9%*	*2.4%*
Apparent Alumina Surplus/(Deficit)	Mt	**2.1**	**1.0**	**0.0**	**-1.5**	**1.2**	**-1.2**	**3.5**	**5.0**	**8.9**	**7.8**	**7.9**
Average Spot Alumina Prices	US$/t	**$367**	**$317**	**$301**	**$254**	**$346**	**$471**	**$375**	**$343**	**$348**	**$350**	**$392**
Australia'a average contract price	US$/t	$268	$271	$241	$241	$295	$322	$332	$340	$356	$363	$370
World Primary Aluminium Production	Mt	**50.7**	**53.3**	**56.7**	**58.4**	**63.1**	**63.9**	**67.4**	**71.2**	**74.1**	**77.0**	**78.9**
YoY change		*5.0%*	*5.3%*	*6.4%*	*2.9%*	*8.0%*	*1.2%*	*5.6%*	*5.6%*	*4.1%*	*3.9%*	*2.4%*
China primary production	Mt	25.0	27.5	30.5	31.6	36.0	36.1	38.3	40.7	42.7	44.9	46.0
YoY change		*10.9%*	*10.2%*	*10.5%*	*3.6%*	*14.0%*	*0.3%*	*6.2%*	*6.2%*	*5.0%*	*5.0%*	*2.5%*
non-China primary production	Mt	25.7	25.8	26.3	26.8	27.1	27.8	29.1	30.6	31.4	32.2	32.9
YoY change		*-0.2%*	*0.4%*	*1.9%*	*2.2%*	*1.0%*	*2.5%*	*4.9%*	*4.9%*	*2.8%*	*2.3%*	*2.4%*
World Primary Aluminium Demand	Mt	**50.1**	**53.9**	**56.2**	**58.6**	**62.4**	**64.3**	**67.4**	**70.4**	**73.4**	**76.54**	**79.33**
YoY change		*5.5%*	*7.6%*	*4.1%*	*4.4%*	*6.4%*	*3.1%*	*4.8%*	*4.4%*	*4.3%*	*4.2%*	*3.6%*
Regional Demand Breakdown												
China	Mt	23.9	26.6	28.4	30.3	33.4	34.4	36.4	38.5	40.7	42.9	44.9
India	Mt	1.7	1.8	1.9	2.0	2.2	2.4	2.5	2.7	2.8	3.0	3.2
USA	Mt	4.9	5.1	5.1	5.1	5.4	5.5	5.6	5.7	5.8	5.9	5.9
Europe	Mt	8.5	8.8	9.0	9.2	9.1	9.3	9.7	9.9	10.1	10.3	10.5
Japan	Mt	2.0	2.1	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1
ROW	Mt	9.1	9.5	9.7	9.9	10.3	10.7	11.1	11.5	11.9	12.3	12.7
Primary Aluminium Market Balance (before inventory)	Mt	**0.54**	**-0.58**	**0.58**	**-0.23**	**0.70**	**-0.45**	**0.03**	**0.83**	**0.69**	**0.46**	**-0.45**
Reported inventories	Mt	7.17	6.74	3.79	3.12	4.06	3.82	3.85	4.68	5.37	5.83	5.38
Change in reported inventories	Mt	-0.20	-0.43	-2.95	-0.67	0.94	-0.24	0.03	0.83	0.69	0.46	-0.45
Apparent change in off-warrant inventories	Mt	0.27	-0.89	3.68	-3.09	-0.67	0.02	0.21	0.00	0.00	0.00	0.00
Inventory-to-Consumption Ratio	wks	**7.46**	**6.52**	**3.52**	**2.78**	**3.39**	**3.10**	**2.98**	**3.46**	**3.81**	**3.97**	**3.54**
Primary Aluminium Market Balance	Mt	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.03**	**0.83**	**0.69**	**0.46**	**-0.45**
Price	US$/t	**$1,847**	**$1,866**	**$1,665**	**$1,605**	**$1,968**	**$2,113**	**$2,072**	**$2,127**	**$2,227**	**$2,271**	**$2,315**
	US$/lb	**$0.84**	**$0.85**	**$0.76**	**$0.73**	**$0.89**	**$0.96**	**$0.94**	**$0.97**	**$1.01**	**$1.03**	**$1.05**
US Mid-West premium	US$/t	**$245**	**$446**	**$285**	**$154**	**$191**	**$388**	**$400**	**$350**	**$350**	**$250**	**$200**
'all-in' US price	US$/t	**$2,093**	**$2,312**	**$1,950**	**$1,759**	**$2,159**	**$2,502**	**$2,472**	**$2,477**	**$2,477**	**$2,477**	**$2,471**
*Total exchange stocks, unwrought producer, consumer, port and merchant stocks at period end as reported by IAI & WBMS												
China's share of global aluminium production	%	49%	52%	54%	54%	57%	56%	57%	57%	58%	58%	58%
China's share of global aluminium demand	%	48%	49%	51%	52%	53%	53%	54%	55%	55%	56%	57%

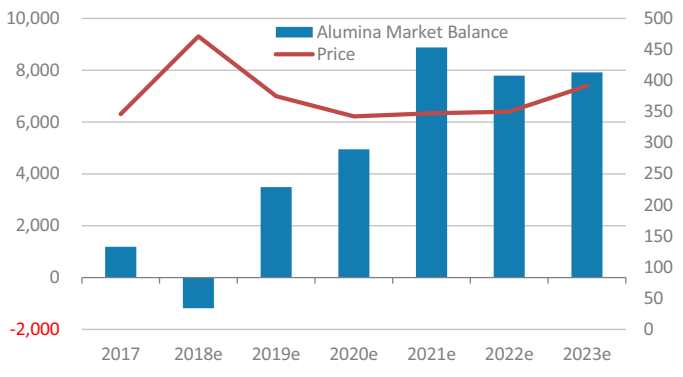
Source: IPAI, WBMS, Wood Mackenzie, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 15: Aluminium market balance, price outlook, kt; US$/lb



Source: IPAI, WBMS, Wood Mackenzie, Bloomberg, Morgan Stanley Research estimates (e)

Exhibit 16: Alumina market balance, price outlook, kt; US$/t



Source: Bloomberg, Morgan Stanley Research estimates (e)

Copper

Tightening up

Fair price: There's a perception in the market that copper is pricing in sentiment-driven weakness – but at around $2.80/lb, we see spot as a fair reflection of the market's balanced fundamentals.

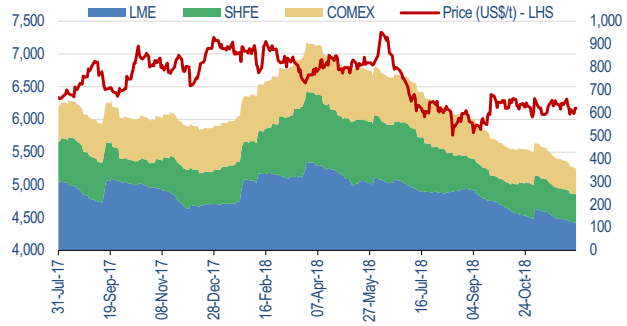
Slowing demand: China's refined copper demand grew >5% YoY through Jan-Nov 2018, as a shortfall of scrap, price-driven inventory build, and anticipated supply disruption boosted cathode demand above end-use growth (we model 2-3% ytd). That trend slowed during 4Q18, reflected in China's weakening cathode premia. Given high downstream inventory, we expect refined demand growth to remain muted over the coming months (we assume 1.9% in 2019).

Smelting showdown: Codelco's temporary closure of its Chuquicamata and Porterillos smelters to bring them into line with tougher emissions legislation is likely to tighten cathode supply in 1Q19. However, the ability to ship concentrate instead; ample smelting capacity within China; and soft demand mean we don't expect this to lead to a significant uplift in price in 1Q19.

Disruption reviewed: We retain a 5% disruption allowance on our 2019 copper mine supply estimates. Despite limited headline disruption in 2018, there have been losses (we estimate 3.1% ytd), and we see continued risks – even to our forecast shrinking mine supply (-0.4%). The start-up of Cobre Panama, Grasberg's transition, and potential labour disruption at Chuquicamta are all potential sources of weaker-than-expected supply in 2019 (Exhibit 22). Grade declines, power issues and weather-related disruption also remain key risks to copper's supply side.

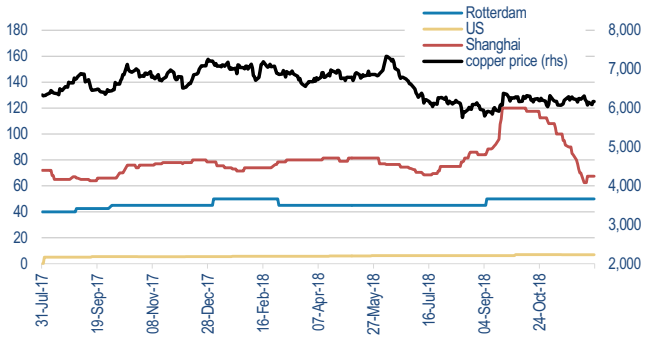
MS outlook: We see a deficit forming in 2019 as mine supply growth slows and demand grows around 2% YoY (we estimate). That should lift price to $3.09/lb in 2019, before a return to balance leads us to expect a continued trend towards our long-term forecast of $2.80/lb real 2018$ ($3.19/lb nominal 2025).

Exhibit 17: Copper exchange inventories vs LME price (kt, US$/t)



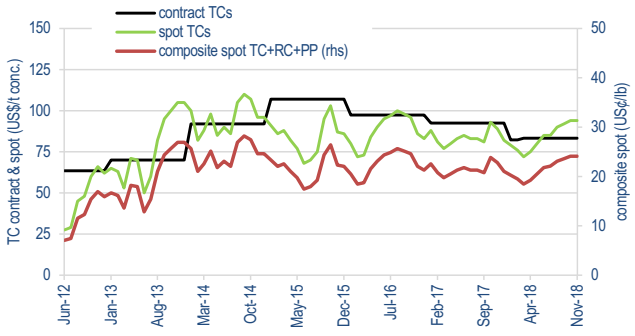
Source: Bloomberg, LME, SHFE, Comex, Morgan Stanley Research

Exhibit 18: Copper merchant premia (US$/t)



Source: Bloomberg, Morgan Stanley Research

Exhibit 19: Copper TC/RCs



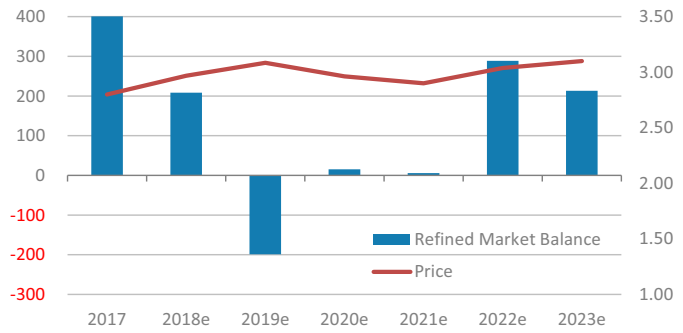
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 20: Copper global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
World Mine Production												
concentrates	Mt	14.2	14.4	15.1	16.2	16.3	16.9	17.5	18.2	18.9	19.6	20.1
SX/EW	Mt	3.7	3.7	3.8	3.8	3.7	3.7	3.8	3.8	3.6	3.6	3.4
disruption allowance	%						1.3%	5.0%	5.0%	5.0%	5.0%	5.0%
Total Mine Production	Mt	**18.1**	**18.4**	**19.1**	**20.2**	**20.2**	**20.6**	**20.5**	**21.1**	**21.6**	**22.3**	**22.6**
YoY change	%	*7.7%*	*1.6%*	*4.3%*	*5.7%*	*-0.3%*	*1.9%*	*-0.4%*	*3.1%*	*2.0%*	*3.3%*	*1.3%*
Concentrate balance		**0.4**	**-0.4**	**-0.1**	**0.0**	**-0.3**	**-0.5**	**-1.4**	**-1.8**	**-1.4**	**-0.6**	**-0.3**
TC/RC contract	US$/t,¢/lb	70/7	92/9.2	107/10.7	97.35/9.735	92.5/9.25	82.25/8.225	80.8/8.08	80/8	80/8	84/8.4	85.4/8.5
composite TC/RC/PP charge	US¢/lb	18.0	23.6	27.4	25.0	23.7	21.1	20.7	20.5	20.5	21.5	21.9
World Smelter Production												
primary	Mt	13.2	14.3	14.6	15.6	15.7	16.1	16.1	16.7	17.3	18.0	18.4
secondary	Mt	3.2	3.0	2.9	2.9	3.0	3.1	3.2	3.2	3.3	3.3	3.3
Total Smelter Production	Mt	**16.4**	**17.2**	**17.5**	**18.6**	**18.7**	**19.2**	**19.2**	**20.0**	**20.6**	**21.3**	**21.7**
imputed concentrate balance	Mt	0.4	-0.4	-0.1	0.0	-0.3	-0.5	-1.4	-1.8	-1.4	-0.6	-0.3
world refinery production												
electrowon	Mt	3.7	3.8	3.8	3.9	3.7	3.6	3.7	3.7	3.4	3.4	3.3
primary	Mt	15.6	16.4	16.8	17.7	17.8	18.3	18.3	19.0	19.6	20.3	20.8
secondary	Mt	1.6	1.6	1.6	1.4	1.7	1.8	1.8	1.8	1.8	1.8	1.8
Total Refinery Production	Mt	**20.9**	**21.8**	**22.2**	**23.0**	**23.2**	**23.7**	**23.8**	**24.4**	**24.8**	**25.5**	**25.9**
YoY change	%	*3.6%*	*4.1%*	*1.9%*	*3.5%*	*1.2%*	*2.2%*	*0.1%*	*2.8%*	*1.7%*	*2.8%*	*1.2%*
World Copper Demand	Mt	**20.8**	**21.7**	**22.0**	**22.6**	**22.8**	**23.5**	**24.0**	**24.4**	**24.8**	**25.3**	**25.6**
YoY change	%	*5.4%*	*4.1%*	*1.5%*	*2.8%*	*1.0%*	*3.1%*	*1.9%*	*1.9%*	*1.7%*	*1.7%*	*1.5%*
China demand		9.2	9.8	10.2	10.7	10.9	11.5	11.7	11.9	12.2	12.4	12.6
China's YoY change	%	*11.7%*	*6.4%*	*4.8%*	*4.9%*	*1.8%*	*5.5%*	*1.5%*	*2.0%*	*2.0%*	*1.9%*	*1.8%*
non-China's YoY change	%	*0.9%*	*2.3%*	*-1.1%*	*1.0%*	*0.4%*	*0.8%*	*2.2%*	*1.8%*	*1.4%*	*1.4%*	*1.3%*
Implied Market Balance (before inventory)	Mt	**0.11**	**0.13**	**0.20**	**0.36**	**0.40**	**0.21**	**-0.20**	**0.02**	**0.01**	**0.29**	**0.21**
Refined Stocks End of Period	kt	**906**	**756**	**935**	**983**	**971**	**804**	**605**	**620**	**626**	**915**	**1,128**
reported refined inventory change	kt	-153	-151	179	49	-12	-167	-199	15	6	289	213
apparent change in unreported inventories	kt	265	277	19	309	415	375					
Inventory-to-usage rate	wks	**2.3**	**1.8**	**2.2**	**2.3**	**2.2**	**1.8**	**1.3**	**1.3**	**1.3**	**1.9**	**2.3**
Market Balance	Mt	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**-0.20**	**0.02**	**0.01**	**0.29**	**0.21**
Price	US$/t US$/lb	**$7,332** **$3.33**	**$6,863** **$3.11**	**$5,513** **$2.50**	**$4,872** **$2.21**	**$6,172** **$2.80**	**$6,543** **$2.97**	**$6,801** **$3.09**	**$6,531** **$2.96**	**$6,393** **$2.90**	**$6,697** **$3.04**	**$6,834** **$3.10**
China's share of global refined copper production	%	30%	32%	33%	33%	37%	39%	41%	43%	43%	42%	42%
China's share of global refined copper demand	%	44%	45%	46%	47%	48%	49%	49%	49%	49%	49%	49%

Source: Wood Mackenzie, Bloomberg, ICSG, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 21: Copper market balance, price outlook (kt; US$/lb)



Source: WBMS, Bloomberg, Morgan Stanley Research estimates (e)

Exhibit 22: Mine supply – major gains/losses 2019

2019 gains	+kt	2019 losses	-kt
Cobre Panama	150	Grasberg	-294
Toquepala	84	Escondida	-75
Bingham Canyon	68	El Teniente	-47
Zaldivar	46	La Caridad	-39
Candelaria	45	Spence	-21
El Abra SxEw	45	Alumbrera	-21
Mopani	44	Quebrada Blanca	-17
Roan Tailings Retreat	40	Minto	-16
Centinela - Esperanza	40	KGHM mines	-14
Buenavista	37	Sepon/Khanong	-13

Source: Morgan Stanley Research estimates

Nickel

Price floored

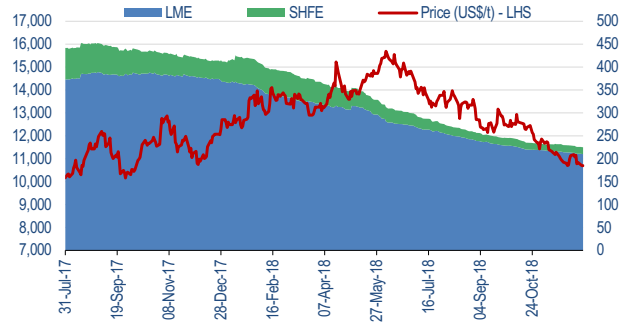
Deeper down: Nickel's price has continued to fall, trading below the marginal cost of production. This is partly sentiment-driven, but largely fundamental – the stainless market remains under pressure from Indonesia's rapidly growing supply and weak end-use demand; while nickel ore output continues to expand. Inventory, though, has continued to fall – now just 15kt remains on SHFE (211kt LME).

Back to the Philippines: The announcement that shuttered Filipino mines would be allowed to restart adds a potential 40ktpa to supply, which has already recovered 75ktpa since 2016. Together with abundant supply from Indonesia, that means China's industry is well stocked ahead of the coming wet season (Exhibit 25).

Stainless struggles: Tsingshan's cheap stainless has increasingly been diverted away from China, bringing some relief for domestic producers – Oct 2018 output grew 8% YoY. Combined with a lower nickel price, that is likely to boost 300 series output, which had been tracking -10% ytd. Over the full year 2018, we estimate China's nickel-in-stainless demand has fallen 2.5%. We expect this to stabilise in 2019.

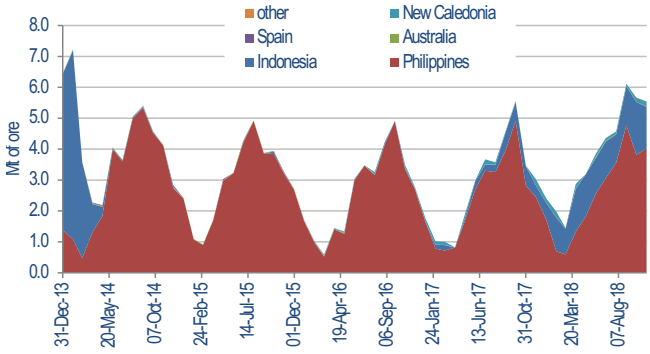
Supply still needed: Despite near-term demand weakness and abundant ore, a lack of mine investment means nickel's market doesn't appear oversupplied through the medium term; and as EV demand begins to recover and stainless absorbs the shock of low-cost Indonesian output, we expect price to recover to incentive levels, which we now estimate at $16,314/t (real 2018$) – the slight decline driven by the addition of Tsingshan's HPAL project (we estimate $12,425/t incentive price). Before then, though, nickel's price is likely to remain under pressure from weak demand and growing low-grade ore supply. We estimate $11,712/t in 2019; see MS metal&ROCK: Long-term prices – stimulating supply.

Exhibit 23: Nickel exchange inventories vs LME price (kt, US$/t)



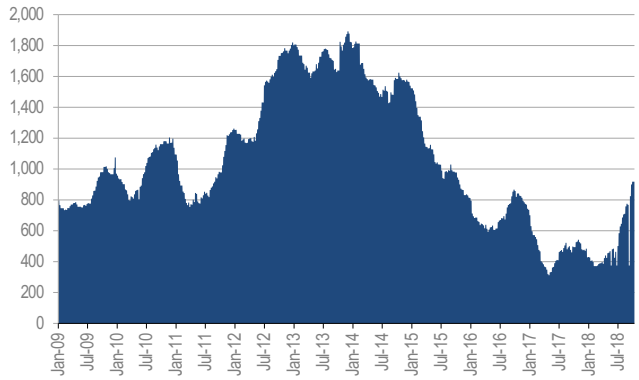
Source: Bloomberg, LME, SHFE, Comex, Morgan Stanley Research

Exhibit 24: China nickel-bearing ore imports



Source: Bloomberg, Morgan Stanley Research

Exhibit 25: Nickel laterite ore inventories, China (10kt)



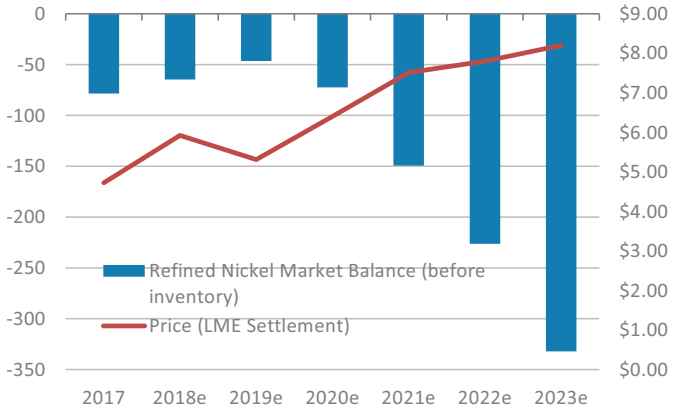
Source: Bloomberg, Morgan Stanley Research

Exhibit 26: Nickel global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Total Mine Production	kt	**2,351**	**1,951**	**2,054**	**1,933**	**2,080**	**2,260**	**2,433**	**2,523**	**2,515**	**2,291**	**2,228**
World mine production growth rate	%	8.7%	-17.0%	5.2%	-5.9%	7.7%	8.6%	7.6%	3.7%	-0.3%	-8.9%	-2.8%
Regional Mined Production Breakdown												
Indonesia	kt	825	174	219	276	422	545	613	638	665	470	420
Philippines	kt	241	447	467	342	372	418	457	467	467	467	467
Russia	kt	249	238	240	220	230	230	242	242	242	242	242
Canada	kt	218	209	201	226	209	198	198	199	186	177	182
New Caledonia	kt	75	110	117	146	141	152	169	174	182	182	182
Australia	kt	224	188	176	148	125	130	141	155	106	101	94
Brazil	kt	95	110	96	74	75	88	96	99	106	105	106
Total world primary availability	kt	**1,992**	**1,973**	**1,974**	**2,023**	**2,052**	**2,170**	**2,272**	**2,317**	**2,344**	**2,339**	**2,332**
World refined availability growth rate	%	13.4%	-0.9%	0.0%	2.5%	1.4%	5.8%	4.7%	2.0%	1.2%	-0.2%	-0.3%
Total world refined production	kt	1485	1538	1551	1536	1450	1465	1508	1542	1568	1566	1569
China NPI production	kt	**493**	**422**	**385**	**388**	**431**	**458**	**470**	**465**	**460**	**455**	**445**
Total World Nickel Demand	kt	**1,748**	**1,802**	**1,809**	**1,978**	**2,130**	**2,235**	**2,318**	**2,389**	**2,493**	**2,565**	**2,665**
Primary Nickel in Stainless	kt	1188	1224	1217	1367	1484	1551	1596	1612	1670	1697	1738
Primary Nickel in Non-Stainless (ex-EV)	kt	560	579	586	600	623	644	657	673	689	700	712
Nickel in EVs	kt			6	10	23	40	66	105	135	168	214
World Nickel Demand Growth	%	7.4%	3.1%	0.4%	9.3%	7.7%	4.9%	3.7%	3.1%	4.3%	2.9%	3.9%
China Nickel Usage Growth	%	18.6%	5.1%	0.7%	12.7%	6.5%	-1.1%	0.8%	-1.6%	-1.0%	-0.3%	2.1%
World ex-China Usage Growth	%	-2.5%	1.0%	-0.1%	5.5%	9.2%	12.0%	6.8%	7.6%	9.2%	5.5%	5.2%
Regional Usage Breakdown												
China	kt	906	952	959	1,081	1,151	1,138	1,148	1,129	1,118	1,114	1,138
USA	kt	120	121	113	114	129	136	138	143	151	153	156
Europe	kt	321	322	301	324	326	323	327	330	332	333	334
ROW	kt	401	407	436	458	524	639	706	787	893	965	1038
Refined Nickel Market Balance (before inventory)	kt	**244**	**171**	**165**	**46**	**-78**	**-65**	**-46**	**-72**	**-149**	**-226**	**-332**
Reported total commercial stocks	kt	**285**	**444**	**514**	**491**	**433**	**323**	**276**	**204**	**54**	**0**	**0**
Reported stock to consumption ratio	wks	**8.5**	**12.8**	**14.8**	**12.9**	**10.6**	**7.5**	**6.2**	**4.4**	**1.1**	**0.0**	**0.0**
Refined Nickel Market Balance	kt	**0**	**0**	**0**	**0**	**0**	**-65**	**-46**	**-72**	**-149**	**-226**	**-332**
Price (LME Settlement)	US$/t US$/lb	**$15,034** **$6.82**	**$16,891** **$7.66**	**$11,859** **$5.38**	**$9,594** **$4.35**	**$10,414** **$4.72**	**$13,056** **$5.92**	**$11,712** **$5.31**	**$14,110** **$6.40**	**$16,562** **$7.51**	**$17,196** **$7.80**	**$18,078** **$8.20**
China's share of global refined nickel production	%	36%	33%	30%	29%	29%	28%	27%	27%	26%	26%	26%
China's share of global refined nickel demand	%	52%	53%	53%	55%	54%	51%	49%	47%	45%	43%	43%

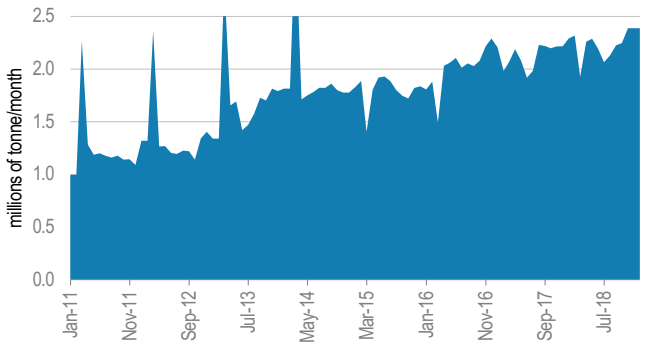
Source: Wood Mackenzie, Bloomberg, INSG, Morgan Stanley Research estimates (e)

Exhibit 27: Nickel market balance, price outlook (kt; US$/lb)



Source: Morgan Stanley Research estimates (e)

Exhibit 28: China's stainless steel production (Mt/month)



Source: Bloomberg, Morgan Stanley Research

Zinc

Edging into surplus

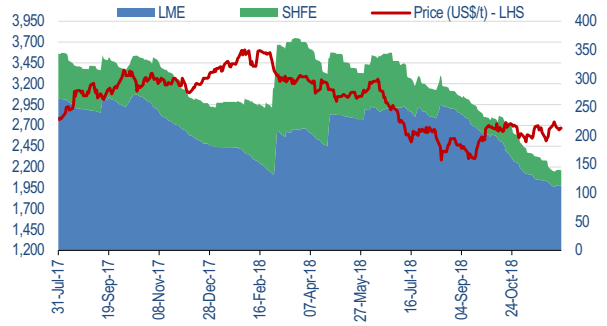
Price capped: Zinc's price has tracked sideways since its initial rebound in September 2018, averaging $2,644/t qtd. The return of the concentrate market to surplus – reflected in the rapid recovery in spot TCs (Nov 2018 160/t) – and weak downstream demand continue to limit price upside, despite a tight metal market and falling inventory.

Supply is growing: Major new zinc mines Century Tailings and Gamsberg have faced teething issues that have limited the pace of growth. However, MMG's Dugald River continues to perform well (145kt 2018e) and, together with recovering China mine output and growth from Peru, we see 5.4% growth in 2018; 6.6% in 2019. China's smelters, though, have remained under pressure, limiting downstream metal production (we model -0.7% in 2018), and keeping the metal market relatively tight.

Demand stalls: Galvanisers remain under pressure from environmental restrictions in China, and industry consolidation is resulting in new, more efficient plants, requiring less zinc per unit of galvanised steel. Meanwhile, the weak automotive sector is also impacting demand for zinc oxide, with one Chinese producer reporting demand down 50% month on month in Nov 2018. This weak demand is offsetting slow supply growth, preventing emergence of a downstream deficit.

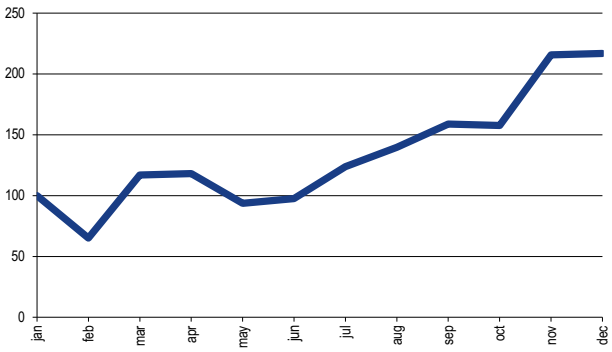
MS outlook: While supply is likely to remain tight through 1H19, limited demand growth will continue to weigh on the market and we now see little chance of a major lift in price before zinc's market returns to surplus in 2H19. Price will then drop towards $2,300/t; while TCs are likely to rise to around the $200/t level for 2019 annual contracts. Our long-term forecast remains unchanged at $2,315/t real 2018$.

Exhibit 29: Zinc exchange inventories vs LME price (kt, US$/t)



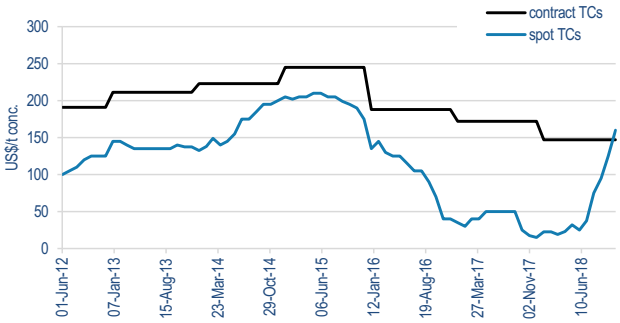
Source: Bloomberg, LME, SHFE, Morgan Stanley Research

Exhibit 30: China's monthly zinc imports - composite index



Source: China Customs, Antaike, Morgan Stanley Research

Exhibit 31: Zinc TCs



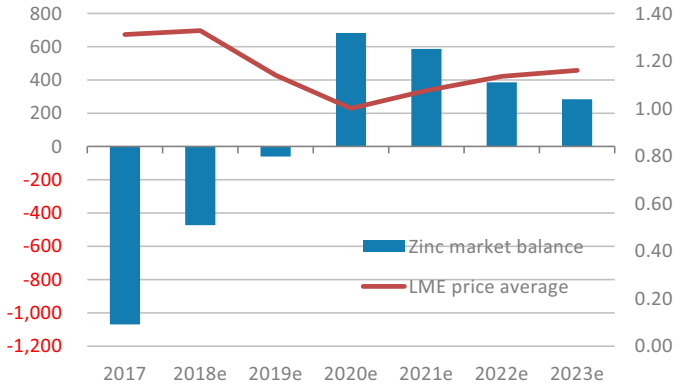
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 32: Zinc global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
World Mine Production	Mt	**12.9**	**13.0**	**12.5**	**11.9**	**12.7**	**13.4**	**14.2**	**14.8**	**15.0**	**14.8**	**14.7**
YoY change	%	*1.2%*	*0.6%*	*-3.4%*	*-4.6%*	*6.1%*	*5.8%*	*5.9%*	*4.2%*	*1.0%*	*-0.8%*	*-0.8%*
concentrate balance	Mt	397	117	-744	-1,033	-280	227	537	468	565	423	144
treatment charge	US$/t	209	237	245	191	172	147	175	195	190	190	194
World Metal Production												
Primary Metal Production	Mt	11.8	12.1	12.5	11.8	12.0	12.5	12.9	13.9	14.1	14.2	14.3
Secondary Metal Production	Mt	1.1	1.1	1.2	1.2	1.3	1.3	1.5	1.5	1.5	1.5	1.5
Total Metal Supply	Mt	**12.9**	**13.2**	**13.7**	**13.0**	**13.2**	**13.8**	**14.4**	**15.4**	**15.6**	**15.7**	**15.8**
World Metal Demand	Mt	**13.3**	**13.9**	**13.9**	**14.1**	**14.3**	**14.2**	**14.5**	**14.7**	**15.0**	**15.3**	**15.5**
YoY change	%	*4.0*	*4.4*	*0.0*	*1.1*	*1.8*	*-0.6*	*1.6*	*2.0*	*1.8*	*1.8*	*1.7*
China's YoY change	%	8.2	6.9	2.1	2.8	1.0	-3.0	1.5	2.0	1.8	1.7	1.6
non-China's YoY change	%	0.7	2.3	-1.8	-0.5	2.5	1.6	1.6	1.9	1.9	1.9	1.8
Regional Demand Breakdown												
China	Mt	6.1	6.5	6.6	6.8	6.9	6.7	6.8	6.9	7.0	7.1	7.3
BRI (Brazil, Russia, India)	Mt	1.1	1.1	1.0	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.5
USA	Mt	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Europe	Mt	2.2	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5
ROW	Mt	2.8	3.0	2.9	2.8	3.0	3.0	3.0	3.1	3.1	3.2	3.2
Implied Market Balance (before inventory)	Mt	**-0.39**	**-0.68**	**-0.22**	**-1.07**	**-1.07**	**-0.47**	**-0.06**	**0.68**	**0.59**	**0.39**	**0.28**
Inventories												
Reported commercial inventories	Mt	1.48	1.19	1.09	1.02	0.66	0.53	0.47	1.15	1.74	2.12	2.41
Inventory-to-demand ratio	wks	5.8	4.5	4.1	3.8	2.4	1.9	1.7	4.1	6.0	7.2	8.1
Market Balance	Mt	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**-0.06**	**0.68**	**0.59**	**0.39**	**0.28**
Price (LME)	US$/t US$/lb	**$1,910** **$0.87**	**$2,161** **$0.98**	**$1,931** **$0.88**	**$2,092** **$0.95**	**$2,891** **$1.31**	**$2,926** **$1.33**	**$2,513** **$1.14**	**$2,205** **$1.00**	**$2,370** **$1.08**	**$2,502** **$1.14**	**$2,557** **$1.16**
China's share of global refined zinc production	%	40%	43%	43%	45%	45%	43%	45%	44%	45%	45%	46%
China's share of global refined zinc demand	%	45%	47%	48%	48%	48%	47%	47%	47%	47%	47%	47%

Source: Wood Mackenzie, Bloomberg, ILZSG, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 33: Zinc market balance, price outlook (kt; US$/lb)



Source: Morgan Stanley Research estimates (e)

Exhibit 34: Zinc mine supply – key changes, 2019

2019 gains	+kt	2019 losses	-kt
China mines	356	Red Dog	-45
Gamsberg	175	Pend Oreille	-30
Century tailings	150	Bisha	-20
Hindustan Zinc min	118	Black Mountain	-13
Penasquito	50	Golden Grove	-10
Mount Isa	30	Aguas Tenidas	-8
Woodlawn Tailings	28	Bayern	-5
Castellanos	25	San Cristobal	-5
Myra Falls	25	Rosebery	-5
Skorpion	20	Akzhal	-5

Source: Morgan Stanley Research

Lead

Demand doldrums

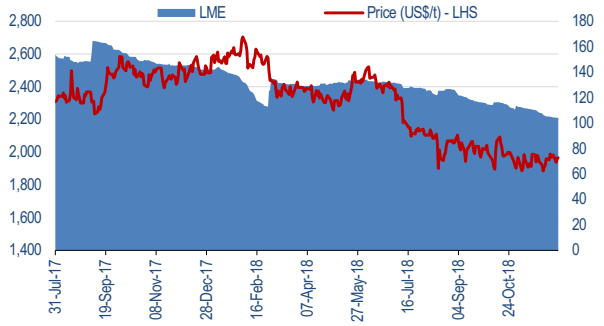
Stalled price: Like zinc, lead's falling exchange inventory (104kt; -143kt qtd) has failed to translate into a higher price, with macro threats and a weakening autos sector keeping the market subdued through 4Q18 ($1,964/t qtd).

Demand trends lower: The weakening global autos market has continued to limit demand for lead, keeping a lid on price. China's LAB output fell 1% YoY over Jan-Sep 2018; and the continued decline in automotive sales (-12% YoY in Sept-Oct 2018) is likely to translate to further weakness over the coming months.

Supply constraints: Lead's spot TC still sits at around $20/t, suggesting concentrate availability has yet to ease. However, with smelter maintenance + environmental inspections largely complete, China's metal output picked up to 447kt in Oct 2018 (+5% YoY) – recovering just as demand began to weaken. Elsewhere, high emissions levels at Nyrstar's 200ktpa Port Pirie smelter resulted in the temporary closure of the sinter plant in Dec 2018, although the impact on the smelter's lead output is unclear (we estimate 179kt 2018; 192kt 2019).

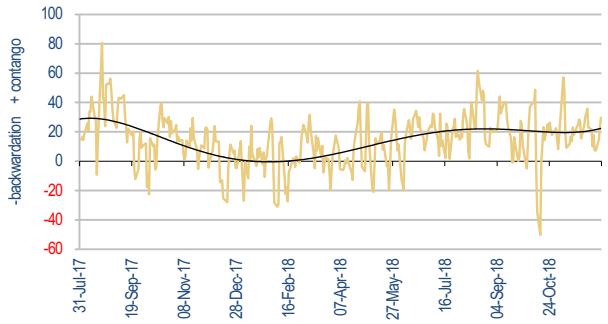
MS outlook: Like zinc, lead's weak demand is limiting the likelihood of a price recovery before mine supply growth brings lead's market back to balance in 2019. We maintain our price forecast at $2,111/t 2019; $1,940/t long-term real ($2,213/t 2025 nominal).

Exhibit 35: Lead exchange inventories vs LME price (kt, US$/t)



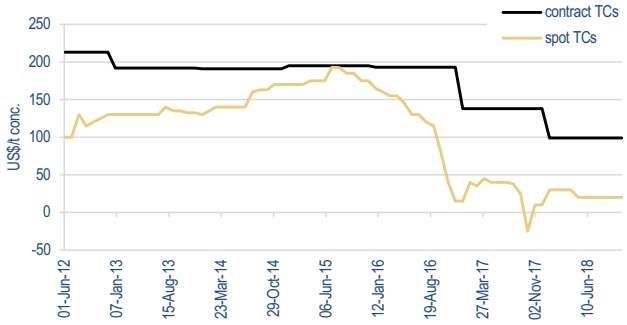
Source: Bloomberg, LME, Morgan Stanley Research

Exhibit 36: Lead: cash to 3-month (US$/t)



Source: Bloomberg, 3-day moving average

Exhibit 37: Lead TCs



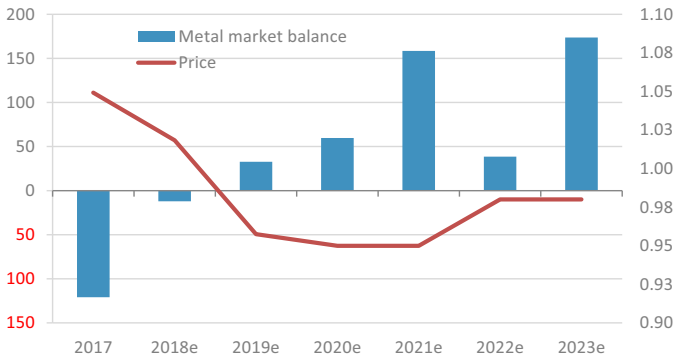
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 38: Lead global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
World Mine Production	Mt	**5.2**	**5.2**	**5.1**	**4.9**	**5.1**	**5.3**	**5.4**	**5.7**	**5.9**	**6.0**	**6.4**
YoY change	%	*10.7%*	*-0.2%*	*-2.5%*	*-3.3%*	*4.3%*	*4.0%*	*2.0%*	*5.4%*	*3.4%*	*1.9%*	*5.6%*
concentrate balance	Mt	172	-244	-44	-717	-1,112	-1,195	-1,184	-970	-715	-596	-246
treatment charge	US$/t	200	197	219	207	157	99	151	194	194	201	205
World Refined Production												
Primary Refined Production	Mt	5.5	5.7	5.6	5.6	5.6	5.8	5.9	6.1	6.4	6.5	6.8
Secondary Refined Production	Mt	5.8	6.0	6.1	6.4	6.6	6.8	7.1	7.1	7.1	7.1	7.1
Total Refined Supply	Mt	**11.3**	**11.7**	**11.8**	**12.0**	**12.3**	**12.5**	**12.8**	**13.1**	**13.4**	**13.6**	**13.9**
World Refined Demand	Mt	**11.3**	**11.7**	**11.7**	**12.1**	**12.4**	**12.5**	**12.8**	**13.0**	**13.3**	**13.5**	**13.7**
YoY change	%	4.6	3.3	0.4	2.0	2.3	2.1	2.4	2.1	2.0	0.8	2.6
China's YoY change	%	8.1	4.7	-2.0	2.9	1.1	2.2	1.8	1.5	1.2	0.8	0.5
non-China's YoY change	%	2.1	2.6	2.0	3.4	4.0	0.4	2.3	2.2	2.3	2.4	2.4
Regional Demand Breakdown												
China	Mt	5.1	5.4	5.3	5.4	5.5	5.6	5.7	5.8	5.9	5.9	5.9
BRI (Brazil, Russia, India)	Mt	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.9
USA	Mt	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Europe	Mt	1.7	1.8	1.8	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.2
ROW	Mt	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.2
Market Balance (before inventory)	Mt	**0.06**	**0.04**	**0.02**	**-0.07**	**-0.12**	**-0.01**	**0.03**	**0.06**	**0.16**	**0.04**	**0.17**
Inventories												
Reported commercial inventories	Mt	0.09	0.06	0.01	0.03	0.04	0.01	0.04	0.10	0.19	0.16	0.26
Inventory-to-demand ratio	wks	0.4	0.3	0.1	0.1	0.2	0.0	0.2	0.4	0.7	0.6	1.0
Market Balance	Mt	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.03**	**0.06**	**0.09**	**-0.03**	**0.10**
Price (LME)	US$/t US$/lb	**$2,139** **$0.97**	**$2,094** **$0.95**	**$1,788** **$0.81**	**$1,867** **$0.85**	**$2,313** **$1.05**	**$2,245** **$1.02**	**$2,111** **$0.96**	**$2,094** **$0.95**	**$2,094** **$0.95**	**$2,161** **$0.98**	**$2,161** **$0.98**
China's share of global refined lead production	%	64%	66%	65%	73%	79%	81%	81%	79%	76%	75%	71%
China's share of global refined lead demand	%	45%	46%	45%	45%	44%	45%	45%	44%	44%	44%	43%

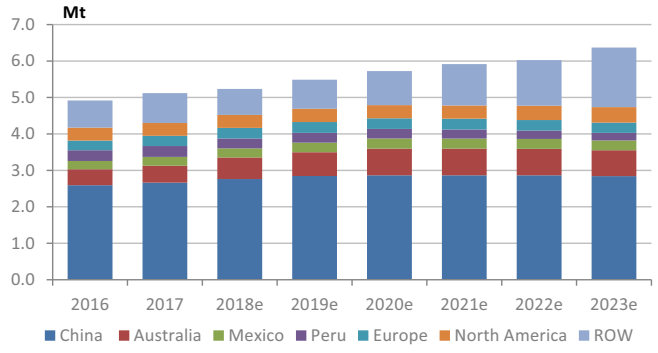
Source: Wood Mackenzie, Bloomberg, ILZSG, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 39: Lead market balance, price outlook (kt; US$/lb)



Source: Morgan Stanley Research estimates (e)

Exhibit 40: Lead mine supply by region



Source: Wood Mackenzie, Bloomberg, Morgan Stanley Research Estimates (e)

Gold

Warming up

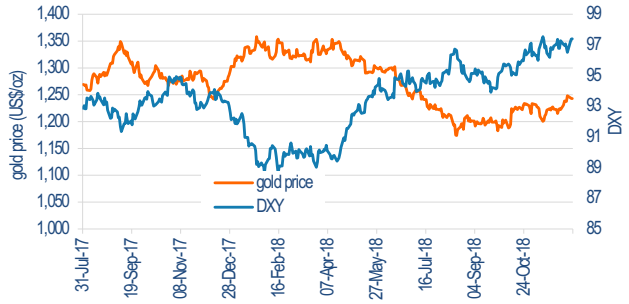
Finding support: Gold's creep higher through 4Q18 ($1,245/oz; +5%qtd), despite continued US dollar strength, reflects a fall in real rates and thawing sentiment towards the precious metal, seen in a slight uptick in ETF holdings and a decline in CFTC short positioning.

Bullish macro environment: MS economists' 2019 forecasts of a weakening US dollar, rising inflation, and a pause in rate hikes in 2H19 are all likely to drive investors back towards gold in 2019, we believe, together with our strategists' view that US equity upside is limited due to tightening financial conditions and decelerating growth. Meanwhile, the recent increase in gold purchases by central banks – particularly Russia, Kazakhstan and Central European banks (total +352t ytd; +22% YoY) – lends additional support to price. This trend appears likely to persist into 2019.

But physical buying mixed: Through 3Q18, gold's lower price encouraged increased demand for bar & coin and jewellery sales, particularly in India and China. But there are signs that 4Q18's price lift reversed that trend – at least in India – where gold imports dropped by almost half in Nov 2018. Electronics demand has been stronger than expected, with increased gold use on rising semiconductor shipments (Oct 2018 + 12% YoY). Headwinds are building, though, with tightening environmental regulations in China and US-China trade tensions key risks to electronics demand in 2019.

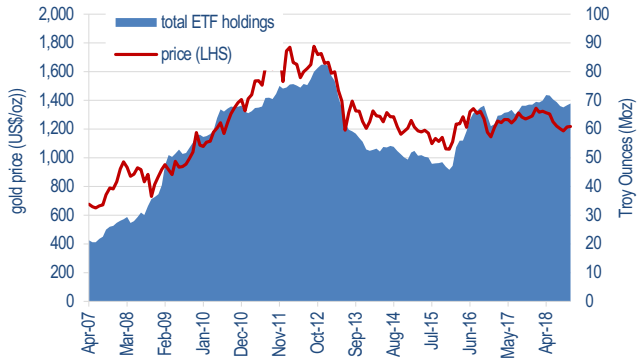
MS outlook: We expect increasingly supportive macroeconomic conditions to lift gold's price through 2019, and we raise our forecast to $1,295/oz 2019, with a peak of $1,350/t in 4Q19. We lower our long-term forecast slightly in real terms to $1,140/oz real 2018$ ($1,301/t nominal 2025); MS metal&ROCK: Long-term prices – stimulating supply.

Exhibit 41: US$ gold price vs DXY



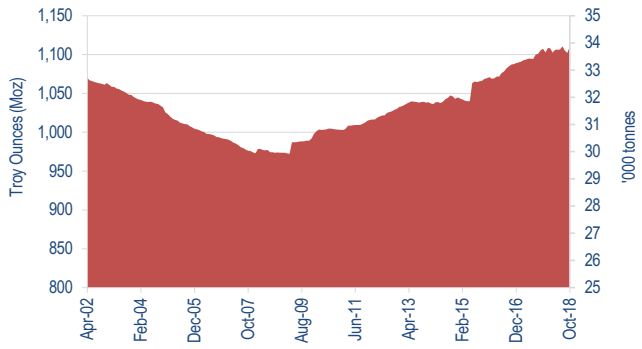
Source: Bloomberg, Morgan Stanley Research

Exhibit 42: Gold's total ETF holdings worldwide



Source: Bloomberg, Morgan Stanley Research

Exhibit 43: IMF estimated central bank gold holdings



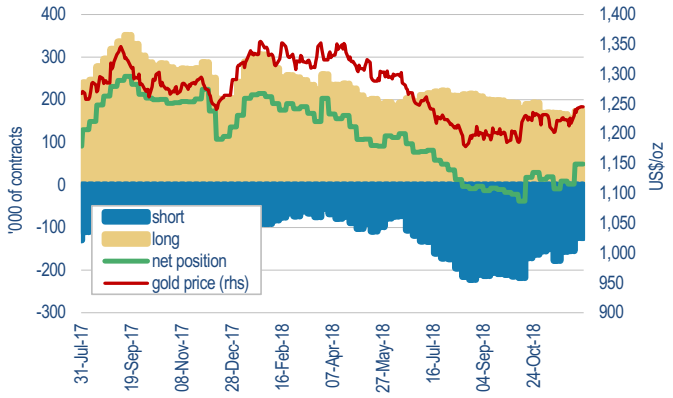
Source: Bloomberg, Morgan Stanley Research

Exhibit 44: Gold global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Supply												
Total Mine Supply	tonnes	2868	3049	3122	3171	3259	3176	3226	3277	3330	3385	3442
YoY change	%	6%	6%	2%	2%	3%	-3%	2%	2%	2%	*1.6*	*1.7*
Scrap supply	tonnes	1263	1191	1117	1292	1168	1175	1187	1199	1211	1223	1235
YoY change	%	-25%	-6%	-6%	16%	-10%	1%	1%	1%	1%	*1.0*	*1.0*
Official sector net sales/(purchases)	tonnes	-624	-584	-577	-390	-375	-469	-483	-497	-512	-528	-543
YoY change	%	10%	-6%	-1%	-32%	-4%	25%	3%	3%	3%	*3.0*	*3.0*
Net producer hedging	tonnes	-28	105	13	33	-28	3	3	3	3	4	4
Total Supply	tonnes	**3,480**	**3,761**	**3,676**	**4,106**	**4,025**	**3,885**	**3,933**	**3,982**	**4033**	**4084**	**4137**
YoY change	%	-8%	8%	-2%	12%	-2%	-3%	1%	1%	1%	1%	1%
Demand												
Carat Jewellery	tonnes	2669	2481	2404	2066	2194	2196	2218	2241	2264	2288	2312
YoY change	%	23%	-7%	-3%	-14%	6%	0%	1%	1%	1%	*1.0*	*1.1*
Electronics	tonnes	250	278	262	256	266	274	282	290	299	308	317
YoY change	%	-6%	11%	-6%	-2%	4%	3%	3%	3%	3%	3%	3%
Dental	tonnes	23	20	19	18	17	16	16	15	15	14	14
YoY change	%	-19%	-13%	-5%	-5%	-6%	-3%	-3%	-3%	-3%	*-3.0*	*-3.0*
Official Coins, Medals & Imitation coins	tonnes	367	281	296	272	263	298	323	351	381	413	448
YoY change	%	23%	-23%	5%	-8%	-3%	13%	8%	8%	8%	*8.5*	*8.5*
Total Fabrication Demand	tonnes	**3,309**	**3,059**	**2,981**	**2,612**	**2,740**	**2,785**	**2,840**	**2,898**	**2959**	**3024**	**3092**
YoY change	%	20.1%	-7.6%	-2.6%	-12.4%	4.9%	1.6%	2.0%	2.0%	2.1%	2.2%	2.3%
change in ETF Holdings	tonnes	-917	-108	-118	677	-35	13	150	100	50	-50	-50
Bar Hoarding	tonnes	1340	762	790	797	779	782	786	778	762	747	732
YoY change	tonnes	-251	48	23	20	541	306	158	207	261	364	364
Total Investment Demand	%	**171**	**702**	**695**	**1,494**	**1,285**	**1,101**	**1,094**	**1,084**	**1074**	**1061**	**1046**
YoY change	%	-83%	311%	-1%	115%	-14%	-14%	-1%	-1%	-1%	19%	18%
Total Demand (fabrication + investment)	tonnes	**3,480**	**3,761**	**3,676**	**4,106**	**4,025**	**3,885**	**3,933**	**3,982**	**4,033**	**4,084**	**4,137**
Gold Price	US$/oz	**1,412**	**1,266**	**1,160**	**1,248**	**1,257**	**1,268**	**1,295**	**1,295**	**1,290**	**1,300**	**$1,300**

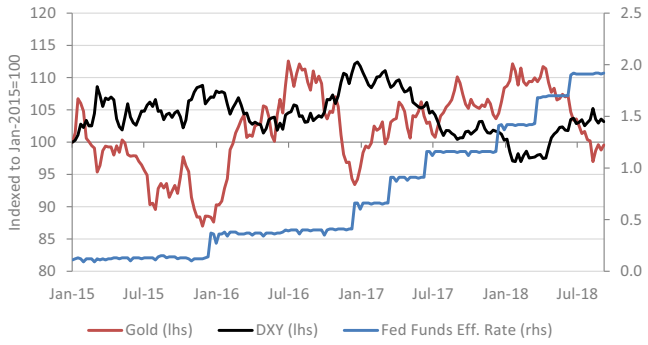
Source: WGC, WBMS, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 45: Gold CFTC- Commitment of Traders- Non- Commercial Positions



Source: Bloomberg, Morgan Stanley Research

Exhibit 46: Gold price vs Fed rate hikes & DXY



Source: Bloomberg, Morgan Stanley Research

Silver

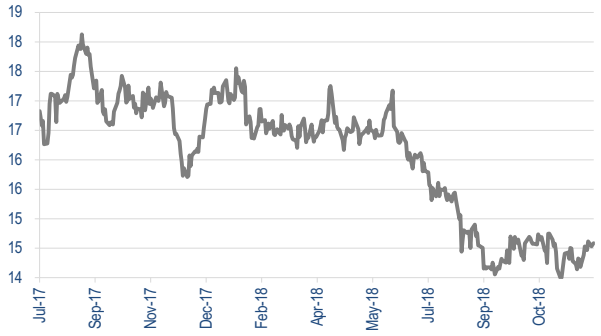
Positioned for a rebound

Stuck in a rut: Silver's traded in a tight $14-14.75/oz range during 4Q18, gaining just 0.5% through the quarter vs a 5% lift in gold's price. Unlike gold, CFTC positioning has remained net short (Exhibit 51), and there have been limited inflows into ETFs during the quarter, as trade tensions have continued to deter investors despite warming macro sentiment towards gold. As a result, the gold-silver ratio remained stubbornly around 85.

Industrial drag: The drag on silver's fabrication demand in 2018 (we estimate -4.4% YoY) has partly arisen from subsidy reductions and capacity limits for China's photovoltaics industry, as well as anti-dumping duties imposed by Japan and the US. However, as the industry adjusts to the new order, demand should pick up into 2019. Elsewhere, soft jewellery demand in China and India, and weak physical bar & coin demand earlier in the year have also weighed – although the latter has begun to recover during 4Q18, with the US Mint reporting increased sales of silver bullion coins.

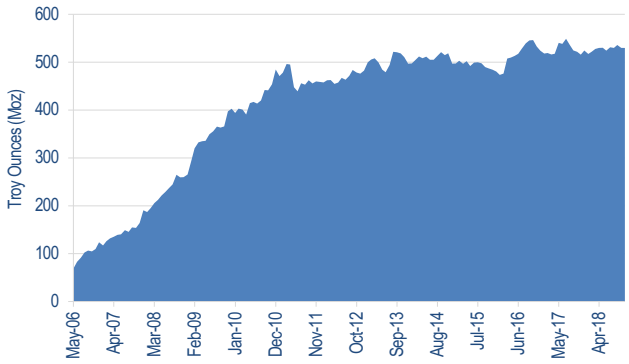
MS outlook: We still expect a rebound in silver's price in 2019 as the macroeconomic backdrop becomes more favourable (see Gold). We forecast $16.75/lb in 2019; $19.50/lb long-term real 2018$.

Exhibit 47: Silver spot price (US$/oz)



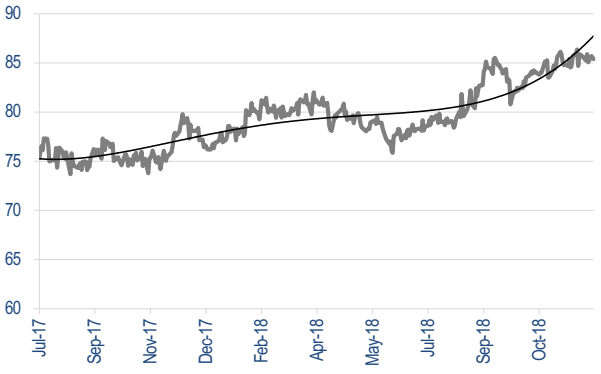
Source: Bloomberg, Morgan Stanley Research

Exhibit 48: Silver's total ETF holdings worldwide



Source: Bloomberg, Morgan Stanley Research

Exhibit 49: Gold:silver price ratio



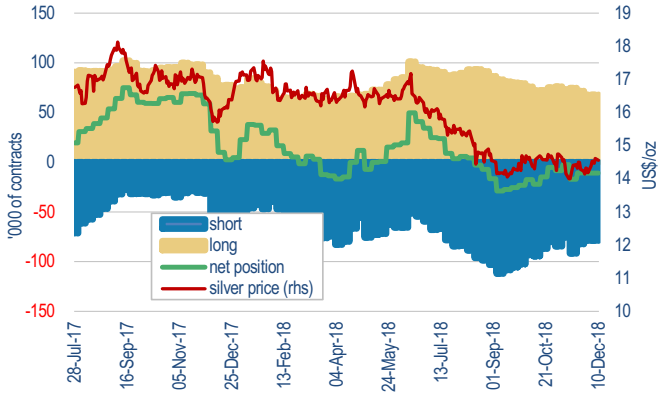
Source: Bloomberg, Morgan Stanley Research

Exhibit 50: Silver global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Supply												
Mine Production	tonnes	25,620	26,992	27,841	27,639	26,503	26,905	27,308	27,581	27,857	28,136	28,417
YoY change	%	*4.0*	*5.4*	*3.1*	*-0.7*	*-4.1*	*1.5*	*1.5*	*1.0*	*1.0*	*1.0*	*1.0*
Net Government Sales/(Purchase)	tonnes	246	0	0	0	0	0	0	0	0	0	0
YoY change	%	*6.8*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Silver Scrap	tonnes	5,941	5,145	4,389	4,386	4,417	4,354	4,398	4,442	4,531	4,621	4,668
YoY change	%	*-24.7*	*-13.4*	*-14.7*	*-0.1*	*0.7*	*-1.4*	*1.0*	*1.0*	*2.0*	*2.0*	*1.0*
Net Producer Hedging	tonnes	-1082	523	243	-588	44	-218	0	0	0	0	0
Total Supply	tonnes	**30,724**	**32,659**	**32,472**	**31,436**	**30,964**	**31,041**	**31,706**	**32,023**	**32,388**	**32,757**	**33,085**
YoY change	%	*-1.8*	*6.3*	*-0.6*	*-3.2*	*-1.5*	*0.3*	*2.1*	*1.0*	*1.1*	*1.1*	*1.0*
Demand												
Electronics	tonnes	8,274	8,208	7,651	7,275	7,555	7,776	7,776	7,776	7,854	7,932	8,091
YoY change	%	*-0.3*	*-0.8*	*-6.8*	*-4.9*	*3.8*	*2.9*	*0.0*	*0.0*	*1.0*	*1.0*	*2.0*
Photography	tonnes	1,571	1,509	1,449	1,406	1,275	1,244	1,207	1,171	1,135	1,101	1,068
YoY change	%	*-6.8*	*-4.0*	*-3.9*	*-3.0*	*-9.3*	*-2.4*	*-3.0*	*-3.0*	*-3.0*	*-3.0*	*-3.0*
Brazing Alloys and Solders	tonnes	1,981	2,075	1,913	1,720	1,788	1,804	1,858	1,914	1,971	2,030	2,091
YoY change	%	*4.3*	*4.7*	*-7.8*	*-10.1*	*4.0*	*0.9*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
Jewellery/Silverware, Coins, Medals	tonnes	16,211	16,227	18,102	14,469	13,020	11,944	12,100	12,259	12,420	12,583	12,749
YoY change	%	*51.1*	*-2.7*	*24.8*	*-28.9*	*-27.3*	*-13.3*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Other Applications	tonnes	6,980	6,762	7,129	7,539	7,922	7,403	7,691	8,004	8,345	8,717	9,121
YoY change	%	*5.5*	*-1.7*	*2.7*	*-4.1*	*-1.5*	*-1.6*	*0.8*	*0.8*	*0.8*	*0.8*	*0.8*
Total Fabrication Demand	tonnes	**35,016**	**34,780**	**36,245**	**32,410**	**31,561**	**30,170**	**30,632**	**31,123**	**31,725**	**32,364**	**33,121**
YoY change	%	*13.7*	*-0.7*	*4.2*	*-10.6*	*-2.6*	*-4.4*	*1.5*	*1.6*	*1.9*	*2.0*	*2.3*
Balance	tonnes	**-9,868**	**-6,779**	**-3,249**	**1,586**	**-610**	**703**	**925**	**1,000**	**763**	**493**	**64**
Change in ETF Holdings	tonnes	459	5	-524	-2,560	13	168	150	-100	-100	-100	-100
Reported ETF Holdings	tonnes	19,376	19,381	18,857	16,297	16,310	16,478	16,628	16,528	16,428	16,328	16,228
YoY change	%	*2.4*	*0.0*	*-2.7*	*-13.6*	*0.1*	*1.0*	*0.9*	*-0.6*	*-0.6*	*-0.6*	*-0.6*
Implied Other Investment	tonnes	5,116	4,654	0	0	0	0	0	0	0	0	0
Total Demand	tonnes	**40,592**	**39,438**	**35,721**	**29,850**	**31,574**	**30,338**	**30,782**	**31,023**	**31,625**	**32,264**	**33,021**
Price	US$/oz	**23.87**	**19.09**	**15.72**	**17.10**	**17.07**	**15.70**	**16.75**	**17.20**	**18.00**	**19.00**	**20.00**

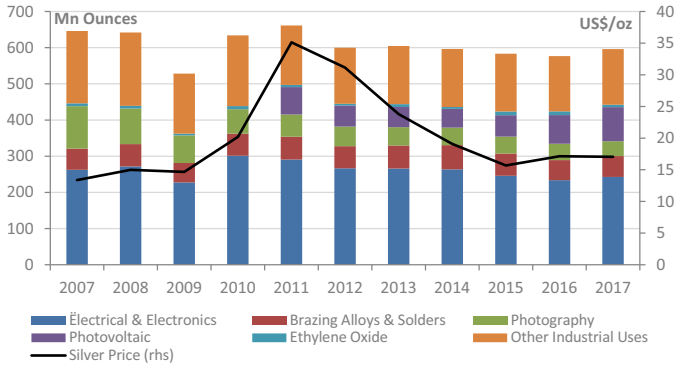
Source: GFMS, WSI, CRU, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 51: CFTC – Commitment of traders – non-commercial positions



Source: Bloomberg, Morgan Stanley Research

Exhibit 52: Industrial silver fabrication by category



Source: GFMS, Morgan Stanley Research

Platinum

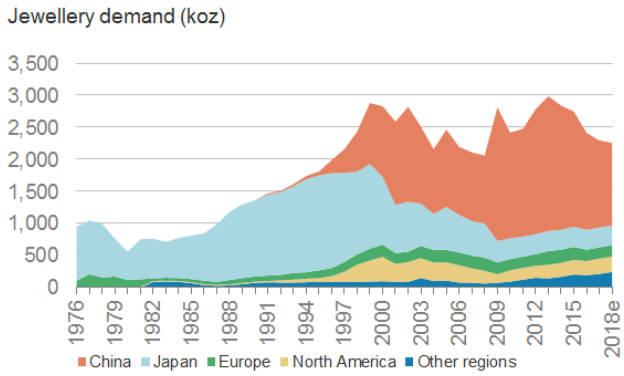
Market to remain in oversupply

Demand to remain soft into 2019: After contracting 1.5% in 2018, we expect demand to remain flat to slightly down in 2019. Key drivers include: 1) light-duty diesel cars continue to lose market share in Europe (Big 5 diesel market share was 35% in October 2018 vs. 43.6% in October 2017) – our autos analysts anticipate further declines into 2019. This could be offset by higher loadings in China, India and Europe to meet tighter emission standards; 2) Chinese jewellery demand fell again in 3Q18 (-4.3% at PGI partners) as the sector struggles with a shift from weight- to piece-based items and competition from K-gold fashion items; 3) ongoing robust industrial demand.

South African supply to remain robust in the near term: The anticipated production cuts from Impala and Lonmin are only expected to impact the market from 2020; this will be partially offset by growth elsewhere (e.g. Styldrift steady state in 4Q18, Booysendal South from 2019).

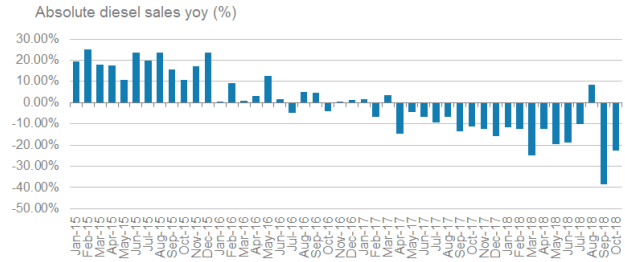
MS outlook: The market remains in a sizeable surplus in 2019 on weak demand and flat supply. Our forecast is underpinned by a weaker US dollar in 2019 providing support for the precious metals. We estimate $815/oz in 2019; long-term $1,112/oz real 2018$; see MS metal&ROCK: Long-term prices – stimulating supply.

Exhibit 53: Contraction in Chinese platinum jewellery (manufacturing -35% off peak) a key drag on gross demand



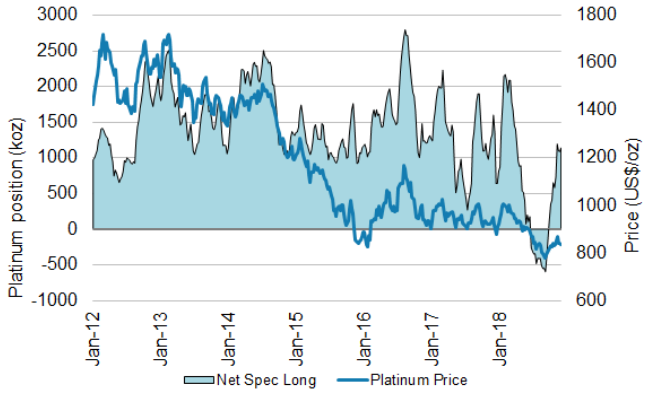
Source: Johnson Matthey, Morgan Stanley Research estimates

Exhibit 54: Absolute European diesel sales have continued to fall



Source: ACEA, Morgan Stanley Research

Exhibit 55: Positioning has picked up off 3Q18 lows: Nymex net spec positioning



Source: Bloomberg, Morgan Stanley Research

Exhibit 56: Platinum global supply-demand model

	Unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Supply												
South Africa	koz	4,208	3,547	4,572	4,392	4,459	4,410	4,409	4,280	4,220	4,267	4,187
Russia	koz	736	700	670	717	692	662	643	643	663	684	727
N America	koz	318	339	314	337	336	337	348	361	375	387	388
Zimbabwe & Others	koz	584	568	552	651	625	645	624	625	625	625	626
Total Mine production	**koz**	**5,846**	**5,154**	**6,108**	**6,097**	**6,112**	**6,054**	**6,024**	**5,909**	**5,883**	**5,963**	**5,928**
% change	%	3%	-12%	19%	0%	0%	-1%	0%	-2%	0%	1%	-1%
Autocatalyst recycling	koz	1,199	1,280	1,112	1,159	1,279	1,384	1,434	1,519	1,604	1,672	1,723
Jewellery recycling	koz	790	762	574	738	638	609	575	599	634	673	717
Total supply	**koz**	**7,835**	**7,196**	**7,794**	**7,994**	**8,029**	**8,047**	**8,034**	**8,027**	**8,120**	**8,308**	**8,368**
Demand												
Autocatalyst	koz	2,937	3,060	3,232	3,330	3,292	3,184	3,098	3,217	3,395	3,605	3,755
Jewellery	koz	2,984	2,839	2,746	2,412	2,296	2,258	2,302	2,465	2,538	2,625	2,570
Chemical	koz	522	576	502	475	504	525	527	533	538	543	549
Electronics	koz	195	198	199	198	200	226	233	240	247	254	262
Glass	koz	102	143	227	246	364	346	336	346	357	368	379
Petroleum	koz	146	172	140	176	220	202	208	210	212	219	225
Other industrial demand	koz	636	648	656	676	696	719	741	763	786	809	834
Total demand	**koz**	**7,522**	**7,636**	**7,702**	**7,513**	**7,572**	**7,460**	**7,445**	**7,773**	**8,073**	**8,423**	**8,573**
Gross Surplus/ (Deficit)	**koz**	**313**	**(440)**	**92**	**481**	**457**	**587**	**588**	**254**	**48**	**(115)**	**(204)**
Investment/ stock movements	koz	871	277	451	620	356	125	250	250	250	250	250
Residual surplus/(deficit)		**(558)**	**(717)**	**(359)**	**(139)**	**101**	**462**	**338**	**4**	**(202)**	**(365)**	**(454)**
Average Price (US$/oz)	**US$/oz**	**1,489**	**1,390**	**1,059**	**990**	**951**	**885**	**815**	**863**	**962**	**1,062**	**1,162**
% price change	*%*	*-4%*	*-7%*	*-24%*	*-6%*	*-4%*	*-7%*	*-8%*	*6%*	*12%*	*10%*	*9%*

Source: Johnson Matthey, World Platinum Investment Council, SFA Oxford, Morgan Stanley Research estimates (e)

Palladium

Emission standard tightening outweights auto sales growth concerns

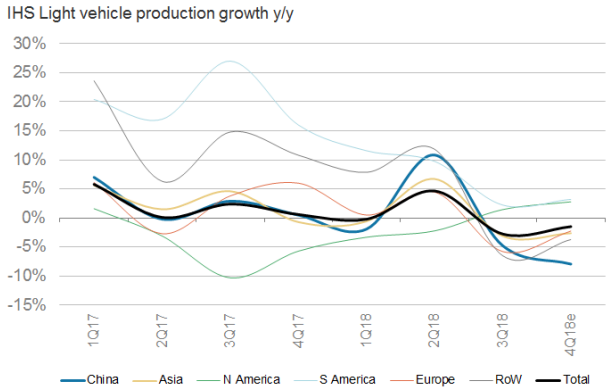
Early adoption of China VI appears to have boosted demand off an already high base. In 2018 China is expected by our autos analysts to account for 30% of global light-vehicle sales and – given the gasoline dominant market – 25% of Pd autocat demand. Regions comprising 32% of PV sales will adopt China VI before July 1, 2019 (source: IHS Markit), and we estimate a total 69% of sales will have adopted the standard before the original introduction date of July 1, 2020. This could be expected to result in a significant uplift in PGM loadings per vehicle.

Slowdown in global auto production in 3Q18 a risk: China has been the predominant driver of the growth in Pd demand over the past decade (19% CAGR), and is a major factor in the slowdown, with 3Q18 China/global vehicle production down -3.7%/-2% respectively; and China PV sales down four months in a row. We expect a return to more moderate Chinese and global growth in 2019, aided by possible tax cuts.

We expect the market deficit to widen into 2019, even under our conservative autocat demand growth forecasts (+0.7%), with less capacity for inventory sell-down (either from Norilsk's strategic fund and/or accumulated SA stocks). A number of indicators continue to point to a tight market.

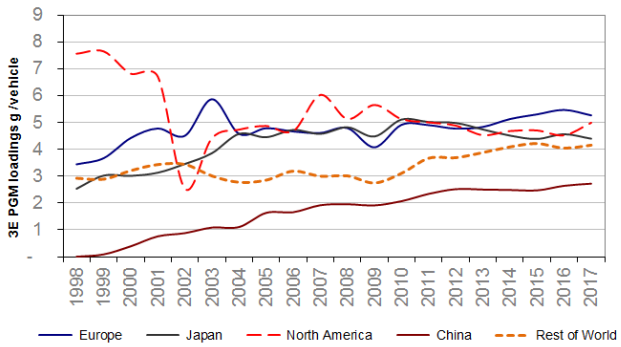
MS outlook: We forecast a persistent deficit in palladium's market – growing to more than 800koz in 2019. A sizeable premium to platinum is likely required before large-scale autocat substitution takes place. We forecast a price of $1,240/oz in 2019; long-term $1,011/oz real 2018$.

Exhibit 57: Global light vehicle production growth has turned negative in 3Q18 – heavily impacted by China



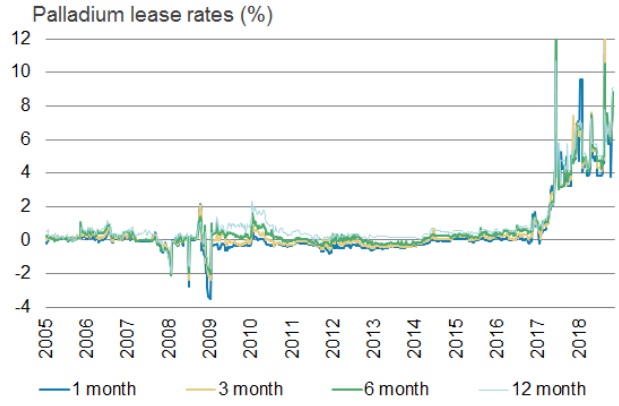
Source: IHS, Morgan Stanley Research

Exhibit 58: China VI emission standard tightening represents a sizeable PGM demand opportunity, as it drives increased loadings



Source: Johnson Matthey, OICA, Morgan Stanley Research

Exhibit 59: Palladium lease rates – market in backwardation



Source: Bloomberg, Morgan Stanley Research

Exhibit 60: Palladium global supply-demand model

	Unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Supply												
South Africa	Koz	2,464	2,126	2,683	2,570	2,554	2,651	2,590	2,522	2,491	2,514	2,489
Russia	Koz	2,628	2,589	2,434	2,773	2,407	2,724	2,840	2,800	2,680	2,730	2,830
North America	Koz	831	912	874	892	891	930	961	1,007	1,058	1,101	1,104
Others	Koz	474	487	464	525	519	512	507	507	507	507	508
Total mine production	**Koz**	**6,397**	**6,114**	**6,455**	**6,760**	**6,371**	**6,817**	**6,898**	**6,836**	**6,736**	**6,852**	**6,932**
% change	*%*	*-1%*	*-4%*	*6%*	*5%*	*-6%*	*7%*	*1%*	*-1%*	*-1%*	*2%*	*1%*
Autocatalyst recycling	Koz	1,899	2,185	1,897	2,001	2,404	2,600	2,699	2,708	2,760	2,872	3,033
Electrical recycling	Koz	463	474	475	481	482	482	496	511	527	542	559
Jewellery recycling	Koz	157	89	46	21	21	17	23	23	24	25	25
Total supply	**Koz**	**8,916**	**8,862**	**8,873**	**9,263**	**9,278**	**9,916**	**10,117**	**10,079**	**10,047**	**10,292**	**10,549**
Demand												
Autocatalyst	Koz	7,069	7,515	7,622	7,941	8,391	8,748	9,055	8,900	8,948	9,029	9,155
Jewellery	Koz	354	272	222	191	173	167	157	165	172	178	185
Dental	Koz	457	464	468	430	398	381	359	377	392	406	421
Chemical	Koz	378	315	451	414	529	497	512	527	543	559	576
Electronics	Koz	1,017	970	903	871	840	828	779	819	851	883	915
Other industrial demand	Koz	109	111	134	151	134	153	144	151	157	163	169
Total Demand	**Koz**	**9,384**	**9,647**	**9,800**	**9,998**	**10,465**	**10,774**	**11,006**	**10,940**	**11,063**	**11,219**	**11,421**
Gross surplus / (deficit)	**Koz**	**(468)**	**(785)**	**(927)**	**(735)**	**(1,187)**	**(858)**	**(890)**	**(861)**	**(1,016)**	**(927)**	**(872)**
Investment/ Stock movements	Koz	- 8	943	(659)	(646)	(386)	(540)	-	-	-	-	-
Residual surplus/(deficit)	**Koz**	**(460)**	**(1,728)**	**(268)**	**(89)**	**(801)**	**(318)**	**(890)**	**(861)**	**(1,016)**	**(927)**	**(872)**
Average Price (US$/oz)	**US$/oz**	**727**	**810**	**697**	**616**	**872**	**1,027**	**1,240**	**1,215**	**1,205**	**1,196**	**1,189**
% price change		*13%*	*11%*	*-14%*	*-12%*	*42%*	*18%*	*21%*	*-2%*	*-1%*	*-1%*	*-1%*

Source: Johnson Matthey, SFA Oxford, Morgan Stanley Research estimates (e)

Rhodium

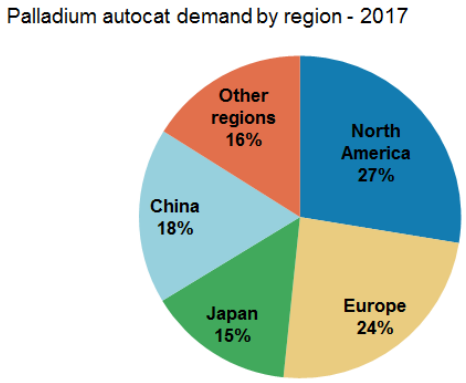
Demand backdrop has improved on emission standard tightening, future supply constraints

Emission tightening boosts demand: 1) Regions comprising 32% of PV sales will early adopt China VI before July 1, 2019 (source: IHS Markit) and 69% of sales before the original introduction date of July 1, 2020 (we estimate). China is expected to account for 18% of Rh autocat demand in 2018; 2) Real driving emissions (RDE) testing under Euro 6d-TEMP and Euro 6d legislation; 3) progressive introduction of Tier 3 fleet regulations in the US. This could be expected to result in an uplift in Rh loadings per vehicle. Note that metal is often purchased in advance and thus the impact of a shift in demand is often seen in the price before the supply/demand balance.

A small and illiquid market. Against a backdrop of improving demand, we still forecast a drop-off in South African supply into 2020 as both Lonmin and Impala are expected by our metals & mining analysts to close rhodium rich (UG2) western limb production.

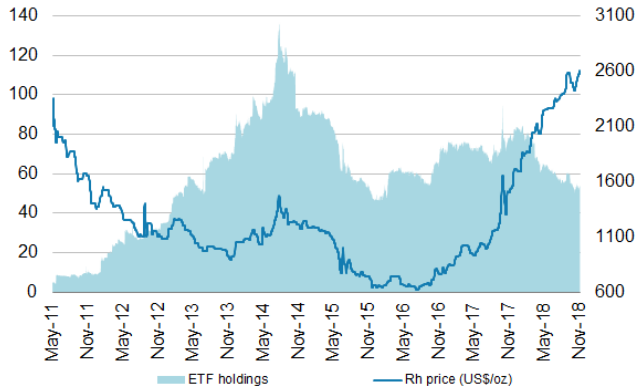
MS outlook: A number of indicators continue to point to a tight market (lease rates), even though our balance reflects a surplus in 2018. Furthermore, we remain comfortable with a rhodium price at a significant premium to platinum and palladium, based on technical efficiency in the autocatalyst process (as per our long-term real price assumption). We forecast $2,627/oz in 2019; long-term $3,000/oz real 2018$.

Exhibit 61: Rhodium autocat demand - relatively dispersed across regions, China makes up 18%



Source: Johnson Matthey, Morgan Stanley Research

Exhibit 62: Liquidation in Rhodium ETF positioning ytd



Source: Bloomberg, Morgan Stanley Research

Exhibit 63: Rhodium global supply-demand model

	Unit	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Rhodium Production											
South Africa	Koz	470	611	615	612	626	614	585	576	576	567
Russia	Koz	80	80	85	68	70	73	72	69	70	73
North America	Koz	24	22	24	22	22	22	22	22	22	22
Others	Koz	43	41	49	47	45	44	44	44	44	44
Total Supply	**Koz**	**617**	**754**	**773**	**749**	**763**	**753**	**723**	**711**	**713**	**706**
% change	%	-12%	22%	3%	-3%	2%	-1%	-4%	-2%	0%	-1%
Rhodium Consumption											
Autocatalyst (net)	Koz	463	500	551	543	562	576	583	605	623	640
gross	Koz	*769*	*762*	*822*	*852*	*893*	*928*	*947*	*978*	*1,000*	*1,017*
recycling	Koz	*306*	*262*	*271*	*309*	*331*	*352*	*364*	*373*	*377*	*378*
Industrial	Koz	170	197	166	199	166	171	176	181	187	192
ETF	Koz	10	(39)	25	10	(26)					
Total Demand	**Koz**	**643**	**658**	**742**	**752**	**702**	**747**	**759**	**786**	**810**	**832**
Oversupply/(Undersupply)	**Koz**	**(26)**	**96**	**31**	**(3)**	**61**	**6**	**(36)**	**(75)**	**(97)**	**(126)**
Average Price (US$/oz)	**US$/oz**	**1,171**	**972**	**686**	**1,109**	**2,220**	**2,627**	**2,790**	**2,954**	**3,117**	**3,280**
% price change	%	10%	-17%	-29%	62%	100%	18%	6%	6%	6%	5%

Source: Johnson Matthey, SFA Oxford, Morgan Stanley Research estimates (e)

Diamonds

Momentum slowing

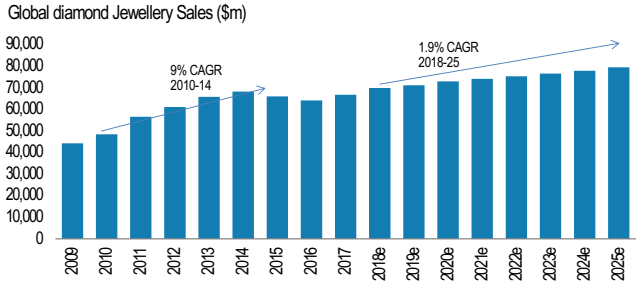
Jewellery demand slowing: Results from major listed jewellers indicate that demand is starting to slow. In China and Hong Kong, YoY growth dropped from 20%+ in 2Q 2018 – so low single digit or even negative in 3Q 2018. This slowdown is also shown by Tiffany, where growth peaked in 2Q at 7% and dropped to 3% in 3Q. We see further market risk as we head into 2019, given our global strategy call for a deceleration in GDP growth in the US, which is c.50% of demand for diamonds.

Near-term credit tightness in India: Commentary from Alrosa and De Beers indicates that credit tightness in the midstream in India is causing some disruption at the lower end of the market. These smaller players are finding it more difficult to access the credit required to purchase smaller stones, and this has led miners to cut prices by up to 10% at the smaller end in recent months. While there appears to be some signs of price stabilisation, we see this as another reason to remain cautious for now.

But medium-term supply drop still looms: Looking out over the next few years shows a positive picture on the supply side, with production set to fall 7.5% by 2020, as Rio's Argyle mine comes to the end of its life. This drop seems too large to be filled by lab-grown stones, so barring a demand shock, the supply/demand balance looks attractive a few years out.

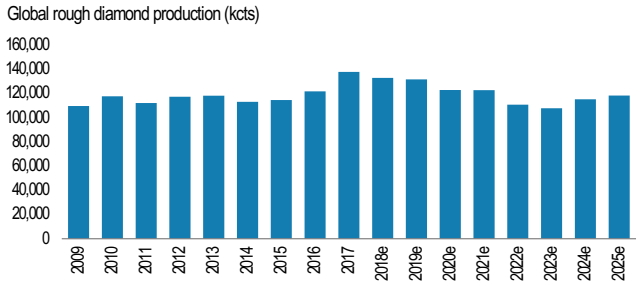
Lightbox launched: De Beers lab-grown Lightbox venture has now launched – a bold move that we continue to see as a positive step as it allows De Beers to drive the narrative towards a clear dichotomy between lab-grown and mined stones. See our note here.

Exhibit 64: We see 1.9% diamond jewellery demand growth over 2018-25e ...



Source: Euromonitor, Morgan Stanley Research estimates (e)

Exhibit 65: ... with production flat to down (in the medium term)...



Source: Bain, Morgan Stanley Research estimates (e)

Exhibit 66: ... but our cautious near-term outlook is driven by sowing jewellery sales growth

Shows YoY growth

Company	Category	4Q17	1Q18	2Q18	3Q18
Tiffany	Comparable group sales on constant currency basis	1%	7%	7%	3%
Signet	Same store group sales	-5%	0%	2%	2%
Chow Tai Fook	Same store gem-set jewellery sales (China)	-1%	-8%	-4%	-1%
Chow Tai Fook	Same store gem-set jewellery sales (HK & Macau)	22%	16%	26%	-2%
Luk Fook	Same store gem-set jewellery sales (HK & China)	10%	18%	18%	5%

Source: GJEPC, Morgan Stanley Research

Exhibit 67: Diamonds global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e
Supply											
Angola	kcts	8,602	8,791	9,016	9,021	9,439	9,100	9,100	9,400	10,800	13,200
Australia	kcts	11,729	9,288	13,564	13,958	17,135	14,870	15,685	7,843	7,843	0
Botswana	kcts	23,188	24,668	20,779	20,501	22,961	24,501	23,232	25,458	25,490	21,846
Canada	kcts	10,600	12,012	11,677	13,036	23,234	20,591	18,854	16,278	13,112	11,880
Democratic Republic of Congo	kcts	15,682	15,652	16,016	23,207	18,903	18,903	18,903	18,903	18,903	18,903
Lesotho	kcts	414	346	304	342	1,126	1,882	2,422	2,624	2,416	1,810
Namibia	kcts	1,689	1,918	2,053	1,718	1,948	1,927	1,766	1,805	1,844	1,854
Russian Federation/FSU	kcts	37,884	38,304	41,912	40,322	42,615	40,287	42,178	42,111	42,249	41,749
South Africa	kcts	8,143	7,431	7,218	8,312	9,683	9,260	8,542	7,398	9,131	8,428
Tanzania	kcts	180	253	217	242	298	351	351	356	356	356
Zimbabwe	kcts	10,412	4,772	3,491	2,103	2,508	2,508	2,508	2,508	2,508	2,508
Other	kcts	1,241	1,344	1,151	1,309	1,005	1,005	1,005	1,005	1,005	1,005
Total mined supply	**kcts**	**129,762**	**124,778**	**127,399**	**134,071**	**150,855**	**145,184**	**144,546**	**135,689**	**135,657**	**123,538**
YoY change		*1%*	*-4%*	*2%*	*5%*	*13%*	*-4%*	*0%*	*-6%*	*0%*	*-9%*
Total mined supply net of ALROSA industrial diamonds (30%)		**118,397**	**113,287**	**114,826**	**121,974**	**138,071**	**133,098**	**131,892**	**123,056**	**122,982**	**111,014**
YoY change		1%	-4%	1%	6%	13%	-4%	-1%	-7%	0%	-10%
Inventory movement (increase)/decrease	**kcts**	**0**	**3,008**	**-10,962**	**4,143**	**1,187**	**713**	**523**	**489**	**251**	**251**
Total sales	kcts	0	127,787	116,437	138,214	152,042	145,897	145,068	136,179	135,908	123,790
YoY change		*0%*	*0%*	*0%*	*0%*	*10%*	*-4%*	*-1%*	*-6%*	*0%*	*-9%*
Tracked inventory levels	**kcts**	**18,058**	**15,050**	**26,012**	**21,869**	**20,682**	**19,969**	**19,446**	**18,957**	**15,440**	**14,650**
% of supply		*14%*	*12%*	*20%*	*16%*	*14%*	*14%*	*13%*	*14%*	11%	12%
Total Supply by value	**$m**	**13,971**	**14,496**	**13,882**	**12,401**	**15,870**	**16,195**	**16,489**	**16,925**	**17,195**	**17,471**
YoY Change		*10%*	*4%*	*-4%*	*-11%*	*28%*	*2%*	*2%*	*3%*	*2%*	*2%*
Demand											
Asia Pacific	$m	31393	33335	33395	34057	35786	38122	39266	40444	40,945	41,470
Australasia	$m	1395	1320	1117	1106	1161	1149	1099	1136	1,158	1,180
Eastern Europe	$m	1172	1060	710	505	590	565	540	556	591	628
Latin America	$m	360	369	310	298	334	303	306	322	330	334
MENA	$m	1165	1324	1400	1470	1460	1504	1534	1580	1,628	1,677
North America	$m	22344	22976	22380	20288	20896	21314	21527	21958	22,397	22,845
Western Europe	$m	7950	7876	6703	6395	6526	6938	6844	6954	7,065	7,177
Total Diamond Jewellery Sales	**$m**	**65,779**	**68,261**	**66,016**	**64,119**	**66,753**	**69,896**	**71,117**	**72,949**	**74,113**	**75,310**
YoY change		*8%*	*4%*	*-3%*	*-3%*	*4%*	*5%*	*2%*	*3%*	*2%*	*2%*
Average global price/Market clearing price	**$/ct**	**108**	**116**	**109**	**92**	**105**	**111**	**114**	**124**	**127**	**141**
% price change		*9%*	*8%*	*-6%*	*-15%*	*14%*	*6%*	*2%*	*9%*	*2%*	*12%*

Source: MineralsUK, Kimberly Process, Euromonitor, Bain, Morgan Stanley Research estimates (e). YoY = Year on year

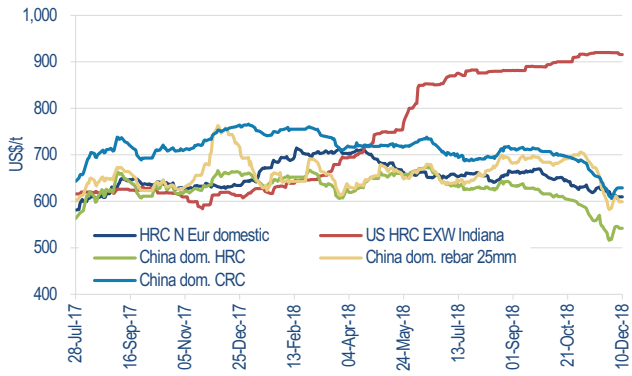
Steel

Exhibit 68: Steel global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Demand - Finished Steel												
EU-28	Mt	144	150	155	159	162	168	170	172	174	176	178
Other Europe	Mt	37	37	40	41	42	43	45	45	46	47	48
Russia/CIS	Mt	59	56	50	49	53	55	56	57	58	60	61
North America	Mt	134	150	138	136	141	144	147	150	153	155	157
South America	Mt	48	45	41	36	37	39	40	41	43	44	45
China	Mt	729	712	676	695	738	797	789	773	750	727	706
India	Mt	74	76	80	84	87	92	98	105	114	125	136
Japan	Mt	65	68	63	62	64	63	63	62	62	60	61
S.Korea	Mt	52	56	56	57	56	59	59	60	61	62	63
Other Asia/Pacific	Mt	94	99	105	115	109	112	114	116	115	117	116
RoW	Mt	95	98	99	98	95	98	100	102	105	107	110
Total	**Mt**	**1,529**	**1,547**	**1,503**	**1,531**	**1,585**	**1,670**	**1,681**	**1,685**	**1,681**	**1,679**	**1,679**
YoY growth	%	6%	1%	-3%	2%	4%	5%	1%	0%	0%	0%	0%
World ex-China	Mt	800	834	827	836	847	873	892	912	931	952	974
YoY growth	%	2%	4%	-1%	1%	1%	3%	2%	2%	2%	2%	2%
finished demand : crude production	%	92%	92%	92%	93%	93%	93%	94%	94%	94%	94%	94%
Production - Crude Steel												
EU-28	Mt	166	169	166	162	168	169	171	173	175	178	180
Other Europe	Mt	39	38	36	38	42	43	45	46	47	48	49
Russia/CIS	Mt	108	106	102	102	101	103	104	106	109	111	113
North America	Mt	119	121	111	111	116	122	121	122	125	127	127
South America	Mt	46	45	44	40	44	45	47	52	52	52	52
China	Mt	832	840	821	825	832	921	897	880	856	832	808
India	Mt	81	87	89	95	101	106	113	122	131	142	151
Japan	Mt	111	111	105	105	105	105	103	103	105	105	105
S.Korea	Mt	66	72	70	69	71	72	73	73	74	75	76
Other Asia/Pacific	Mt	44	47	45	48	63	54	54	54	55	57	59
RoW	Mt	49	50	49	50	56	61	63	64	66	68	70
Total		**1,660**	**1,687**	**1,638**	**1,644**	**1,698**	**1,801**	**1,791**	**1,796**	**1,795**	**1,795**	**1,792**
YoY growth	%	5%	2%	-3%	0%	3%	6%	-1%	0%	0%	0%	0%
World ex-China	Mt	828	847	817	820	867	880	894	916	939	963	983
YoY growth	%	0%	2%	-4%	0%	6%	2%	2%	2%	3%	3%	2%
Steel prices (hot rolled coil)												
US	US$/t	631	658	524	571	685	934	839	723	701	701	681
China	US$/t	601	530	393	404	480	545	525	523	520	520	500
Europe	US$/t	614	568	421	454	605	665	585	517	482	472	475

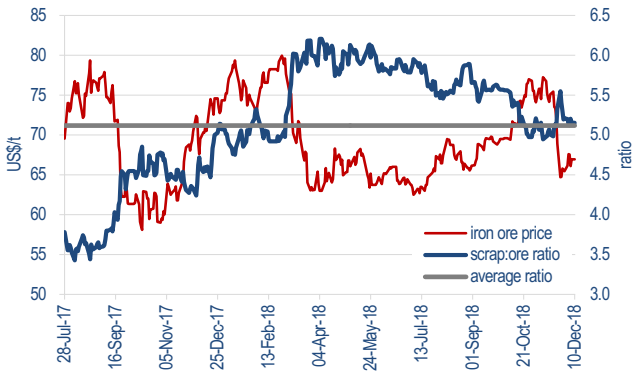
Source: WSA, IISI, CRU, Bloomberg, Morgan Stanley Research estimates (e)

Exhibit 69: Selection of finished steel product prices (US$/t)



Source: Bloomberg, Morgan Stanley Research

Exhibit 70: China's scrap-to-ore price ratio (vs. iron ore price)



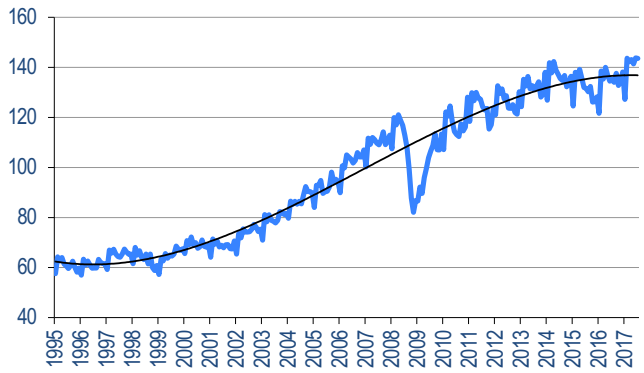
Source: Bloomberg, Morgan Stanley Research

Exhibit 71: Steel China supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Crude Steel Production	Mt	832	840	821	825	832	921	897	880	856	832	808
YoY growth	%	11%	1%	-2%	0%	1%	11%	-3%	-2%	-3%	-3%	-3%
Exports	Mt	62	94	112	109	75	58	58	58	58	58	58
Imports	Mt	14	14	13	13	14	13	13	13	13	13	13
Net imports/-exports	Mt	-48	-79	-100	-96	-61	-45	-45	-45	-45	-45	-45
Estimated mill + trader Inventory increase/(decrease)	Mt	5	-2	-3	1							
Apparent steel consumption (crude equivalent)	Mt	759	742	704	724	769	846	837	820	796	772	749
YoY growth	%	11%	-2%	-5%	3%	6%	10%	-1%	-2%	-3%	-3%	-3%
ratio of finished-to-crude steel		96.0%	96.0%	96.0%	96.0%	96.0%	94.2%	94.2%	94.2%	94.2%	94.2%	94.2%
Apparent steel consumption (finished steel)	Mt	729	712	676	695	738	797	789	773	750	727	706
YoY growth	%	11%	-2%	-5%	3%	6%	8%	-1%	-2%	-3%	-3%	-3%
Crude Steel Capacity (incl. IF)	Mt	1,215	1,265	1,250	1,172	1,022	1,012	1,002	992	972	953	924
Net capacity addition /-reduction	Mt	74	50	-15	-78	-150	-10	-10	-10	-20	-19	-29
Average Utilization Rate	%	68%	66%	66%	70%	81%	91%	90%	89%	88%	87%	87%

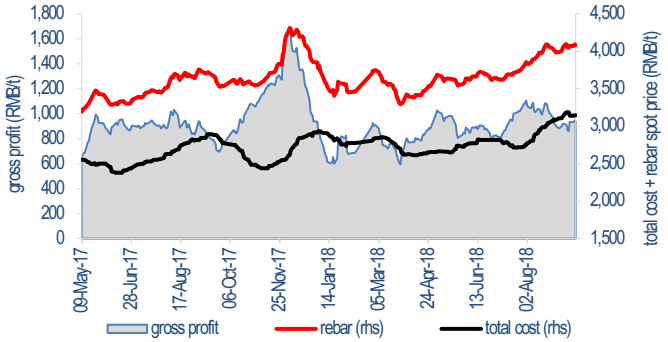
Source: WSA, IISI, CRU, Bloomberg, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 72: World crude steel output (Mt/month)



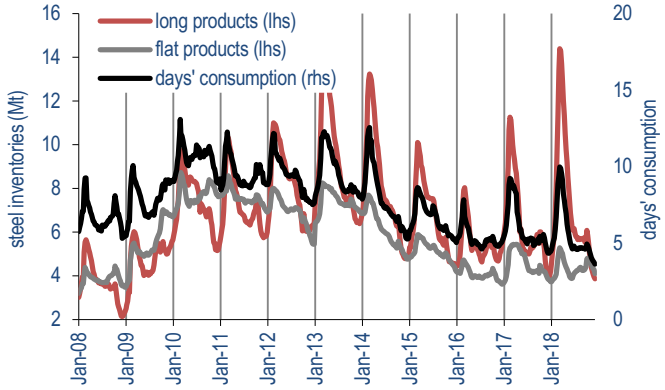
Source: Bloomberg, Morgan Stanley Research

Exhibit 73: China's steel industry profitability



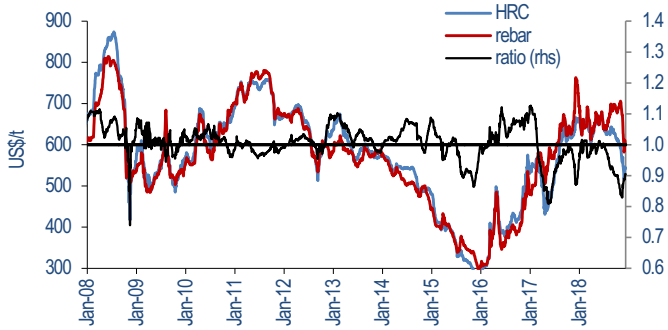
Source: Bloomberg, Morgan Stanley Research

Exhibit 74: Steel inventory vs. days' consumption at distributors



Source: Mysteel, NBS, CEIC, Morgan Stanley Research

Exhibit 75: China's HRC-to-rebar price ratio



Source: Bloomberg, Morgan Stanley Research

Iron Ore

Oversupply risk

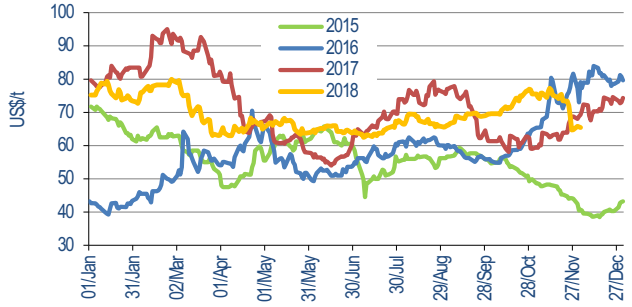
Volatility returns: After trading most of the year in a narrow range, volatility returned to the iron ore price. In Oct 2018, the flagship 62% Fe fines surged into the $70s/t, as steel mills maximised output (82.5Mt; +2% month on month) ahead of the winter cuts, while iron ore imports dropped (88.4Mt; -5% MoM). Late Nov 2018, price dropped $11/t in a week, following a 17% fall in China's domestic rebar price, before stabilising in the mid-$60s. We expect price to stay around current levels until pre-Chinese new year restocking starts.

Steady demand: Iron ore was supported by strong construction activity in China until Nov 2018, reflected in the strong rebar price. Since then, rebar has weakened, driven by a seasonal slowdown in construction demand and milder winter production cuts than last winter. Rapidly falling steel margins show that the elevated high-grade premium is partly cyclical, rather than a structural shift, as the high-grade differential narrowed in response. Looking to 2019, we forecast China's seaborne iron ore imports to hold firm at -1% YoY, as a decline in crude steel production (MSe -2.6% YoY) is partially offset by a lower scrap rate in China's oxygen converters (MSe 17%).

More supply: Supply growth in 2H18 has been driven by Brazil (+8% YoY) as S11D ramps; while Australia's exports have fallen (-3% YoY). We forecast 2019 to be the last year of significant seaborne supply growth, as 90Mtpa S11D still has further to ramp and 26Mtpa Minas Rio restarts. In Australia, we expect the majors' exports to increase by 13Mt in 2019, driven mainly by +9Mt from BHP. We forecast total seaborne supply to increase by 36Mt in 2019.

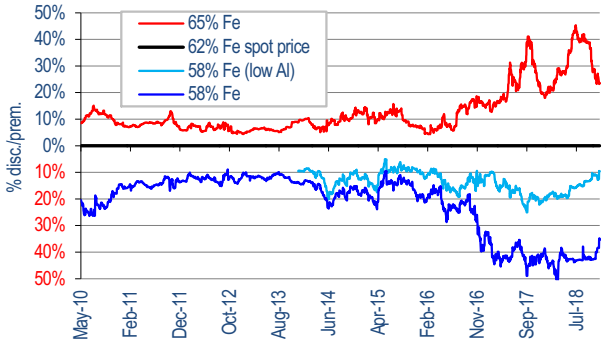
MS outlook: Despite a steady demand outlook, continued supply ramp will likely tip this year's balanced market into oversupply and put downward pressure on price in 2019. We forecast $62/t in 2019, +2% vs our previous forecast. We raise our long-term price to $55/t real 2018$ ($63/t nominal 2025).

Exhibit 76: Iron ore spot price: 62% Fe fines, cfr China (US$/t)



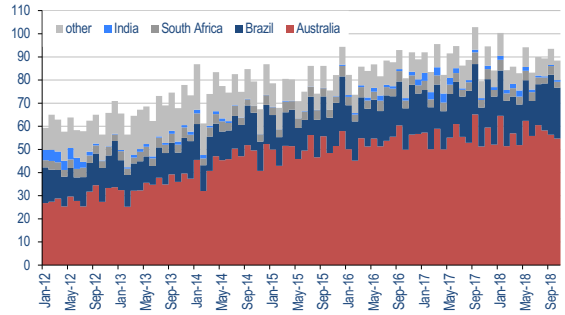
Source: Platts, Morgan Stanley Research

Exhibit 77: Iron ore prices: -discount/+premium vs. 62% Fe (%)



Source: Morgan Stanley Research, Platts

Exhibit 78: China's iron ore imports by origin (Mt/month)



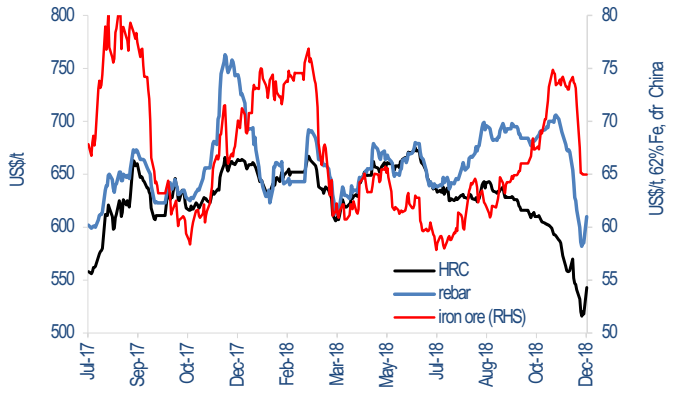
Source: Blomberg, Morgan Stanley Research

Exhibit 79: Iron ore global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Global crude steel production	Mt	1,660	1,687	1,638	1,644	1,698	1,801	1,791	1,796	1,795	1,795	1,792
YoY growth	%	*5.4%*	*1.6%*	*-2.9%*	*0.4%*	*3.3%*	*6.1%*	*-0.6%*	*0.3%*	*-0.1%*	*0.0%*	*-0.2%*
China's crude steel production	Mt	832	840	821	825	832	921	897	880	856	832	808
YoY growth	%	*11.4%*	*1.0%*	*-2.3%*	*0.4%*	*0.9%*	*10.7%*	*-2.6%*	*-1.9%*	*-2.8%*	*-2.8%*	*-2.8%*
Global iron ore demand	Mt	2,158	2,215	2,140	2,157	2,129	2,208	2,213	2,210	2,203	2,200	2,191
Global iron ore supply	Mt	2,133	2,217	2,181	2,164	2,150	2,206	2,250	2,258	2,257	2,246	2,251
Global Balance	**Mt**	**-24**	**3**	**41**	**6**	**22**	**-2**	**37**	**48**	**53**	**46**	**60**
Total seaborne iron ore demand	Mt	1,173	1,318	1,342	1,408	1,450	1,458	1,456	1,443	1,425	1,409	1,391
YoY growth	%	*5.8%*	*12.3%*	*1.8%*	*4.9%*	*3.0%*	*0.6%*	*-0.1%*	*-0.9%*	*-1.2%*	*-1.1%*	*-1.3%*
China iron ore import requirements	Mt	820	933	953	1,025	1,075	1,067	1,056	1,033	998	965	934
China as % of seaborne market	%	70%	71%	71%	73%	74%	73%	73%	72%	70%	69%	67%
Total seaborne iron ore supply	Mt	1,192	1,326	1,351	1,428	1,485	1,482	1,519	1,525	1,521	1,507	1,512
YoY growth	%	*7.0%*	*11.3%*	*1.9%*	*5.7%*	*4.0%*	*-0.2%*	*2.4%*	*0.4%*	*-0.2%*	*-0.9%*	*0.3%*
Seaborne Balance	**Mt**	**18**	**8**	**9**	**20**	**36**	**24**	**62**	**82**	**96**	**98**	**120**
price CY fines cfr	**US$/t (62%Fe)**	**135**	**97**	**56**	**58**	**71**	**69**	**62**	**58**	**60**	**60**	**60**
price CY fines cfr	**US¢/mtu**	**218**	**156**	**90**	**94**	**115**	**112**	**100**	**94**	**97**	**97**	**97**
price CY lump cfr	**US$/t**	**147**	**108**	**65**	**68**	**81**	**84**	**76**	**69**	**71**	**72**	**72**
lump/fine differential	*US$/t*	*12.3*	*10.5*	*9.2*	*9.4*	*9.2*	*15.3*	*13.8*	*11.0*	*11.2*	*11.7*	*12.2*
Imports												
China	Mt	820	933	953	1,025	1,075	1,067	1,056	1,033	998	965	934
Japan	Mt	136	136	129	130	127	125	121	121	124	124	124
Europe	Mt	105	130	126	122	122	122	124	126	128	130	132
Exports												
Rio Tinto	Mt	244	288	310	329	330	341	343	346	346	348	350
BHP Billiton	Mt	206	220	261	263	268	270	280	278	281	278	279
Fortescue	Mt	90	146	161	168	169	168	170	170	170	170	170
Vale	Mt	295	259	293	302	318	328	334	338	336	335	335
India	Mt	16	12	8	26	27	18	12	10	8	6	5
top-3, share of seaborne	%	63%	58%	64%	63%	62%	63%	63%	63%	63%	64%	64%
top-3 + FMG, share of seaborne	%	70%	69%	76%	74%	73%	75%	74%	74%	74%	75%	75%

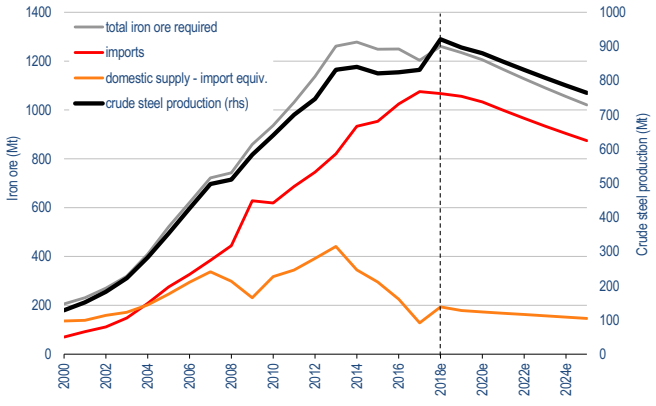
Source: Metalytics, Tex Report, UNCTAD, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 80: China's key steel prices vs. iron ore price (US$/t)



Source: Platts; Bloomberg

Exhibit 81: China's iron ore supply vs crude steel production (Mt)



Source: NBS, Morgan Stanley Research estimates (e)

Manganese Ore

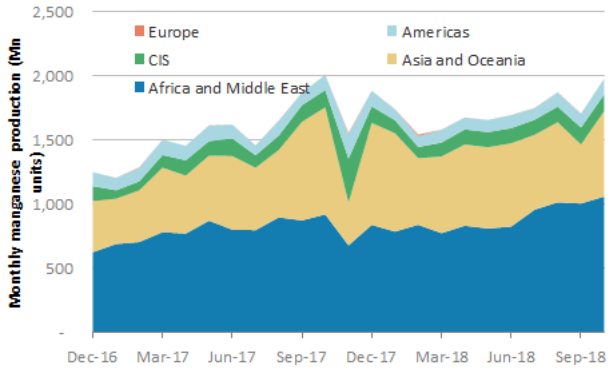
China's capacity cuts support price

Strong supply response: International Manganese Institute (IMNI) data show global manganese production up nearly 10% YoY, driven primarily by African production. We're seeing strong export growth from South Africa, and increasingly it is very low-grade ore of typically 30% Mn and 20% Fe. In fact, we estimate that 4.2Mtpa ore production (about 25%) from South Africa is this very low-grade material.

South African 30% Mn; 20% Fe ore sets the price: We estimate that juniors selling this very low-grade ore are very close to break-even at current prices, as it attracts a big discount to the benchmark. This supply represents about 1.4Mt Mn units – about 6.8% of global supply. Kalagadi Manganese is ramping up to 3Mtpa ore (37% Mn), equivalent to 1.1Mt Mn units. We also see supply growth from Assmang (1Mt ore / 0.4Mt Mn units). So, based on our expectations of demand growth, we think that the very low-grade producers will be displaced, resulting in a structural shift in the cost curve.

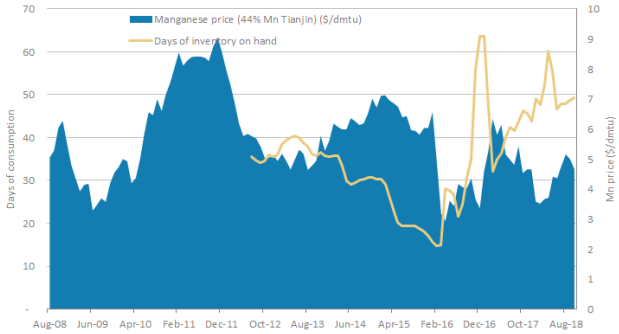
MS outlook: Tight supply-demand conditions will prevail until the end of 2019. We expect prices to remain well supported (i.e. above $6.50/dmtu) through 1H19, and thereafter to adjust lower. We forecast $6.19/lb 2019.

Exhibit 82: Monthly manganese ore production is charging ahead, up 10% year on year



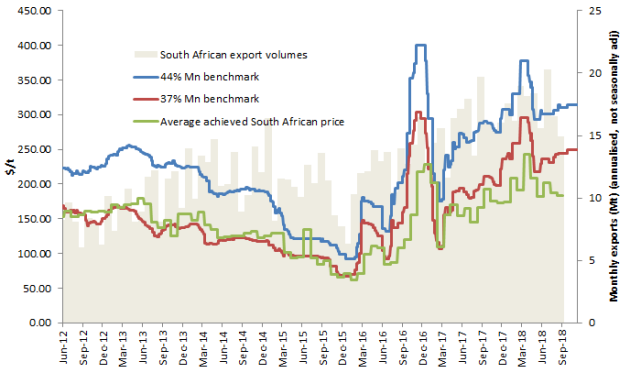
Source: IMNI, Morgan Stanley Research

Exhibit 83: Inventory at acceptable levels



Source: Mysteel, Platts, Morgan Stanley Research estimates

Exhibit 84: South Africa Mn ore exports continue to climb, in response to high prices



Source: Platts, DTI, Morgan Stanley Research

Exhibit 85: Manganese supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Global Steel Production	**Mt**	**1,660**	**1,687**	**1,638**	**1,644**	**1,698**	**1,801**	**1,791**	**1,796**	**1,795**	**1,795**	**1,792**
Global steel production growth	*%*	*5.4%*	*1.6%*	*-2.9%*	*0.4%*	*3.3%*	*6.1%*	*-0.6%*	*0.3%*	*-0.1%*	*0.0%*	*-0.2%*
China steel production growth	*%*	*11.4%*	*1.0%*	*-2.3%*	*0.4%*	*0.9%*	*10.7%*	*-2.6%*	*-1.9%*	*-2.8%*	*-2.8%*	*-2.8%*
ex-China production growth	*%*	*-0.1%*	*2.3%*	*-3.6%*	*0.4%*	*5.7%*	*1.6%*	*1.6%*	*2.4%*	*2.5%*	*2.6%*	*2.1%*
Total apparent consumption, manganese units	**Mt**	**18.3**	**19.1**	**16.3**	**15.1**	**18.7**	**21.6**	**21.5**	**21.5**	**21.5**	**21.5**	**21.5**
Kg Mn per ton of steel	*%*	*9.9*	*10.2*	*8.9*	*8.3*	*9.9*	*10.8*	*10.8*	*10.8*	*10.8*	*10.8*	*10.8*
Manganese ore production (Mt ore)												
Australia	Mt	7.4	7.6	6.3	5.9	4.9	6.7	6.7	6.7	6.8	6.8	6.8
Brazil	Mt	2.8	2.7	2.7	2.0	2.4	2.4	2.4	2.4	2.4	2.4	2.4
China	Mt	14.5	13.1	7.4	5.6	12.2	17.7	17.1	16.8	16.3	15.8	15.6
Gabon	Mt	4.3	4.1	4.5	4.0	4.7	4.6	4.6	4.6	4.6	4.6	4.6
India	Mt	2.5	2.4	1.6	2.2	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Kazakhstan	Mt	2.9	2.6	1.6	2.2	1.7	1.7	1.7	1.7	1.7	1.7	1.7
South Africa	Mt	11.1	14.2	16.0	13.8	16.2	17.0	17.1	17.5	17.9	18.4	18.4
Ghana	Mt	2.0	1.6	1.2	1.8	1.8	2.1	2.1	2.1	2.1	2.1	2.1
Ukraine	Mt	1.5	1.5	1.5	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4
ROW	Mt	2.6	3.0	1.8	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Global manganese ore produced	**Mt**	**51.5**	**52.9**	**44.8**	**40.8**	**49.8**	**58.1**	**57.7**	**57.9**	**57.8**	**57.8**	**57.7**
Of which:												
Seaborne	*Mt*	*27.6*	*29.0*	*26.6*	*26.7*	*33.5*	*35.0*	*35.2*	*35.7*	*36.1*	*36.6*	*36.7*
Non-Seaborne	*Mt*	*23.9*	*23.9*	*18.2*	*14.0*	*16.3*	*23.1*	*22.5*	*22.2*	*21.7*	*21.2*	*21.0*
Grades:												
Seaborne		*41.3%*	*40.1%*	*40.0%*	*39.3%*	*38.7%*	*38.6%*	*38.6%*	*38.6%*	*38.6%*	*38.5%*	*38.5%*
Non-Seaborne		*28.6%*	*31.5%*	*31.0%*	*33.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*	*35.0%*
Contained manganese production (incl stock moves)		**18.3**	**19.1**	**16.3**	**15.1**	**18.7**	**21.6**	**21.5**	**21.5**	**21.5**	**21.5**	**21.5**
Global Supply/Demand Balance	**Mt**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Price	**US$/mtu**	**5.42**	**4.52**	**2.99**	**4.53**	**6.86**	**7.22**	**6.19**	**5.50**	**4.88**	**4.21**	**4.33**
average grade	*%*	*35%*	*36%*	*36%*	*37%*	*38%*	*37%*	*37%*	*37%*	*37%*	*37%*	*37%*

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

Metallurgical Coal

Market still tight, but supply set to grow

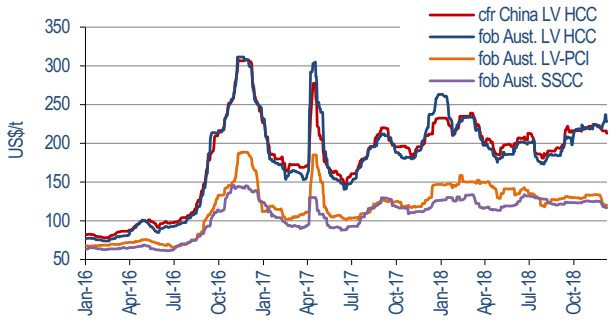
Still elevated: The HCC price remains elevated at $228/t fob Aus. Market tightness showed when the spot price rose $20/t in Oct 2018 on 2.5Mtpa North Goonyella's outage, 2% of Australia's HCC market.

India driving HCC demand: Seaborne demand growth is being driven by India, with its steel output set to rise 5% to 106Mt in 2018e. India's 2018 met coal imports have surged 14% to 59Mtpa (MSe), making it Australia's leading HCC export destination (MSe 33Mtpa). In China, though, contrary to its crude steel output growth, coke production is down 2% (Jan-Oct YoY), on higher scrap use and a falling coke rate. In line with lower coke output, China's met coal imports have been falling since Aug 2018 (-4% YoY), as output from major met coal producing Shanxi Province recovers. China's coal import quota also has an impact, as evidenced by the 17% MoM drop in China's Nov 2018 total coal imports.

Supply creeping up: Australia's HCC exports are set to total 117Mt in 2018e; +8% YoY) – back at pre-cyclone Debbie levels, but port and rail maintenance held back further HCC export growth in 2018. Since Australia can't fulfil growing demand, US mines – the market's swing supplier – have increased exports by 14% (Jan-Sep YoY), incentivised by consistently high prices.

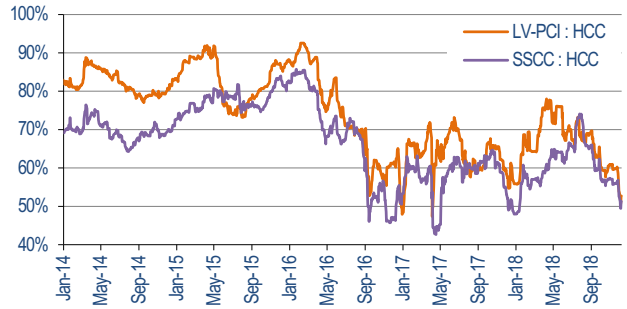
Relief ahead: Although wet season disruption in 1Q19 is likely to cap export growth, we expect Australia's supply to rise further in 2019 (by +9Mt), mainly from BHP (+4Mt; 100% basis) and Qcoal's recently-started Byerwen mine (+2Mt), providing the seaborne market some relief. However, we expect India's demand growth to continue, partly offsetting China's declining met-coal imports. We lift our price forecast to $192/t in 2019, on an expectation of stronger prices during 1H ($208/t), before weakening in 2H (to $177/t). In a surplus market, price needs to fall far enough to deter US exports (we model $130/t 2021). We forecast long-term $124/t real 2018$ ($141/t nominal 2025).

Exhibit 86: Met coal prices (US$/t)



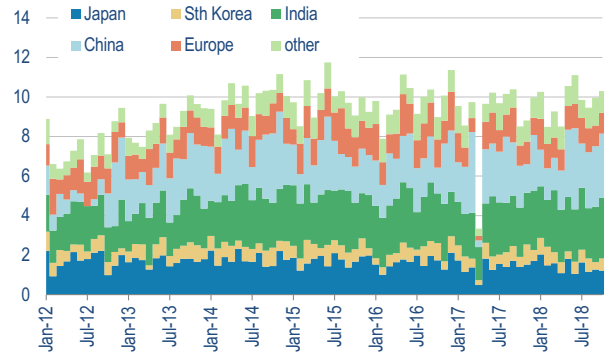
Source: Tex Report, Platts, Morgan Stanley Research

Exhibit 87: Met coal price ratios



Source: Tex Report, Platts, Morgan Stanley Research

Exhibit 88: Australia's hard coking coal exports (Mt/month)



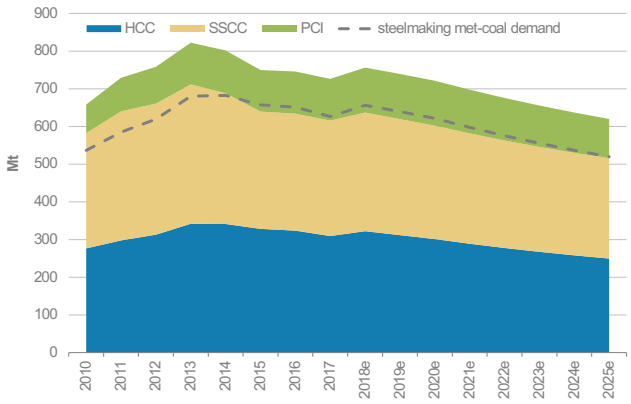
Source: Australian Bureau of Statistics

Exhibit 89: Metallurgical coal seaborne supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Global Crude Steel Production	Mt	1,660	1,687	1,638	1,644	1,698	1,801	1,791	1,796	1,795	1,795	1,792
Global Pig Iron Production	Mt	1,210	1,231	1,197	1,203	1,244	1,322	1,316	1,322	1,322	1,324	1,324
Metallurgical Coal usage in steel-making	Mt	1,131	1,142	1,116	1,125	1,152	1,225	1,221	1,227	1,228	1,231	1,232
Requirement for metallurgical coal for coke-making	**Mt**	1,008	1,014	987	994	1,017	1,081	1,078	1,084	1,086	1,090	1,091
Metallurgical Coal Exports												
Australia	Mt	169.2	184.3	183.2	186.2	168.3	176.0	185.3	195.3	200.2	200.5	196.6
Canada	Mt	36.7	32.8	29.5	27.9	28.2	30.7	32.4	34.7	37.4	39.9	43.3
United States	Mt	58.9	56.4	41.4	33.7	46.4	52.3	49.1	47.2	45.7	44.8	43.9
Colombia	Mt	1.4	0.7	0.5	0.7	0.9	1.1	1.1	1.1	1.1	1.1	1.1
Venezuela	Mt	0.4	0.0	0.0	0.0	0.1	0.0	0.2	0.3	0.3	0.3	0.3
China	Mt	1.1	0.8	1.0	1.2	2.3	1.0	1.5	1.4	1.5	1.4	1.3
Indonesia	Mt	2.2	2.3	0.3	1.5	3.9	1.7	2.1	2.6	3.8	4.7	6.8
Mongolia	Mt	10.8	10.4	8.9	16.5	18.4	18.8	19.0	19.4	19.8	20.2	20.6
Vietnam	Mt	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
New Zealand	Mt	2.4	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.3	1.5
Russia	Mt	21.2	23.3	21.1	24.8	29.8	29.0	29.6	30.2	30.8	31.4	32.0
other	Mt	9.6	10.4	11.5	12.1	15.6	16.6	18.3	19.1	20.1	20.9	21.6
Total		315	324	300	307	316	329	341	353	363	368	370
Metallurgical Coal Imports (all coking + direct injection coals)												
Japan	Mt	58.5	55.3	55.4	58.3	52.2	51.9	50.6	50.3	51.7	51.7	51.7
China	Mt	75.4	62.4	48.0	59.3	69.9	67.5	62.3	58.6	56.7	55.0	53.4
South Korea	Mt	29.7	32.5	34.0	33.8	30.9	32.5	33.0	33.1	33.6	34.0	34.4
India	Mt	38.3	46.7	49.6	50.9	51.8	59.4	65.3	72.9	79.1	88.0	95.7
Brazil	Mt	18.4	21.7	22.9	22.5	23.6	24.4	24.6	24.9	25.1	25.4	25.6
EU-25*	Mt	69.8	71.5	69.4	67.5	69.0	69.2	69.9	70.7	71.4	72.2	73.0
other	Mt	34.1	36.4	33.7	35.2	34.7	33.0	33.3	33.5	33.8	34.1	34.4
Total		324.2	326.5	313.0	327.5	332.0	337.9	339.0	344.0	351	360	368
Traded Balance		-9	-3	-13	-21	-16	-9	2	9	12	7	2
Annual Average Prices (quarterly set price, post 2010)												
Hard Coking Coal (spot; premium)	US$/t fob	148	115	88	143	190	208	173	139	130	130	135
Hard Coking Coal (contract; premium)	US$/t fob	159	126	102	114	211	210	192	145	132	130	133
Low-vol PCI (contract)	US$/t fob	125	104	84	88	139	150	117	100	101	107	109
Semi-soft coking coal (contract)	US$/t fob	113	93	76	80	131	137	114	92	89	91	93

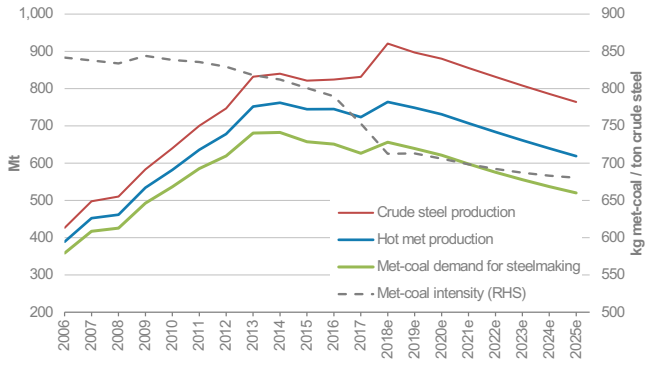
Source: World Steel Association, Tex Report, Eurostat, IHS Energy, Morgan Stanley Research estimates (e)

Exhibit 90: China's total met coal demand (Mt)



Source: Morgan Stanley Research estimates (e), Bloomberg, NBS, WoodMackenzie

Exhibit 91: China's declining met coal demand on falling crude steel production and met coal intensity



Source: Morgan Stanley Research estimates (e), Bloomberg, NBS

Thermal Coal

Market tightness to ease further

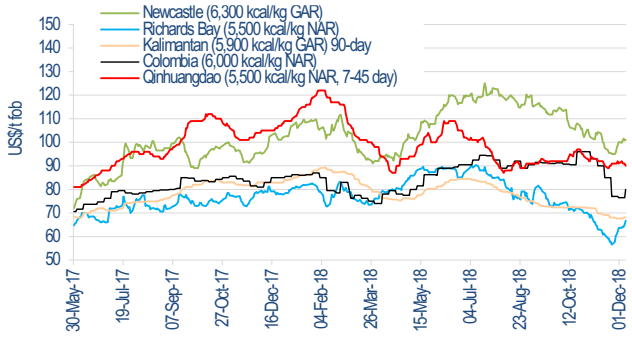
Falling market: Thermal coal prices are falling across the board, on a combination of slowing seaborne demand, rising exports and high inventory. Australia's premium price has fallen below $100/t, while Atlantic basin prices are suppressed as low water levels in the Rhine have resulted in multi-year high inventory in the Netherlands (7Mt).

Seaborne demand slowing: Recovering domestic coal supply (Oct +8% YoY), mild weather and import quotas are suppressing China's thermal imports, which have been falling since Aug 2018. The NDRC wants to cap total coal imports (incl. met) at 2017's level (271Mt), but Jan-Nov imports are 269Mt already. We expect China to keep its thermal imports <200Mtpa in future, as domestic coal is prioritised. Japan – the leading premium coal importer – will import 145Mt in 2018, we estimate (-4% YoY), as nuclear restarts affect thermal power production. We forecast a 2% p.a. fall in Japan's demand (2018-25), as its thermal power generation share gradually trends lower. India's coal imports are up 4% YoY, we estimate (144Mt in 2018e), as Coal India has not hit its production targets, and we expect a further rise in 2019 (of +3%).

Australia's exports rising: Tight supply within the premium segment was the main driver of Australia's spiking energy differential – not immediately arbitraged away, due to limited wash bank capacity in Australia. While South Africa's exports struggle (-6% 3Q18 YoY), Australia's total thermal coal exports rose 6% (July-Oct YoY), with further growth likely in 2019 (we expect +3%), incentivised by high prices.

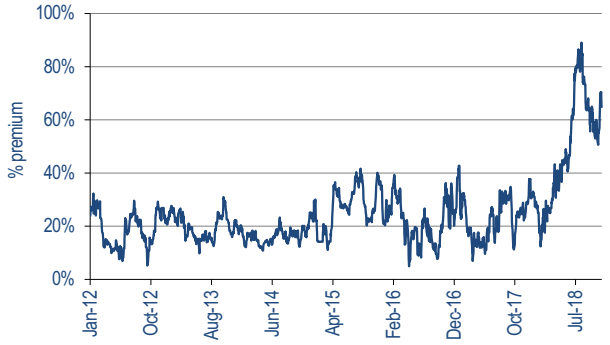
MS outlook: Lower seaborne demand from China + Japan, in combination with rising supplies from Australia + Russia will drive the overall seaborne market into surplus and put downward pressure on price. We lift our forecast to $93/t 2019 (fob Newc); $75/t long-term real 2018 ($86/t nominal 2025).

Exhibit 92: Thermal coal price indices (US$/t)



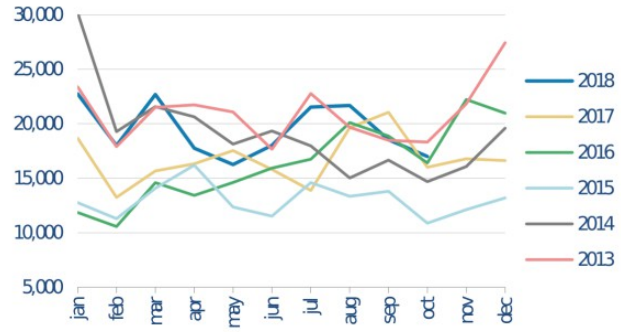
Source: Tex Report, Platts, Morgan Stanley Research

Exhibit 93: Premium thermal coal's premium: Aus 6,300kcal GAR vs 5,500kcal NAR



Source: Bloomberg, Morgan Stanley Research

Exhibit 94: China's thermal coal imports (kt/month)



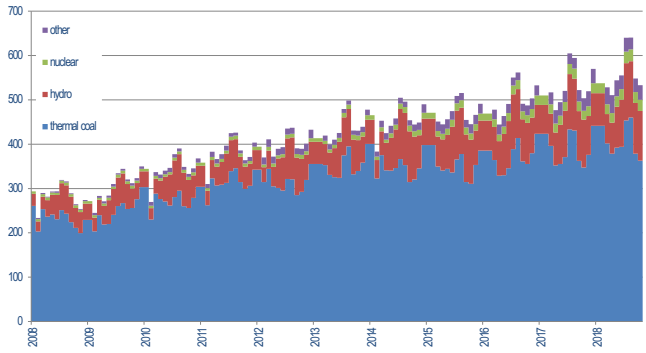
Source: Bloomberg, Morgan Stanley Research

Exhibit 95: Thermal coal seaborne supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Supply												
Indonesia	Mt	424	408	366	369	389	408	400	390	386	382	378
Australia	Mt	188	201	201	199	199	207	213	218	222	224	225
Colombia	Mt	74	75	81	89	83	82	83	86	90	93	97
South Africa	Mt	73	76	77	75	83	78	79	80	80	81	82
United States	Mt	44	29	24	16	37	48	45	40	35	30	30
Canada	Mt	3	3	2	2	2	1	1	1	1	1	1
China	Mt	4	2	1	4	4	2	2	2	2	2	2
Poland	Mt	9	7	7	7	4	2	2	2	2	2	2
Russia	Mt	106	119	118	131	140	142	144	147	150	153	156
RoW	Mt	43	40	25	22	21	21	21	21	21	21	21
Total Supply	**Mt**	**968**	**961**	**901**	**914**	**962**	**992**	**990**	**987**	**990**	**990**	**995**
YoY %chg	*%*	*4.9%*	*-0.7%*	*-6.2%*	*1.4%*	*5.3%*	*3.1%*	*-0.1%*	*-0.4%*	*0.3%*	*0.1%*	*0.5%*
Demand												
Japan	Mt	139	145	158	146	150	145	143	141	139	136	134
South Korea	Mt	97	98	101	101	116	116	118	119	121	123	125
Taiwan	Mt	46	45	31	48	51	51	51	52	52	52	52
China	Mt	252	229	156	196	201	220	200	195	191	189	188
India	Mt	139	172	164	137	139	145	149	155	157	158	160
Europe	Mt	185	169	174	154	158	148	148	148	148	148	148
North America	Mt	18	17	18	17	19	17	17	19	18	18	18
ROW	Mt	93	85	94	101	142	146	150	153	157	162	166
Total Imports	**Mt**	**968**	**961**	**895**	**899**	**976**	**988**	**975**	**982**	**982**	**986**	**992**
YoY %chg	*%*	*5.0%*	*-0.7%*	*-6.9%*	*0.4%*	*8.6%*	*1.3%*	*-1.3%*	*0.7%*	*0.1%*	*0.3%*	*0.6%*
Atlantic Market	Mt	237	219	229	209	218	208	210	214	216	219	222
YoY %chg	*%*	*-0.1%*	*-7.6%*	*4.2%*	*-8.5%*	*4.0%*	*-4.5%*	*1.1%*	*1.9%*	*1.1%*	*1.2%*	*1.4%*
Pacific Market	Mt	731	742	667	690	758	780	765	768	766	767	769
YoY %chg	*%*	*6.7%*	*1.5%*	*-10.1%*	*3.4%*	*9.9%*	*2.9%*	*-2.0%*	*0.4%*	*-0.2%*	*0.1%*	*0.3%*
Trade Balance	**Mt**	**-0.2**	**-0.3**	**5.8**	**14.9**	**-14.1**	**3.7**	**15.6**	**4.9**	**7.1**	**4.6**	**3.9**
Annual Asian Reference Price (US$/t, JFY)		**$95**	**$82**	**$68**	**$62**	**$85**	**$110**	**$95**	**$85**	**$80**	**$75**	**$75**
Price (Newcastle spot, 6,322 kcal/kg, US$/t fob)		**$84**	**$70**	**$58**	**$67**	**$88**	**$108**	**$93**	**$81**	**$76**	**$75**	**$76**

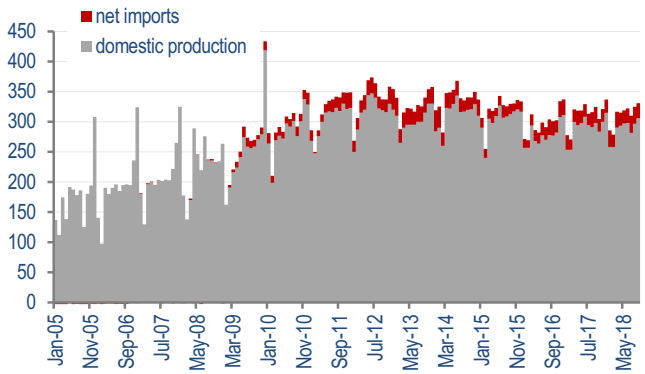
Source: Tex Report, Eurostat, IHS Energy, Morgan Stanley Research estimates (e). YoY = Year on year

Exhibit 96: China's electricity production, by source (billion KWh)



Source: Bloomberg, Morgan Stanley Research

Exhibit 97: China's total (thermal + met) domestic production + net-imports (Mt/mth)



Source: CEIC, Tex Report, IHS, Morgan Stanley Research

Lithium

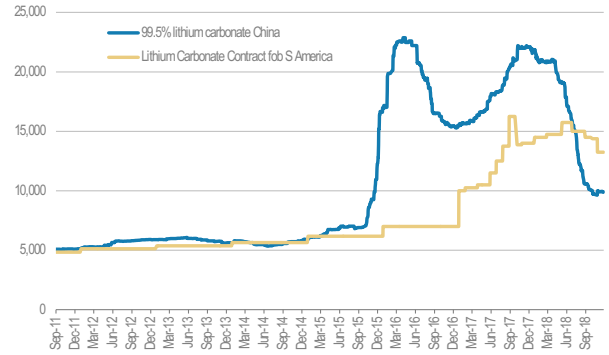
Falling fast

Spot stabilises: As destocking has come to an end in China, lithium's spot carbonate price has stabilised at a little below $10,000/t (ex-VAT). Contract prices have continued to soften, too, but are holding up better at $13,250/t. While destocking might be over, we don't expect a major restock in the near-term, given ongoing consolidation and subsidy changes in China; as well as greater security of supply, which reduces the need for battery makers to hold large inventories as the market matures.

Supply still coming: Although Chile's expansion has been delayed, as Albemarle negotiates with Corfo and SQM pushes its plans back 5 weeks; growth continues at scale elsewhere, and new projects/expansions continue to be approved. Nov 2018's Alb-Min deal firms up the 92ktpa concentrate expansion at Wodgina; while Pilbara Minerals approved its stage 2 expansion at Pilgangoora – set to add 74ktpa from 2021. In total, we now expect Australia's hardrock supply to grow by 220kt to 2025. China's domestic capacity also continues to expand, particularly from local brines – one battery maker told us that it now uses 30% domestic material for its battery output.

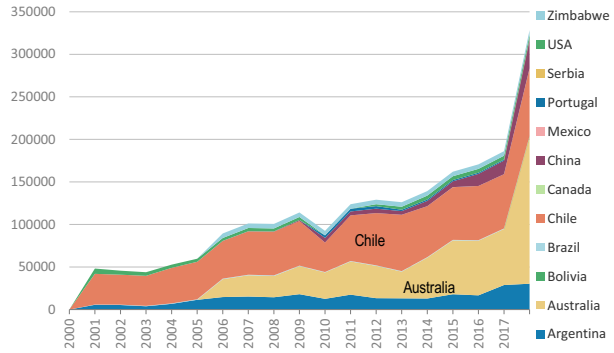
MS outlook: While an end to destocking could lend some near-term support to price, we expect lithium's balanced market in 2018 to move rapidly into substantial surplus in 2019 (we model 54kt), adding to downward pressure. We expect the gap between contract and spot price to be arbitraged away over the coming months, with contract tracking gradually downwards as new agreements are inked at lower price levels. We forecast $12,000/t in 2019.

Exhibit 98: Lithium carbonate prices ($/t)



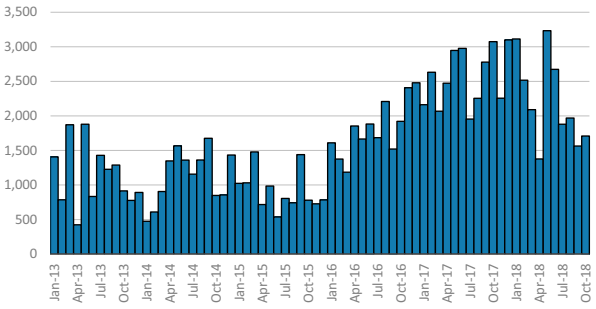
Source: Asian Metal, SNL, Morgan Stanley Research

Exhibit 99: Lithium supply, by country (tonnes LCE)



Source: CRU, Morgan Stanley Research

Exhibit 100: China monthly lithium carbonate imports (t)



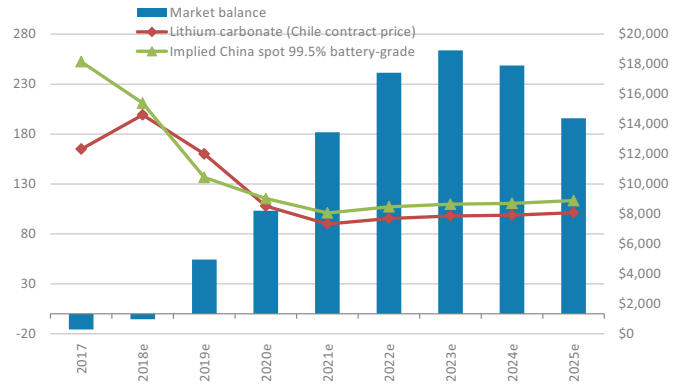
Source: China customs data, Morgan Stanley Research

Exhibit 101: Lithium global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Supply												
Brine/Clay operations	kt	84	91	95	109	139	152	202	256	308	343	365
Brine/Clay expansions/projects (uncommitted)	kt				0	0	5	6	17	44	76	110
Growth in brine supply	%	*-4%*	*9%*	*5%*	*14%*	*27%*	*13%*	*32%*	*32%*	*28%*	*19%*	*13%*
Hardrock operations	kt	55	71	75	77	189	217	239	284	332	351	340
Hardrock expansion/projects (uncommitted)	kt				1	0	0	27	65	84	126	148
Total converted hardrock supply (LCE)	kt	**55**	**71**	**75**	**68**	**76**	**100**	**157**	**198**	**235**	**271**	**295**
Growth in mineral supply	%	*42%*	*28%*	*6%*	*3%*	*143%*	*15%*	*22%*	*31%*	*19%*	*15%*	*2%*
Total World Supply	**kt**	**139**	**162**	**171**	**177**	**215**	**255**	**354**	**458**	**568**	**669**	**747**
Growth in lithium supply	%	*10%*	*16%*	*5%*	*4%*	*21%*	*19%*	*39%*	*29%*	*24%*	*18%*	*12%*
Consumption by end-use												
Rechargeable Battery	kt	47	51	68	79	101	126	161	213	244	281	332
of which Electric Vehicle demand	kt	3	7	18	29	49	72	104	154	181	216	264
Growth in battery demand	%	*23%*	*8%*	*33%*	*16%*	*28%*	*25%*	*28%*	*32%*	*15%*	*15%*	*18%*
Industrial Demand	kt	83	85	99	110	130	135	139	142	143	147	151
Total World Demand	**kt**	**130**	**136**	**167**	**189**	**231**	**261**	**300**	**355**	**387**	**428**	**483**
Growth in lithium demand	%	*10%*	*5%*	*22%*	*13.5%*	*22.0%*	*13.0%*	*14.9%*	*18.4%*	*9.0%*	*10.6%*	*12.9%*
Market balance	**kt**	**9.1**	**25.7**	**4.0**	**-11.9**	**-15.7**	**-5.5**	**54.3**	**103.2**	**181.7**	**241.4**	**263.7**
Lithium carbonate (Chile contract price)	**US$/t fob**	**$5,376**	**$5,645**	**$6,180**	**$6,995**	**$12,325**	**$14,611**	**$12,000**	**$8,524**	**$7,332**	**$7,699**	**$7,861**
Implied China spot 99.5% battery-grade	**US$/t**	**$5,878**	**$5,619**	**$8,091**	**$18,709**	**$18,157**	**$15,395**	**$10,438**	**$9,026**	**$8,065**	**$8,469**	**$8,647**
Implied spodumene price (cif China)	**US/t**			**$428**	**$506**	**$899**	**$880**	**$757**	**$592**	**$520**	**$546**	**$557**

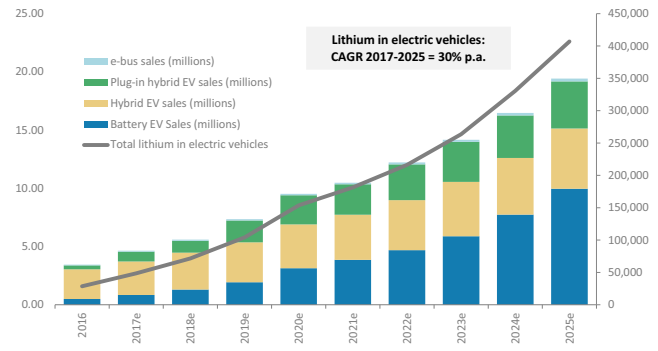
Source: Morgan Stanley Research estimates, CRU, Roskill

Exhibit 102: Lithium supply-demand balance



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

Exhibit 103: Lithium demand in electric vehicles



Source: Morgan Stanley Research estimates (e)

Cobalt

Supply goes nuclear

Back to earth: 4Q18 brought another sharp move lower in LME cobalt price – to $25/lb ($55,000/t) – while more liquid survey-based prices remain better supported at around $30/lb. The announcement by Glencore that it would halt cobalt exports (details below) raised expectations for a price rebound – but with still-muted demand from China, the market impact has been limited to date.

Katanga's export halt: Glencore's plans to ramp supply at Katanga Mining to 32ktpa by 2020 hit a hurdle, as high levels of uranium were found in its cobalt hydroxide exports. Shipments have been halted while the company considers construction of an ion exchange system – possibly by 2Q19; however, mining continues, building inventory in the meantime. As Katanga had only recently restarted, the loss of volume to the market in the near-term is minimal. However, the loss of exports from 1H19 is likely to keep the market tighter for longer and, in our view, will prevent a further decline in price.

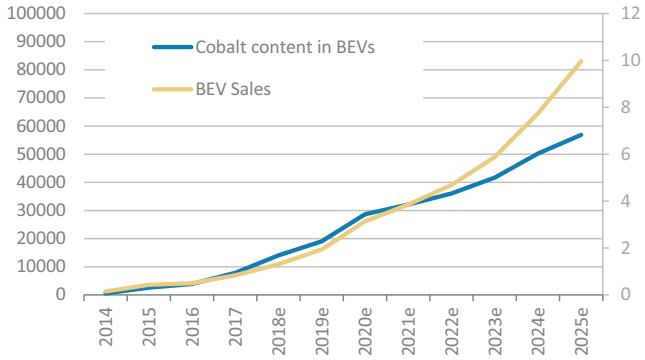
DRC risk: The dependence of cobalt's market on the DRC (70% of mined supply) was brought even more into focus as the country officially declared cobalt a "strategic mineral substance" this month, upping the royalty rate on supply to 10%. As most mines produce cobalt at minimal cost as a by-product from copper mining, we think this move is unlikely to impact existing production.

MS outlook: 1H19 may see price find some support, assuming Glencore's shipments remain out of the market. However, ongoing ramp-up of ERG's 20ktpa RTR project means this support will prove short-lived. We forecast $28/lb 2019; long-term $23/lb (real 2018$).

Exhibit 104: LME cobalt price (US$/lb)

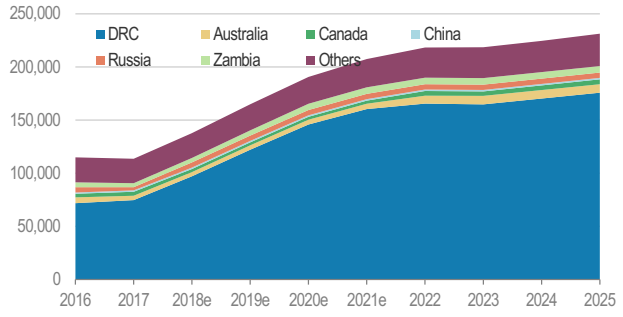
Source: Asian Metal, SNL, Morgan Stanley Research

Exhibit 105: Battery electric vehicle sales and cobalt content



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

Exhibit 106: Mine supply by country (tonnes)



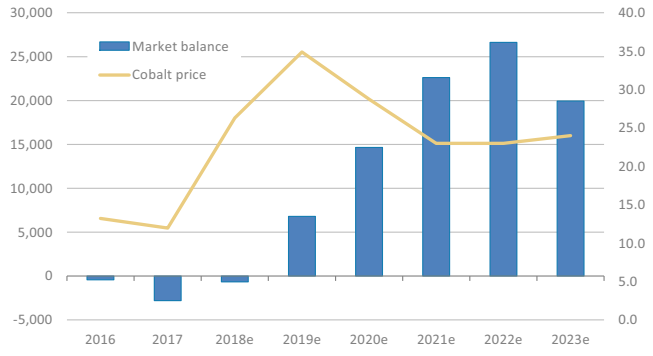
Source: Company data, Morgan Stanley Research estimates (e)

Exhibit 107: Cobalt global supply-demand model

	unit	2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
World Mine Production	tonnes	**97,068**	**112,236**	**112,926**	**114,902**	**113,577**	**137,710**	**164,861**	**190,592**	**207,436**	**218,282**	**218,531**
YoY change	%	*12%*	*16%*	*0.6%*	*2%*	*-1%*	*21%*	*20%*	*16%*	*9%*	*5%*	*0%*
by Country												
DRC		57,529	68,380	67,670	71,773	74,670	97,100	122,104	145,825	160,349	165,489	164,750
Australia		6,171	5,955	5,743	5,475	4,103	3,923	4,123	4,523	5,030	7,444	8,023
Canada		3,213	3,199	2,922	3,409	3,752	2,918	2,791	2,727	2,908	4,429	4,188
China		2,115	2,135	1,308	1,147	1,313	1,336	1,386	1,386	1,385	1,385	1,385
Russia		4,282	4,288	5,000	5,000	3,000	4,900	5,000	5,000	5,000	5,000	5,000
Zambia		5,200	5,500	4,600	4,600	3,750	4,180	4,903	5,900	6,150	6,150	6,150
Others		18,558	22,779	25,684	23,499	22,989	23,352	24,553	25,230	26,614	28,385	29,035
World Refined Supply	tonnes	**85,417**	**91,389**	**97,129**	**96,872**	**104,722**	**110,168**	**123,646**	**143,104**	**156,057**	**164,512**	**164,858**
YoY change	%	*10%*	*7%*	*6%*	*0%*	*8%*	*5%*	*12%*	*16%*	*9%*	*5%*	*0%*
+ additional battery recycling growth		*1,000*	*1,500*	*1,500*	*1,800*	*2,000*	*2,500*	*2,875*	*3,306*	*3,802*	*4,373*	*5,247*
Total World Demand	tonnes	**78,235**	**85,665**	**91,229**	**96,605**	**104,524**	**111,329**	**119,721**	**131,759**	**137,242**	**142,254**	**150,159**
YoY change	%	*2.9%*	*9.5%*	*6.5%*	*5.9%*	*8.2%*	*6.5%*	*7.5%*	*10.1%*	*4.2%*	*3.7%*	*5.6%*
Batteries	tonnes	39,152	41,440	45,486	49,321	55,602	60,685	67,309	77,719	81,769	85,629	92,354
of which EVs		356	1022	4214	8946	15418	22724	29545	40050	43844	48656	54753
YoY change	%	*6%*	*6%*	*10%*	*8%*	*13%*	*9%*	*11%*	*15%*	*5%*	*5%*	*8%*
Other	tonnes	39,083	44,225	45,742	47,284	48,923	50,645	52,412	54,039	55,473	56,625	57,805
YoY change	%	*0%*	*13%*	*3%*	3%	3%	4%	3%	3%	3%	2%	2%
Inventory build	tonnes			1000	2500	5000	2000					
Market balance	tonnes	**7,182**	**5,724**	**7,400**	**-433**	**-2,802**	**-662**	**6,800**	**14,652**	**22,617**	**26,630**	**19,947**
Cobalt price	US$/lb	**13.3**	**14.2**	**13.2**	**12.0**	**26.3**	**34.9**	**28.8**	**23.0**	**23.0**	**24.0**	**25.0**
Cobalt price	US$/t	**29,364**	**31,354**	**29,156**	**26,401**	**57,977**	**76,913**	**63,383**	**50,706**	**50,706**	**52,911**	**55,116**

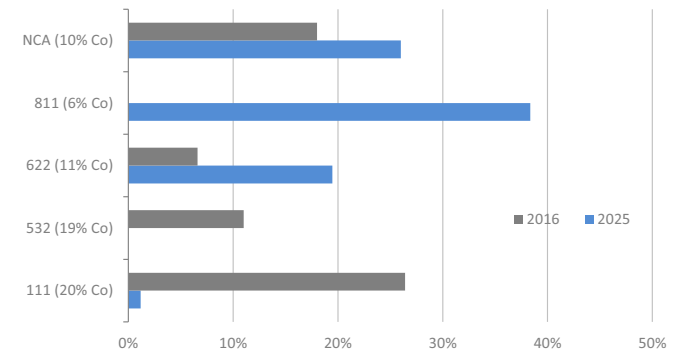
Source: Morgan Stanley Research estimates (e), Darton Commodities, CDI. YoY = Year on year

Exhibit 108: Cobalt supply-demand balance



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

Exhibit 109: Cobalt use in different battery types (%)



Source: Morgan Stanley Research

Summary Balances

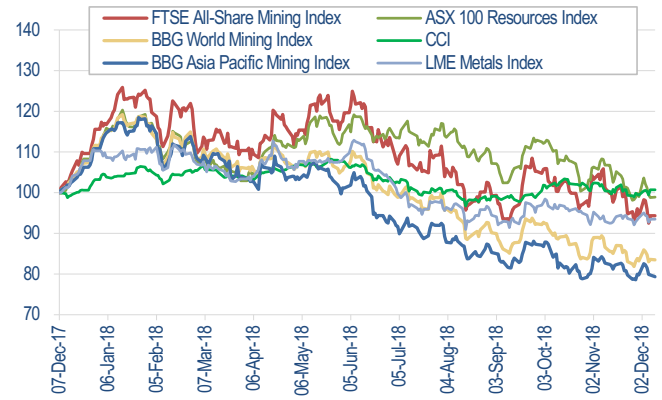
Exhibit 110: Global commodity balances (Mt, Moz)

		2013	2014	2015	2016	2017	2018e	2019e	2020e	2021e	2022e	2023e
Aluminium (Mt)	supply	50.7	53.3	56.7	58.4	63.1	63.9	67.4	71.2	74.1	77.0	78.9
	demand	50.1	53.9	56.2	58.6	62.4	64.3	67.4	70.4	73.4	76.5	79.3
	balance	0.54	-0.58	0.58	-0.23	0.70	-0.45	0.03	0.83	0.69	0.46	-0.45
Alumina (Mt)	supply	101	105	111	112	124	123	135	144	154	158	162
	demand	99	104	111	114	123	125	132	139	145	150	154
	balance	2.1	1.0	-0.0	-1.5	1.2	-1.2	3.5	5.0	8.9	7.8	7.9
Copper (Mt)	supply	20.92	21.78	22.19	22.97	23.24	23.75	23.77	24.44	24.85	25.54	25.86
	demand	20.81	21.66	21.99	22.61	22.84	23.54	23.97	24.43	24.84	25.25	25.64
	balance	0.11	0.13	0.20	0.36	0.40	0.21	-0.20	0.02	0.01	0.29	0.21
Nickel (Mt)	supply	1.992	1.973	1.974	2.023	2.052	2.170	2.272	2.317	2.344	2.339	2.332
	demand	1.748	1.802	1.809	1.978	2.130	2.235	2.318	2.389	2.493	2.565	2.665
	balance	0.244	0.171	0.165	0.046	-0.078	-0.065	-0.046	-0.072	-0.149	-0.226	-0.332
Zinc (Mt)	supply	12.9	13.2	13.7	13.0	13.2	13.8	14.4	15.4	15.6	15.7	15.8
	demand	13.3	13.9	13.9	14.1	14.3	14.2	14.5	14.7	15.0	15.3	15.5
	balance	-0.39	-0.68	-0.22	-1.07	-1.07	-0.47	-0.06	0.68	0.59	0.39	0.28
Lead (Mt)	supply	11.3	11.7	11.8	12.0	12.3	12.5	12.8	13.1	13.4	13.6	13.9
	demand	11.3	11.7	11.7	12.1	12.4	12.5	12.8	13.0	13.3	13.5	13.7
	balance	0.06	0.04	0.02	-0.07	-0.12	-0.01	0.03	0.06	0.16	0.04	0.17
Steel (Mt; crude)	supply	1660	1687	1638	1644	1698	1801	1791	1796	1795	1795	1792
	demand	1645	1670	1620	1645	1724	1786	1797	1803	1798	1798	1800
	balance	15	18	18	-1	-25	15	-6	-7	-3	-4	-8
Iron ore (Mt; seaborne)	supply	1192	1326	1351	1428	1485	1482	1519	1525	1521	1507	1512
	demand	1173	1318	1342	1408	1450	1458	1456	1443	1425	1409	1391
	balance	18	8	9	20	36	24	62	82	96	98	120
Iron ore (Mt; global)	supply	2133	2217	2181	2164	2150	2206	2250	2258	2257	2246	2251
	demand	2158	2215	2140	2157	2129	2208	2213	2210	2203	2200	2191
	balance	-24	3	41	6	22	-2	37	48	53	46	60
Metallurgical coal (seaborne, Mt)	supply	315	324	300	307	316	329	341	353	363	368	370
	demand	324	327	313	328	332	338	339	344	351	360	368
	balance	-9	-3	-13	-21	-16	-9	2	9	12	7	2
Thermal coal (seaborne, Mt)	supply	968	961	901	914	962	992	990	987	990	990	995
	demand	968	961	895	899	975	988	975	982	982	986	992
	balance	-0	-0	6	15	-14	4	16	5	7	5	4
Gold (Moz)	supply	108.2	117.0	114.3	127.7	125.2	120.9	122.3	123.9	125.4	127.0	128.7
	demand	108.2	117.0	114.3	127.7	125.2	120.9	122.3	123.9	125.4	127.0	128.7
	balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Silver (Moz)	supply	955.6	1015.8	1010.0	977.8	963.1	965.5	986.2	996.0	1007.4	1018.9	1029.0
	demand	1089.1	1081.8	1127.3	1008.1	981.6	938.4	952.7	968.0	986.8	1006.6	1030.2
	balance	-133.5	-66.0	-117.3	-30.3	-18.6	27.1	33.4	28.0	20.6	12.2	-1.1
Platinum (Moz)	supply	7.84	7.20	7.79	7.99	8.03	8.05	8.03	8.03	8.12	8.31	8.37
	demand	7.52	7.64	7.70	7.51	7.57	7.46	7.45	7.77	8.07	8.42	8.57
	balance	0.31	-0.44	0.09	0.48	0.46	0.59	0.59	0.25	0.05	-0.11	-0.20
Palladium (Moz)	supply	8.92	8.86	8.87	9.26	9.28	9.92	10.12	10.08	10.05	10.29	10.55
	demand	9.38	9.65	9.80	10.00	10.47	10.77	11.01	10.94	11.06	11.22	11.42
	balance	-0.47	-0.79	-0.93	-0.73	-1.19	-0.86	-0.89	-0.86	-1.02	-0.93	-0.87

Source: Morgan Stanley Research estimates (e)

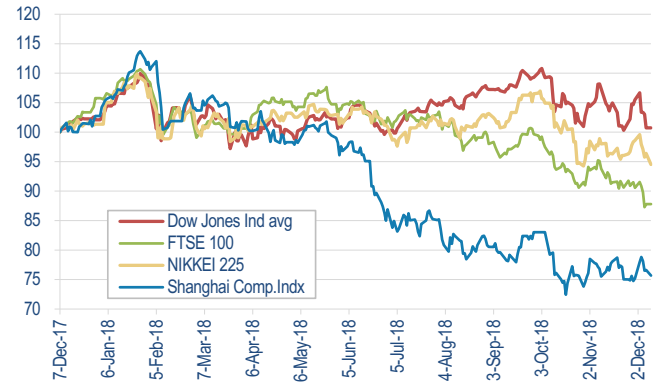
Key Charts

Exhibit 111: Resource sector indices (12-mth rolling)



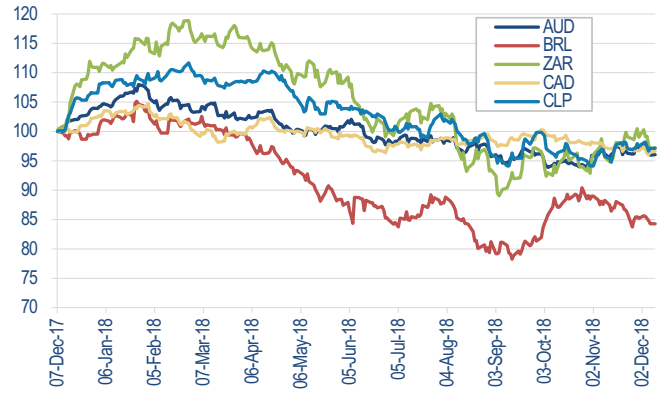
Source: Bloomberg, Morgan Stanley Research

Exhibit 112: General market indices (12-mth rolling)



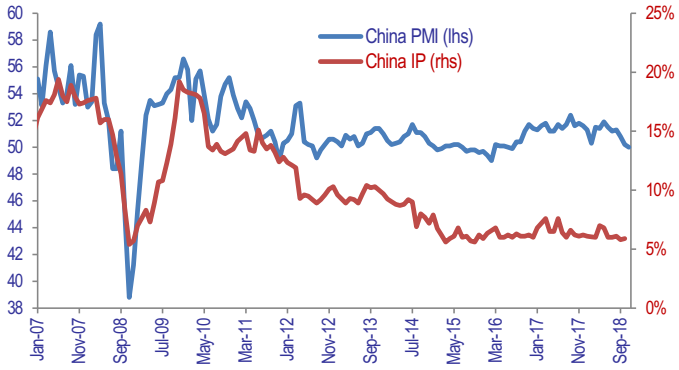
Source: Bloomberg, Morgan Stanley Research

Exhibit 113: Selection of producer currencies (12-mth rolling)



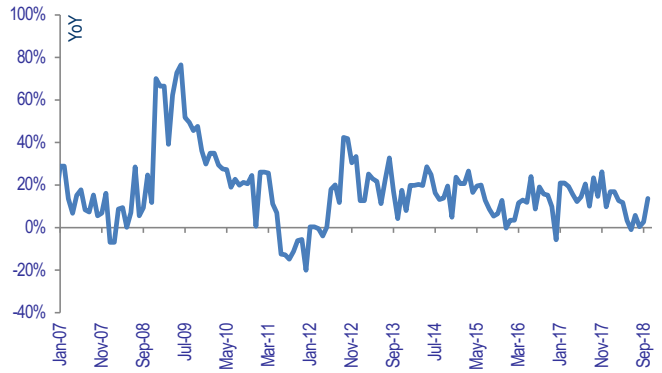
Source: Bloomberg, Morgan Stanley Research

Exhibit 114: China PMI vs IP



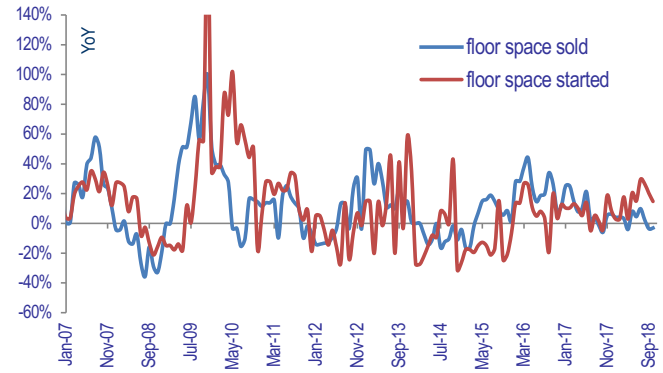
Source: CEIC, Morgan Stanley Research

Exhibit 115: China's infrastructure FAI



Source: CEIC, Morgan Stanley Research

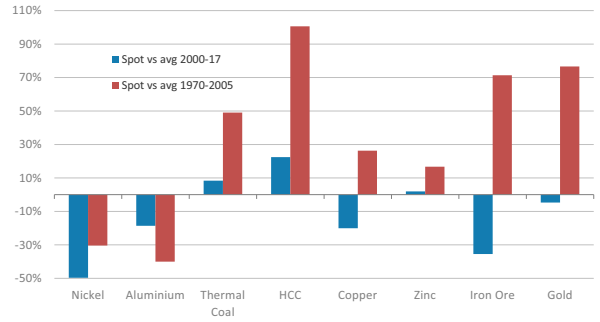
Exhibit 116: Floor space sold vs floor space started



Source: CEIC, Morgan Stanley Research

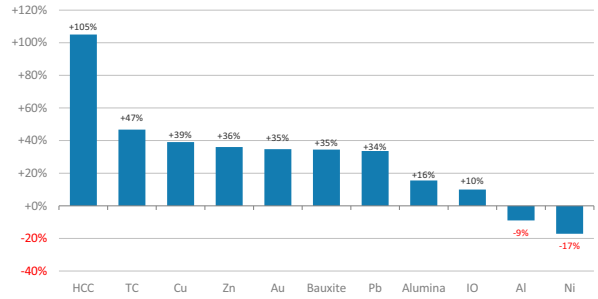
Markets in Context

Exhibit 117: Spot vs historical averages: nickel + aluminium most oversold on this basis



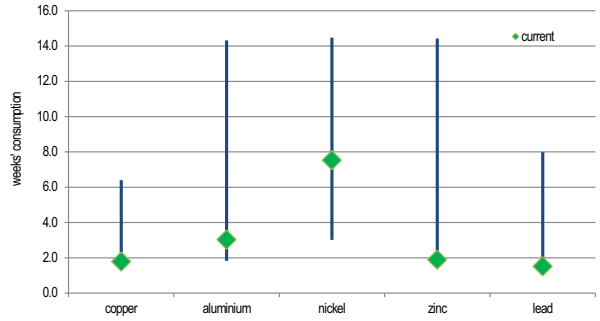
Source: Morgan Stanley Research, Bloomberg, Platts

Exhibit 118: Spot vs marginal cost: nickel + aluminium best positioned on this basis, too…



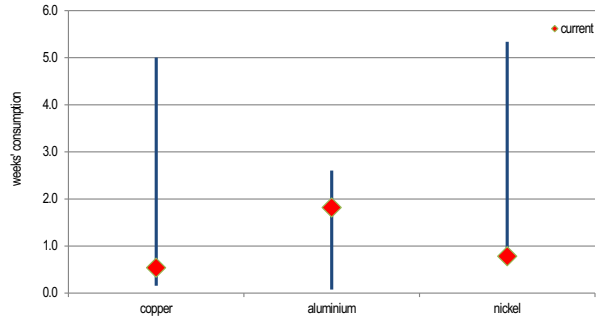
Source: Morgan Stanley Research, Wood Mackenzie, Bloomberg, Platts

Exhibit 119: … but nickel inventory is high, globally (global weeks' consumption; current vs high/low range)…



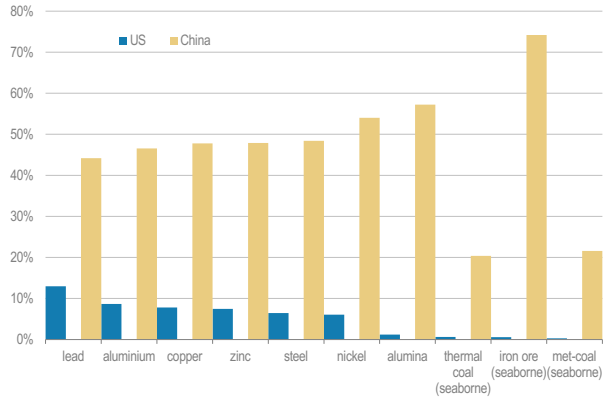
Source: Morgan Stanley Research, WBMS, Bloomberg, LME

Exhibit 120: … not in China though (China weeks; consumption' current vs high/low range)



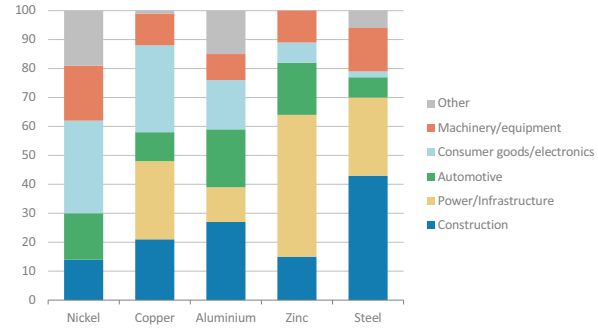
Source: Morgan Stanley Research, WBMS, Bloomberg, SHFE

Exhibit 121: China and US as % commodity demand



Source: Morgan Stanley Research

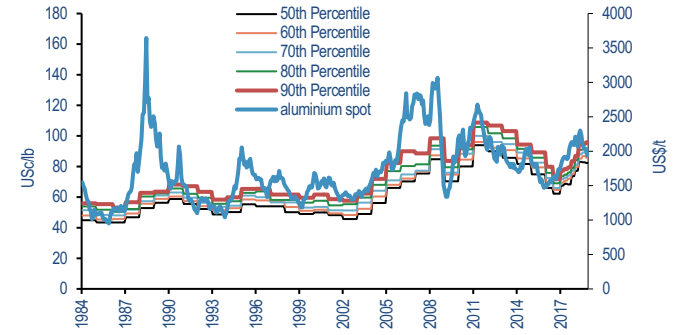
Exhibit 122: China by end use: tariff impact is likely to be hardest on those exposed to consumer goods sector



Source: Morgan Stanley Research, Wood Mackenzie

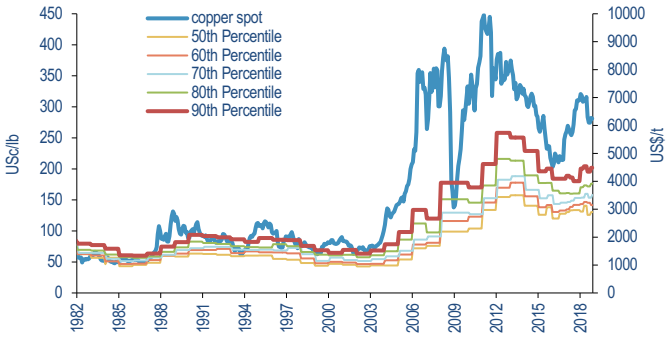
Price vs. marginal costs of production

Exhibit 123: Aluminium



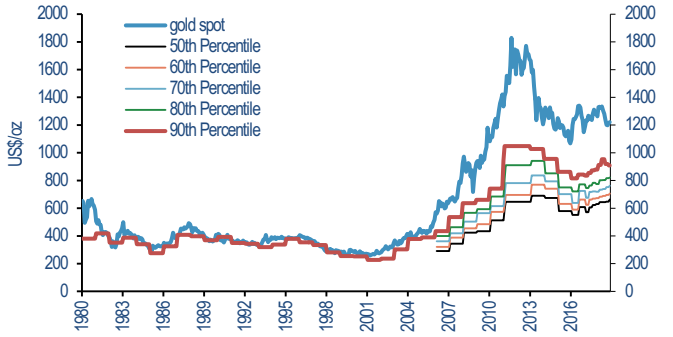
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 124: Copper



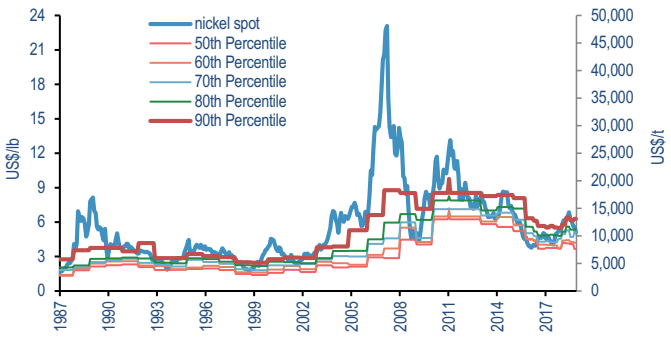
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 125: Gold



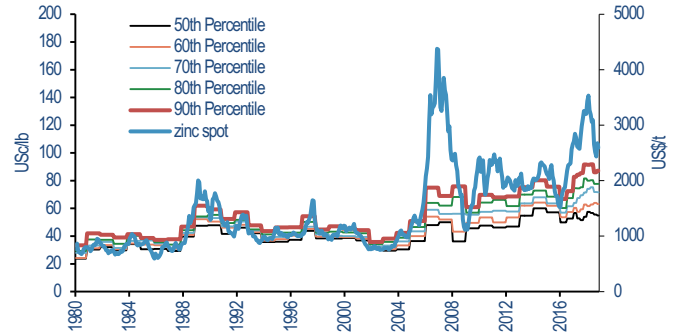
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 126: Nickel



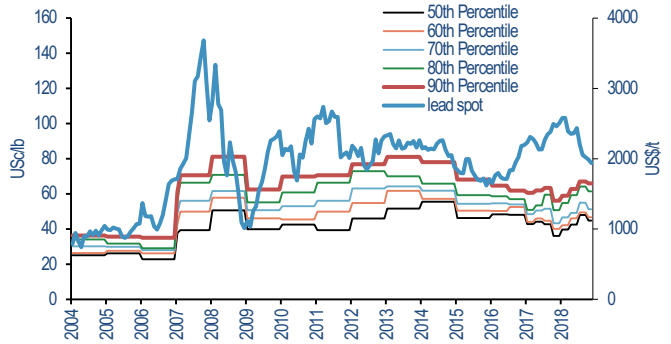
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 127: Zinc



Source: Wood Mackenzie, Morgan Stanley Research

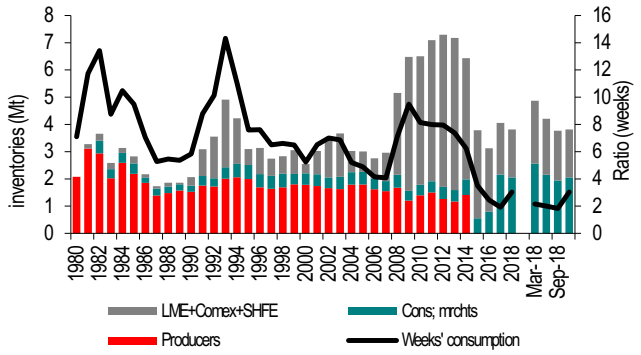
Exhibit 128: Lead



Source: Wood Mackenzie, Morgan Stanley Research

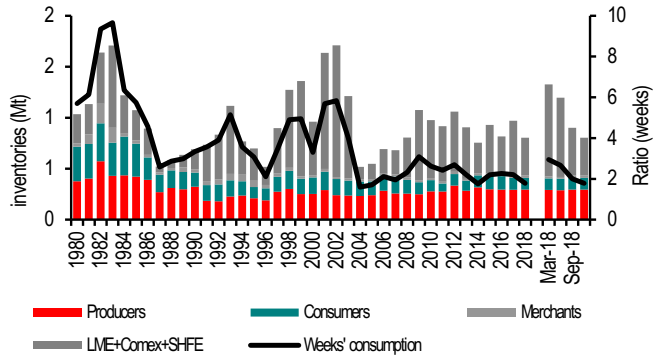
Inventories vs. weeks' consumption ratios – LME base metals

Exhibit 129: Aluminium



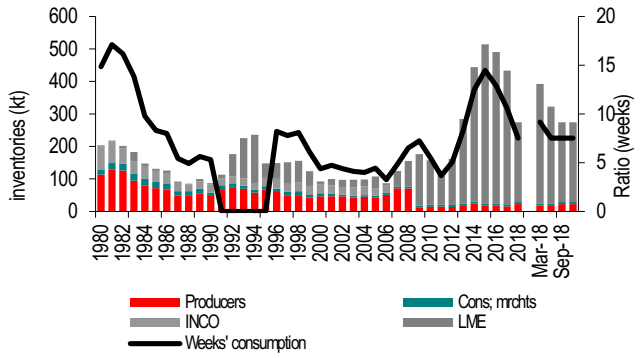
Source: World Bureau of Metals Statistics, Bloomberg, Morgan Stanley Research

Exhibit 130: Copper



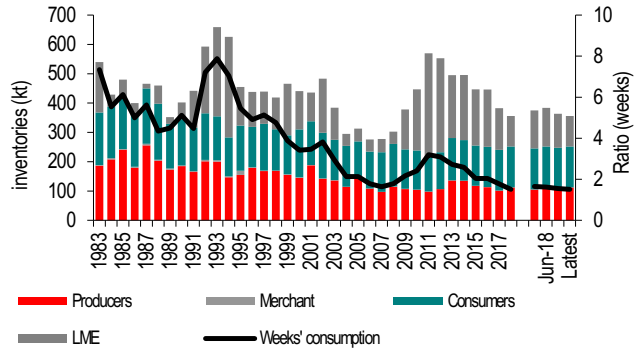
Source: World Bureau of Metals Statistics, International Copper Study Group, Bloomberg, Morgan Stanley Research

Exhibit 131: Nickel



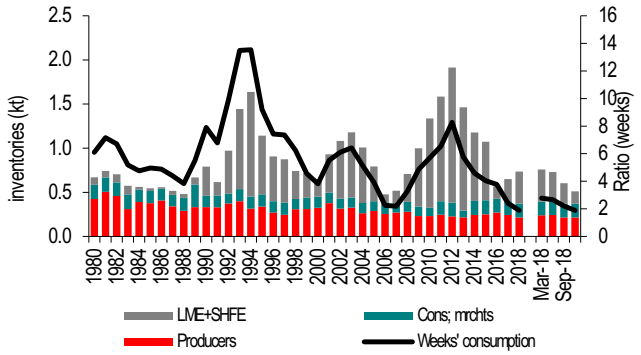
Source: World Bureau of Metals Statistics, International Nickel Study Group, Bloomberg, Morgan Stanley Research

Exhibit 132: Lead



Source: World Bureau of Metals Statistics, International Lead Zinc Study Group, Bloomberg, Morgan Stanley Research

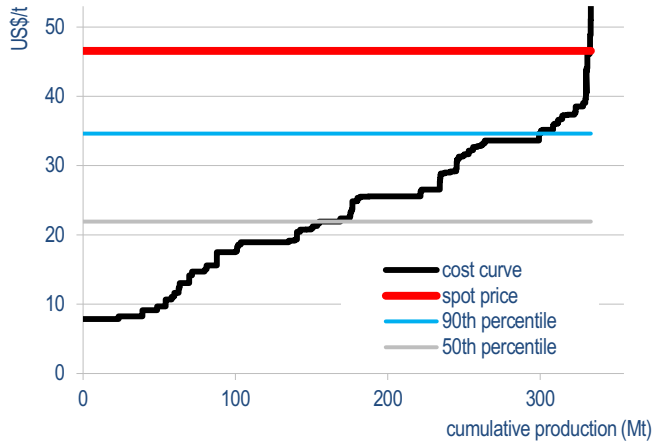
Exhibit 133: Zinc



Source: World Bureau of Metals Statistics, International Lead Zinc Study Group, Bloomberg, Morgan Stanley Research

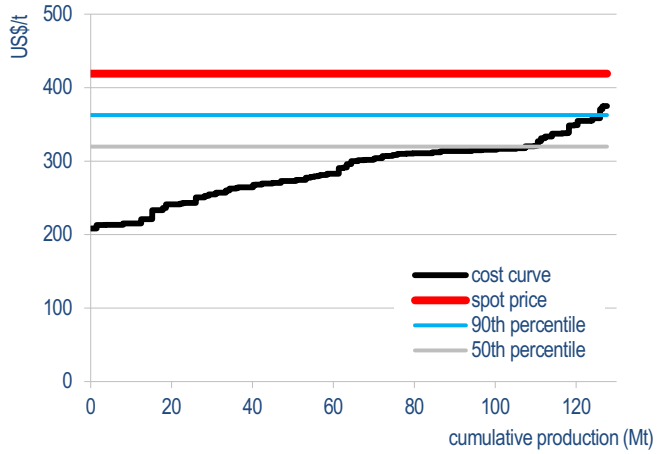
Commodity cost curves

Exhibit 134: Bauxite



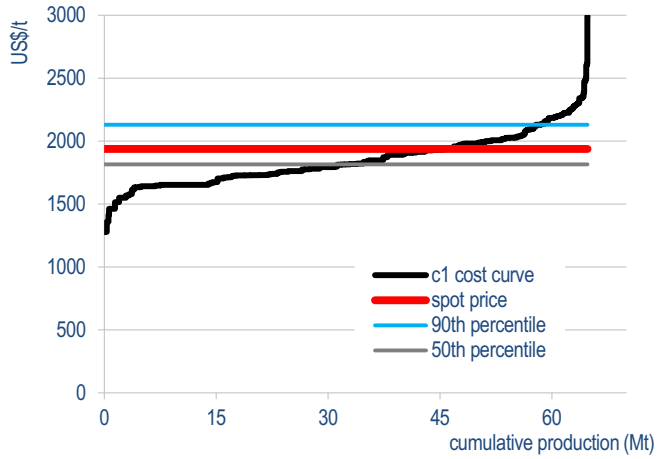
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 135: Alumina



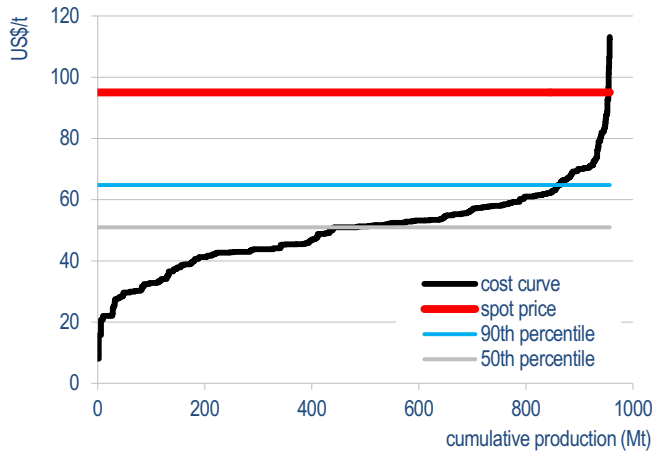
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 136: Aluminium



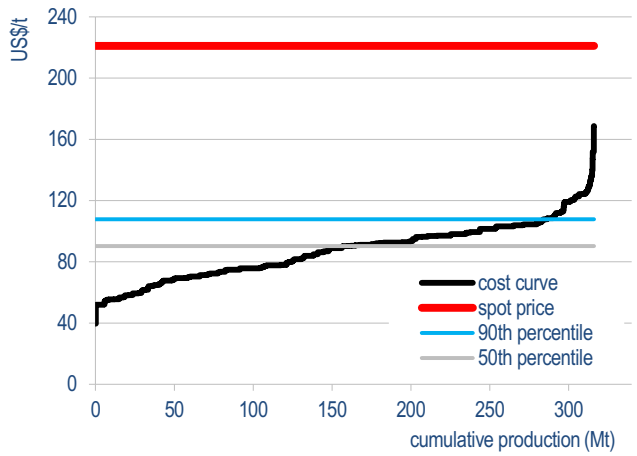
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 137: Thermal Coal



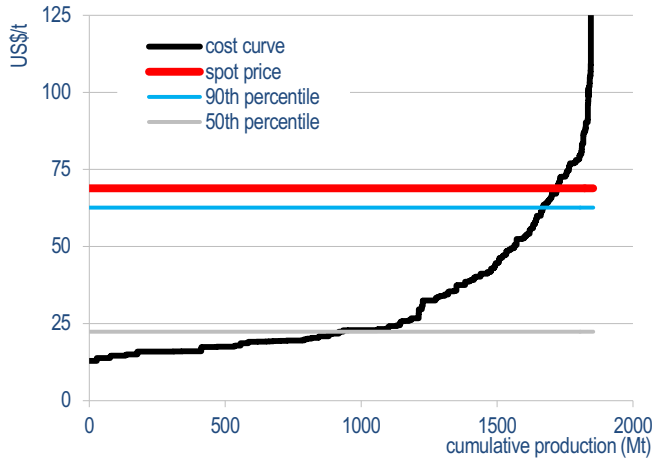
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 138: Met Coal



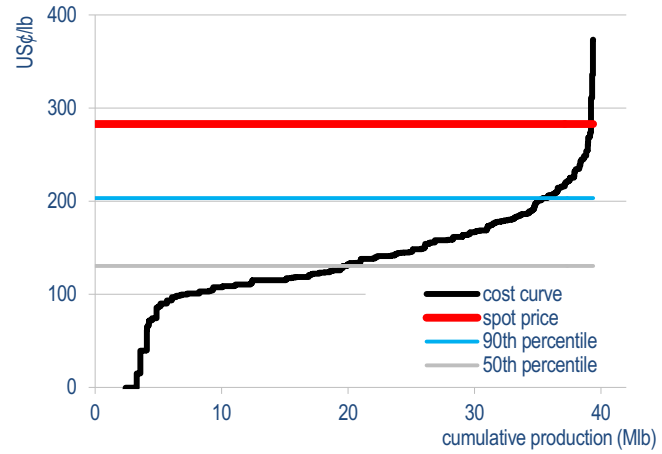
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 139: Iron Ore



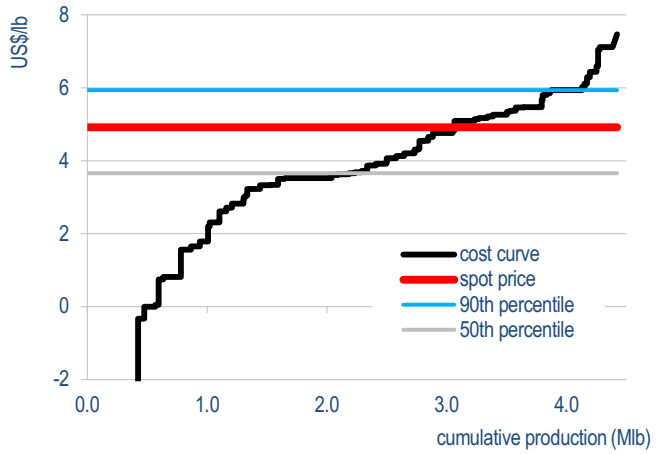
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 140: Copper



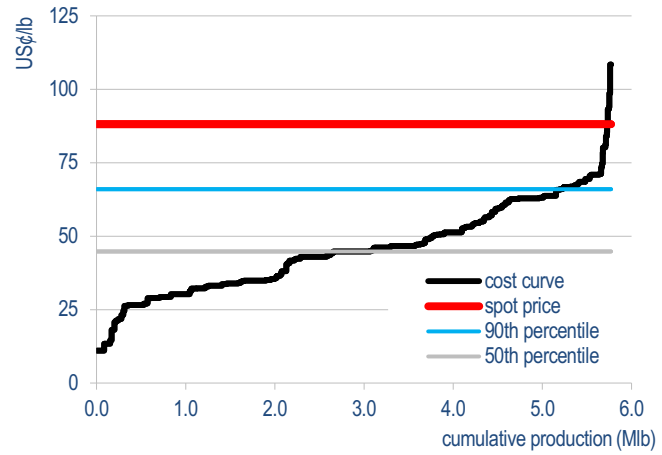
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 141: Nickel



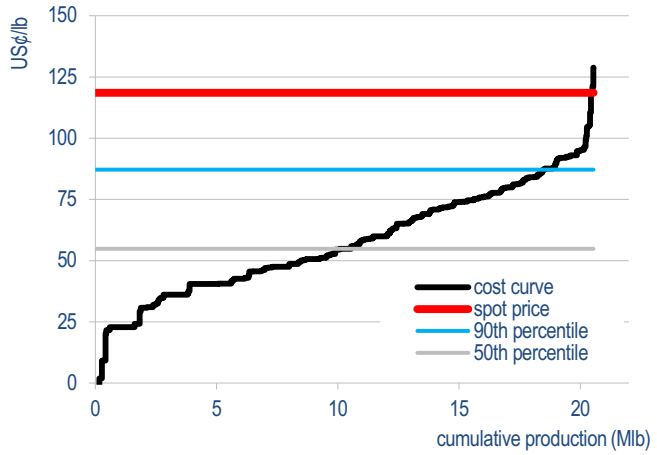
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 142: Lead



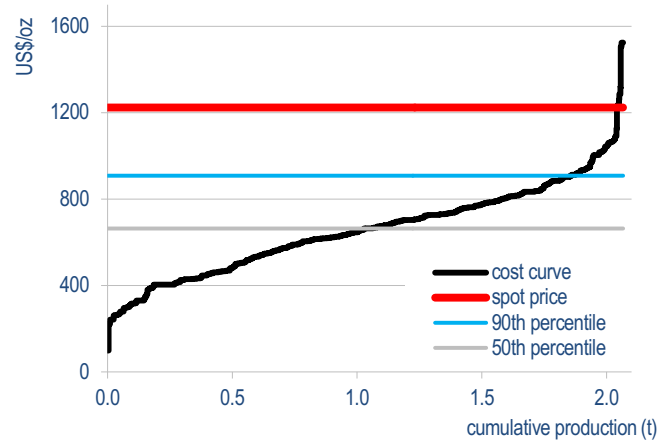
Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 143: Zinc



Source: Wood Mackenzie, Morgan Stanley Research

Exhibit 144: Gold



Source: Wood Mackenzie, Morgan Stanley Research

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Europe Metals & Mining: Match fit	12-Dec-18
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European Metals & Mining Tracker: Solid foundations	27-Sep-18

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GLOBAL METALS & MINING TEAM

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(as of November 30, 2018)

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Overweight/Buy	**1156**	**37%**	**295**	**40%**	**26%**	**541**	**38%**
Equal-weight/Hold	**1405**	**44%**	**342**	**47%**	**24%**	**641**	**45%**
Not-Rated/Hold	**46**	**1%**	**7**	**1%**	**15%**	**7**	**0%**
Underweight/Sell	**555**	**18%**	**85**	**12%**	**15%**	**226**	**16%**
TOTAL	**3,162**		**729**			**1415**	

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