

15 December 2015

Global Metals Playbook: 1Q 2016

Year of Respite

- **Back to fundamentals:** We continue to see only a modest abatement in China-led commodity demand growth, not the capitulation that year-to-date price performances imply. The fact that economic activity everywhere remains buoyant, commodity trade flows are intact, and that producers are rapidly rebalancing their trades in reply to shock-low prices – tells us that downside price risk is limited. Historical benchmarks confirm this view. So after the investor exodus and speculative selling is done, robust fundamentals of Commodity World will again matter to its prices.
- **Likely catalysts for price recovery:** Q1's typically reliable seasonal restock alone has the capacity to terminate ongoing short-selling strategies. Other potential price supports include a demand-led recovery in the oil price (inflationary); resolution over the scale/duration of the US rate hike cycle (generally supportive within 12 months of the cycle's start); and government backing for industrial activity in China (project approvals, funding, macro).
- **Top picks:** First output cuts + stainless steel restock makes oversold nickel our most-preferred; we like copper and zinc too, given balanced outlooks vs. depressed prices. Avoid well supplied trades of mineral sands and thermal coal. Our once-bullish take on met-coal has cooled somewhat, awaiting evidence of cost-push risk to product prices. PGMs are troubled by sticky supply, a structurally impaired demand outlook, and an investor-exit. Gold's been a great place to hide in 2015, but its medium-term flat price outlook now looks unattractive in our 2016 deck.

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Commodity Thermometer: 12-mth outlook

commodity	bearish	neutral	bullish
nickel			
zinc			
copper			
uranium			
palladium			
iron ore			
lead			
alumina			
aluminium			
platinum			
gold			
thermal coal			
metallurgical coal			
mineral sands			

Source: Morgan Stanley Research

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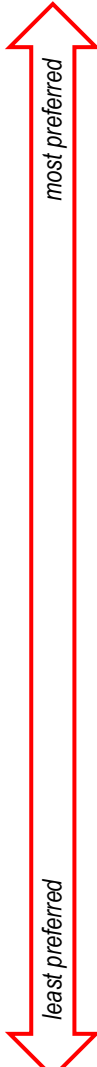
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Key changes to commodity price forecasts

commodity group	unit	1Q 16	2Q 16	3Q 16e	4Q 16e	2015e	2016e	2017e	2018e	LT real	LT nom.
Base Metals											
Aluminium	US\$/lb	0.68	0.70	0.72	0.72	0.75	0.71	0.74	0.80	0.90	0.99
	US\$/t	1,499	1,543	1,587	1,587	1,664	1,554	1,631	1,764	1,973	2,184
vs. previous forecast	%	-8%	-5%	-3%	-3%	-1%	-5%	-5%	-5%	0%	-1%
Copper	US\$/lb	2.20	2.40	2.50	2.40	2.51	2.38	2.49	2.81	2.80	3.10
	US\$/t	4,850	5,291	5,512	5,291	5,527	5,236	5,484	6,200	6,173	6,832
vs. previous forecast	%	-19%	-16%	-11%	-13%	-3%	-14%	-10%	-1%	0%	-1%
Nickel	US\$/lb	4.20	4.80	5.20	5.20	5.40	4.85	5.55	6.60	7.60	8.41
	US\$/t	9,259	10,582	11,464	11,464	11,908	10,692	12,236	14,550	16,755	18,544
vs. previous forecast	%	-28%	-23%	-20%	-20%	-5%	-22%	-18%	-6%	0%	-1%
Zinc	US\$/lb	0.75	0.77	0.80	0.85	0.88	0.79	0.90	0.95	0.96	1.06
	US\$/t	1,653	1,698	1,764	1,874	1,936	1,747	1,984	2,094	2,116	2,342
vs. previous forecast	%	-15%	-13%	-9%	-3%	-3%	-10%	0%	0%	0%	-1%
Precious Metals											
Gold	US\$/oz	1,080	1,100	1,065	1,080	1,162	1,081	1,150	1,200	1,100	1,217
vs. previous forecast	%	-2%	-6%	-9%	-7%	1%	-6%	0%	0%	0%	-1%
Platinum	US\$/oz	881	887	896	906	1,060	892	954	1,078	1,450	1,605
vs. previous forecast	%	-12%	-13%	-14%	-15%	-2%	-14%	-16%	-15%	0%	-1%
Bulks											
Iron Ore (fines 62% Fe, cfr N.China)	US\$/t	48	50	45	40	56	46	45	48	52	58
vs. previous forecast	%	-20%	-17%	-10%	-33%	-3%	-20%	-22%	-17%	0%	-1%
Hard Coking Coal (premium contract fob Aust.)	US\$/t	81	85	80	80	102	82	86	103	115	127
vs. previous forecast	%	-15%	-19%	-20%	-20%	0%	-19%	-18%	-12%	0%	-1%
Thermal coal (spot, fob Newc)	US\$/t	52	52	54	54	58	53	56	58	59	66
vs. previous forecast	%	-16%	-16%	-10%	-10%	-3%	-13%	-9%	-7%	0%	-1%
Bulks											
Uranium (spot)		38	38	40	40	37	39	46	52	62	69
vs. previous forecast	%	-16%	-19%	-23%	-23%	-4%	-20%	-21%	-13%	0%	-1%
Alumina (spot, fob Aust.)		225	230	240	250	303	236	260	278	324	359
vs. previous forecast	%	-18%	-16%	-13%	-9%	-2%	-14%	-7%	-8%	0%	-1%
Zircon (spot, fob Aust.)		1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,030	1,140
vs. previous forecast	%	-2%	-2%	-2%	-2%	0%	-2%	-4%	-5%	0%	-1%

Sector Outlook

Commodity preference, 12-month view

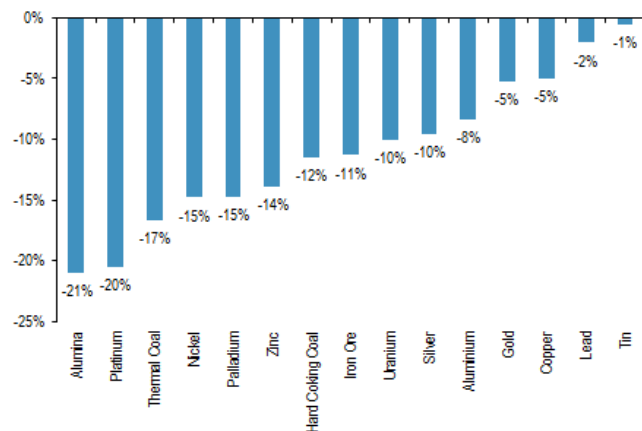


Nickel	production cuts among the sulphide miners have finally started, responding to massive supply (metal inventories) and stainless steel destocking, delivering price stability. Q1 restock season offers price upside.
Zinc	big mines are departing + Glencore's threatening to cut output + China's smelters cutting too. So supply growth is weakening in-line with steel production rates, supportive of the price outlook.
Copper	hit hard by speculators + investor exodus; price has overshot to the downside. Ex-price signals (buoyant premia, low inventories, persistent backwardation) highlight robust demand = bullish.
Uranium	robust nuclear power generating capacity growth in China and the US, together with Japan's economic need to re-activate its capacity, act together as a potent price driver.
Palladium	very low inventories and unreliable supply growth, in the face of generally stable autocat production rate in key centres worldwide.
Iron Ore	slowing supply growth outlook + rapid displacement of China's domestic production by imports + stable/flat Asia steel demand growth outlook underpins a modestly bullish price forecast.
Steel	widespread rationalisation and stable steel demand across key regions promise solid medium-term price performance.
Lead	some recovery in auto production rates for China, the US and Japan next year, together with exiting mines + lack of scrap, offer medium-term price support.
Bauxite	with Indonesia out of the trade, bauxite from Guinea & Australia has become important, taking the price to a local high. Biggest short-term risk is a cut to metal production.
Alumina	collapse in oxide's spot reflects production/capacity cuts downstream, a surplus forming in China's market, risk of rising exports there too. Price upside depends heavily on capacity cuts ex-China.
Aluminium	spot and premia signals have collapsed to lows, testing China's own marginal cost of production. Actual capacity cuts are being reported, but rebalancing will be very slow in this highly competitive industry.
Platinum	adequate production growth + possibly large downstream inventories in autocats are still key bearish risks.
Silver	promises upside via exposure to generally buoyant global industrial activity (China, US), and improved tracking of gold's better price performance.
Gold	lack of inflation, emerging financial stability in Europe, robust economic activity in the US are all bearish. Start of US rate hike cycle should ease trade anxiety, but actual inflation is needed for price upside.
Thermal Coal	large, widespread production cuts in China; rising production costs in Indonesia; deferral of projects – have helped slow the fall in product prices – but seaborne market is structurally challenged.
Metallurgical Coal	China's import flows have stabilised, while higher cost North American production exits. Risk to the upside exists around BHP Billiton's rising pricing power + cost of production.
Mineral Sands	Titanium feedstock + zircon trades have rebalanced; active property markets of China/US offer stable backdrop, but price outlook flat.

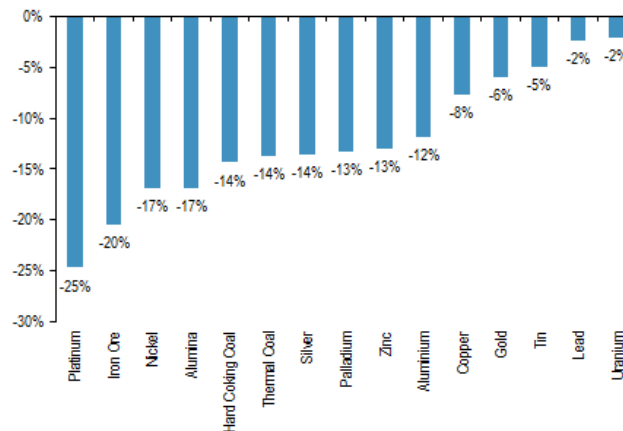
Morgan Stanley Commodity Price Forecasts Versus Consensus

		CY2016e			CY2017e			long-term REAL		
	unit	MS	consensus	% diff	MS	consensus	% diff	MS	consensus	% diff
Base Metals										
Aluminium	US\$/t	1,554	1,696	-8%	1,631	1,849	-12%	1,973	2,080	-5%
Copper	US\$/t	5,236	5,511	-5%	5,484	5,938	-8%	6,173	6,270	-2%
Nickel	US\$/t	10,692	12,549	-15%	12,236	14,728	-17%	16,755	17,791	-6%
Zinc	US\$/t	1,747	2,029	-14%	1,984	2,280	-13%	2,116	2,274	-7%
Lead	US\$/t	1,786	1,823	-2%	1,874	1,920	-2%	1,841	1,990	-8%
Tin	US\$/t	16,755	16,840	-1%	17,416	18,326	-5%	22,046	19,141	15%
Alumina	US\$/t	236	299	-21%	260	313	-17%	324	337	-4%
Precious Metals										
Gold	US\$/oz	1,081	1,141	-5%	1,150	1,223	-6%	1,100	1,129	-3%
Silver	US\$/oz	14.55	16.09	-10%	15.40	17.82	-14%	19.00	17.46	9%
Platinum	US\$/oz	892	1,122	-20%	954	1,267	-25%	1,450	1,341	8%
Palladium	US\$/oz	627	736	-15%	715	824	-13%	850	623	36%
Bulks										
Iron Ore	US\$/t	46	52	-11%	45	57	-20%	52	58	-11%
Hard Coking Coal	US\$/t	82	92	-12%	86	101	-14%	115	131	-13%
Thermal Coal	US\$/t	53	64	-17%	56	65	-14%	59	77	-23%
Other Metals										
Uranium	US\$/lb	39	43	-10%	46	47	-2%	62	64	-3%

Morgan Stanley versus consensus, CY2016e



Morgan Stanley versus consensus, CY2017e



Macro Outlook

Slow recovery in global growth

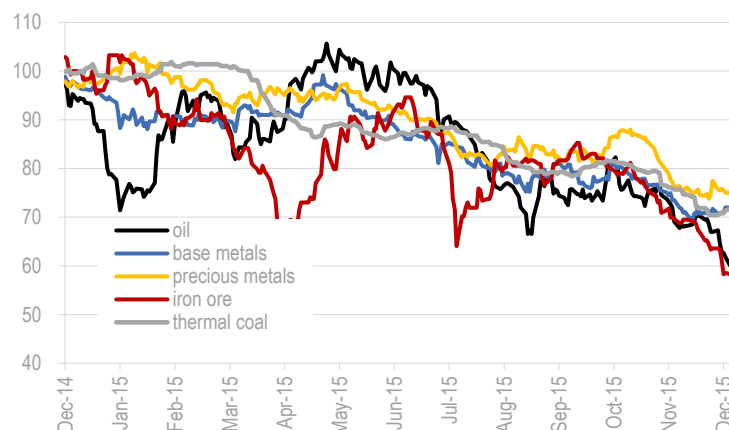
- Morgan Stanley's economists anticipate a slow recovery in global growth, as aggregate demand remains generally stable in developed markets, while the drag of emerging markets eases. From 3.1% in 2015, global growth for 2016 is forecast at 3.3%; then 3.7% for 2017 ([Global Macro Outlook: A Slow Slog Back, 29-Nov-15](#)). The start of the US Fed tightening cycle, the risk of deflation in China, unsettled EU/EM politics – all present key risks to the outlook.
- Crucially for the commodities outlook, our economists have lowered **China's** GDP growth outlook: 6.7% and 6.6% for 2016 and 2017 respectively, with risks tilted to the downside. Despite recent policy easing aimed at stabilizing near term activity, structural headwinds will undermine the impact of the mini-stimulus. Investment growth is forecast to slow more than aggregate demand, given the government's focus on eliminating excess capacity, unwinding property inventory and boosting export growth ([2016 China Economic Outlook: Gradual Slowdown, Persistent Disinflation, 29-Nov-15](#)).
- In the **US**, slower export growth has countered fiscal support, keeping our growth forecast at 1.8% in 2016 and 2017 (4Q/4Q). We expect the US Fed will embark on a tightening cycle in 2016 and 2017, lifting rates to 1.125% by end-2016 and 2.125% by end-2017. Rising interest rates are not expected to create a significant headwind; consumer spending will be slower, but better balanced. ([2016 US Economic Outlook: Testing the Waters, 1-Dec-15](#)).
- **Europe** will see fiscal policy swing from austerity towards stimulus in 2016, while monetary policy maintains a bias towards further easing ([European Economics: Policies, Politics and Polls, 29-Nov-15](#)). Against this backdrop, our economists expect euro area GDP to expand at an above-trend rate of 1.8% in 2016, shaking off political noise from looming elections, the ongoing refugee influx and terrorist threats. However, for euro area growth to be resilient, consumer spending needs to hold up and investment spending has to recover further.
- Improved growth is expected in **Japan** in 2016H1, reflecting improved growth in its export markets, low oil prices and a modest capex rebound. Following forecast growth in 2016 of 1.2%, 2017 will see a reversion – slowing to 0.8% growth as the consumption tax hike reduces disposable income ([2016 Japan Economic Outlook: Better Economy Triggers Late-2016 BoJ Regime Change, 30-Nov-15](#)).
- In **Asia ex-Japan**, the majority of these economies are facing domestic structural challenges – high debt, weak demographics, disinflationary pressures – while also contending with headwinds posed by slowing growth in China. A forecast uptick in growth in 2016 is predicated on a recovery in external demand and a slight recovery in domestic demand. Disinflationary pressures remain a key macro concern. ([2016 Asia Ex-Japan Economic Outlook: Dealing with Disinflation, 29-Nov-15](#)).

Macro Outlook

Macro-shift + investor exodus + speculative selling: it will all end soon

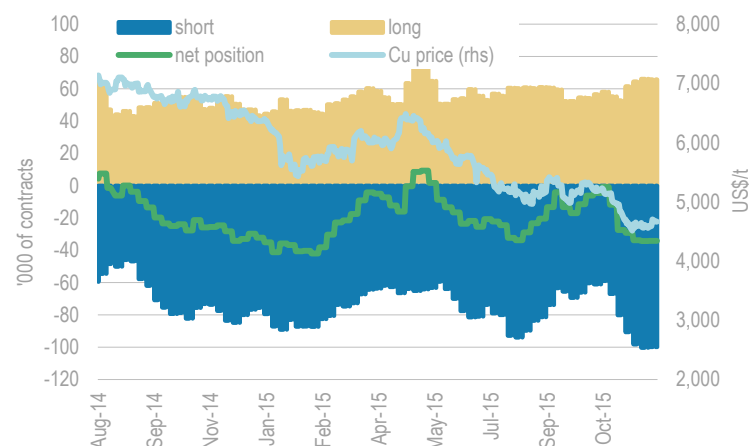
- **Super Cycle terminus:** Prices for industrial commodities – base metals, steel and its various raw materials – have all collapsed 25-50% in 2015. The primary cause is a modest slowing in China's aggregate commodity demand growth, itself a function of an abatement in its multi-decade materials-intensive growth cycle. Basically, China's economy is maturing: transitioning to one that features a substantial services industry, with an important consumer-based driver.
- **The catalyst to sell:** But this macro-evolution has been underway for years. So why did prices collapse this year? The selling catalyst was probably the OPEC-led halving of oil prices in 2014Q4, prompting aggressive selling of energy indices, many of which have metals content. Cutting exposure to all commodities then became a key investor strategy, responding to macro-events such as the mid-year collapse of China's equity markets, the shock RMB-devaluation, growing US rate hike risk. 2015H2's seasonal pullback in trade flows further undermined sentiment.
- **Price disconnect:** The scale of the price impact of the sector's investor exodus and short-selling is best expressed by the exceptional disconnect between price performance and all other fundamental signals of these markets. For the base metals, the CFTC-LME platforms reported premia, forwards and inventories levels for the metals in 2015 that indicate stability, even upside risk, for all prices. More broadly, there have been no reports of a failure of economic activity globally, or in China. Yet commodity prices collapsed. We remain convinced that once the investor withdrawal ends – largely intact, robust fundamentals of commodity markets will reassert themselves, delivering an improved general price outlook.

Commodity price indices (12mth rolling)



Source: Bloomberg, Platts, Morgan Stanley Research

Copper's CFTC CoT - non-commercial (kt; US\$/t)



Source: Bloomberg, Morgan Stanley Research

Price Outlook

Beyond our base case

Bear Case:

- Further RMB depreciation/devaluation in line with basket of currencies, undermining commodities demand in China. This also impairs trade-led growth ex-China, prompting a wave of monetary easing worldwide.
- Interest rate hike cycle starts in the US, buoying USD; inflation actually emerges too, spurring rate hike campaign; step-change acts as a headwind for global commodity demand, particularly precious metals.
- Middle East tensions persist, undermining global trade confidence and financial market stability; deters FDI in emerging markets; commodity demand growth is constrained.

Bull Case:

- US and China deploy commodities-intensive capital infrastructure re-build programs.
- Oil price recovers; global GDP growth lifts; general inflation is effectively managed.

period	Aluminium			Copper			Nickel			Zinc		
	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear
2016	0.78	0.71	0.56	2.61	2.38	1.90	5.82	4.85	3.64	0.87	0.79	0.63
	1,710	1,554	1,243	5,760	5,236	4,189	12,831	10,692	8,019	1,922	1,747	1,398
2017	0.81	0.74	0.59	2.74	2.49	1.99	6.38	5.55	4.44	0.99	0.90	0.72
	1,795	1,631	1,305	6,032	5,484	4,387	14,071	12,236	9,789	2,183	1,984	1,587

period	Gold			Silver			Platinum			Palladium		
	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear
	US\$/oz			US\$/oz			US\$/oz			US\$/oz		
2016	1,301	1,081	919	17.50	14.55	12.37	982	892	803	690	627	565
2017	1,380	1,150	975	18.48	15.40	13.06	1,049	954	859	786	715	643

period	Iron Ore (spot)			Hard Coking Coal (cont.)			Thermal Coal (spot)			Uranium (spot)		
	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear	Bull	Base	Bear
	US\$/t			US\$/t			US\$/t			US\$/lb		
2016	58	46	33	93	82	65	61	53	45	51	39	25
2017	59	45	34	98	86	68	65	56	45	58	46	34

Price forecasts – quarterly & annual

commodity group	unit	1Q 16e	2Q 16e	3Q 16e	4Q 16e	1Q 17e	2Q 17e	3Q 17e	4Q 17e	2015e	2016e	2017e	2018e	2019e	2020e	LT real	LT nom.
Base Metals																	
Aluminium	US\$/lb	0.68	0.70	0.72	0.72	0.74	0.74	0.74	0.74	0.75	0.71	0.74	0.80	0.80	0.92	0.90	0.99
	US\$/t	1,499	1,543	1,587	1,587	1,631	1,631	1,631	1,631	1,664	1,554	1,631	1,764	1,764	2,017	1,973	2,184
Copper	US\$/lb	2.20	2.40	2.50	2.40	2.40	2.45	2.50	2.60	2.51	2.38	2.49	2.81	2.95	3.00	2.80	3.10
	US\$/t	4,850	5,291	5,512	5,291	5,291	5,401	5,512	5,732	5,527	5,236	5,484	6,200	6,504	6,614	6,173	6,832
Nickel	US\$/lb	4.20	4.80	5.20	5.20	5.60	5.60	5.50	5.50	5.40	4.85	5.55	6.60	7.50	8.00	7.60	8.41
	US\$/t	9,259	10,582	11,464	11,464	12,346	12,346	12,125	12,125	11,908	10,692	12,236	14,550	16,535	17,637	16,755	18,544
Zinc	US\$/lb	0.75	0.77	0.80	0.85	0.90	0.90	0.90	0.90	0.88	0.79	0.90	0.95	0.98	1.00	0.96	1.06
	US\$/t	1,653	1,698	1,764	1,874	1,984	1,984	1,984	1,984	1,936	1,747	1,984	2,094	2,161	2,205	2,116	2,342
Lead	US\$/lb	0.80	0.80	0.82	0.82	0.85	0.85	0.85	0.85	0.81	0.81	0.85	0.88	0.89	0.90	0.84	0.92
	US\$/t	1,764	1,764	1,808	1,808	1,874	1,874	1,874	1,874	1,785	1,786	1,874	1,940	1,962	1,984	1,841	2,037
Tin	US\$/lb	7.40	7.40	7.80	7.80	7.80	7.80	8.00	8.00	7.30	7.60	7.90	8.50	9.50	10.75	10.00	11.07
	US\$/t	16,314	16,314	17,196	17,196	17,196	17,196	17,637	17,637	16,098	16,755	17,416	18,739	20,944	23,700	22,046	24,399
Precious Metals																	
Gold	US\$/oz	1,080	1,100	1,065	1,080	1,150	1,150	1,150	1,150	1,162	1,081	1,150	1,200	1,210	1,220	1,100	1,217
Silver	US\$/oz	14.5	15.0	14.2	14.5	15.4	15.4	15.4	15.4	15.8	14.6	15.4	16.2	17.0	18.5	19.0	21.0
Platinum	US\$/oz	881	887	896	906	925	944	964	984	1,060	892	954	1,078	1,228	1,378	1,450	1,605
Palladium	US\$/oz	603	618	635	654	677	701	727	753	697	627	715	833	876	905	850	941
Bulks																	
Iron Ore (fines 62% Fe, cfr N.China)	US\$/t	48	50	45	40	45	50	45	40	56	46	45	48	53	54	52	58
Hard Coking Coal (premium contract, fob Aust.)	US\$/t	81	85	80	80	85	90	85	85	102	82	86	103	108	116	115	127
Thermal coal (spot, fob Newc)	US\$/t	52	52	54	54	55	56	56	56	58	53	56	58	60	62	59	66
Other																	
Uranium (spot)	US\$/lb	38	38	40	40	44	44	48	48	37	39	46	52	56	60	62	69
Alumina (spot, fob Aust.)	US\$/t	225	230	240	250	260	260	260	260	303	236	260	278	308	335	324	359
Zircon (spot, fob Aust.)	US\$/t	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	950	1,051
Rutile (spot, fob Aust.)	US\$/t	800	800	800	800	800	800	800	800	815	800	800	800	800	800	725	802
Exchange Rates																	
1 AUD = USD		0.67	0.65	0.64	0.62	0.61	0.64	0.65	0.66	0.75	0.65	0.64	0.66	0.65	0.64	0.60	0.63
1 USD = BRL		3.98	3.95	3.95	3.90	3.86	3.88	3.90	3.92	3.31	3.94	3.89	3.96	4.04	4.12	3.40	4.25
1 USD = CAD		1.35	1.38	1.42	1.45	1.45	1.45	1.45	1.45	1.27	1.40	1.45	1.45	1.40	1.35	1.25	1.31
1 USD = ZAR		14.75	15.00	15.20	15.40	15.45	15.50	15.55	15.60	12.69	15.09	15.53	15.64	15.70	15.76	12.15	15.73
1 EUR = USD		1.13	1.14	1.14	1.14	1.15	1.15	1.16	1.16	1.11	1.14	1.15	1.17	1.19	1.21	1.23	1.23
1 USD = CNY		6.54	6.65	6.75	6.80	6.86	6.92	6.98	7.07	6.28	6.69	6.96	7.08	7.09	7.10	7.15	7.12

Source: Morgan Stanley Research estimates; exchange rate forecasts are the assumptions that are compiled and used by Global Resources Equity Team

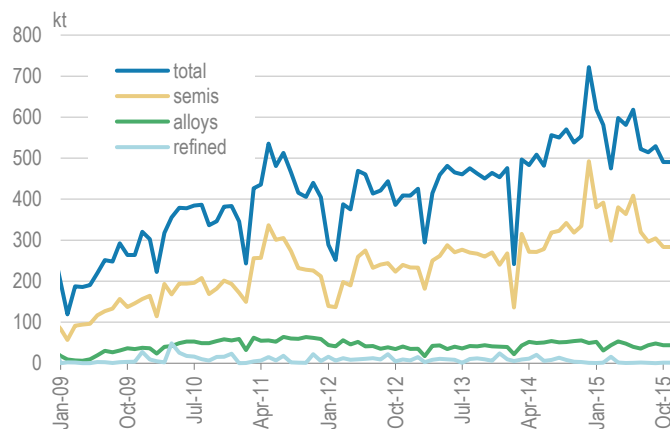
Base Metals

Aluminium

Price slips, as production cuts stack up

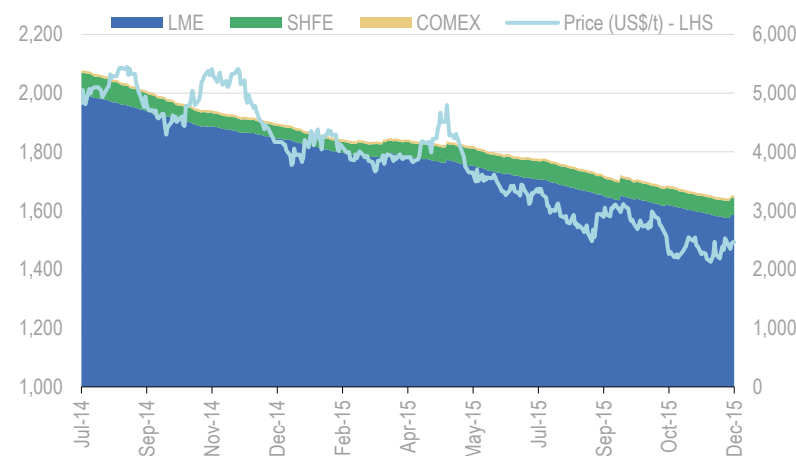
- Capacity cuts gaining momentum:** Relentless supply growth vs. moderation in demand has pushed spot down throughout 2H15 to end at below US\$1,550/t: 40th centile of the industry cost curve; 34Mtpa of global smelter capacity is now loss-making. This has prompted the long-awaited supply response: >2Mtpa cut in China; 640ktpa of capacity cuts ex-China, reported since August.
- Cautious on China's cuts:** Of total loss-making primary production worldwide, 22Mt (67%) is in China. There, they have announced about 2.9Mtpa of capacity cuts. Problem is, we also estimate that over 2Mtpa of China's capacity attracted local government subsidies in 2015 (mainly via power rate reductions), which means the latest cuts probably only reverse/offset these deals, while capacity grows elsewhere. Net outcome for capacity is +6%yoy in 2016.
- Dealing with China's surplus:** The low price may have deterred entrants, but there are lower-cost projects still in play in the provinces of Guangxi, Shandong, Shaanxi and Xinjiang. With larger Economies of Scale + new technologies, they will push into the trade, lower the average cost of production, weighing on already weakened prices.
- Likely outcome? exports lift:** Given China's weak metal demand, producers there are diverting to exports. Monthly semis exports reached a record high of over 400kt in Jun-15, only slowing Aug-Oct on a narrowing price differential. The trade is now so large, the US has raised anti-dumping duties on extrusions from Chinese companies (10% to 61%).

China's aluminium exports



Source: Bloomberg, Morgan Stanley Research

Aluminium exchange inventories



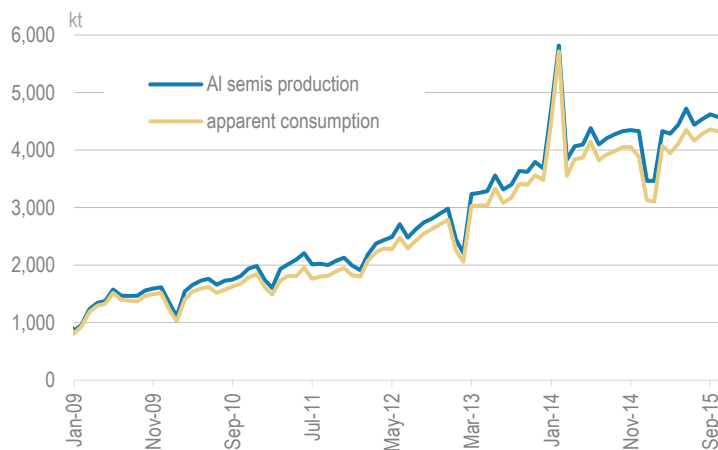
Source: Bloomberg, Morgan Stanley Research

Aluminium

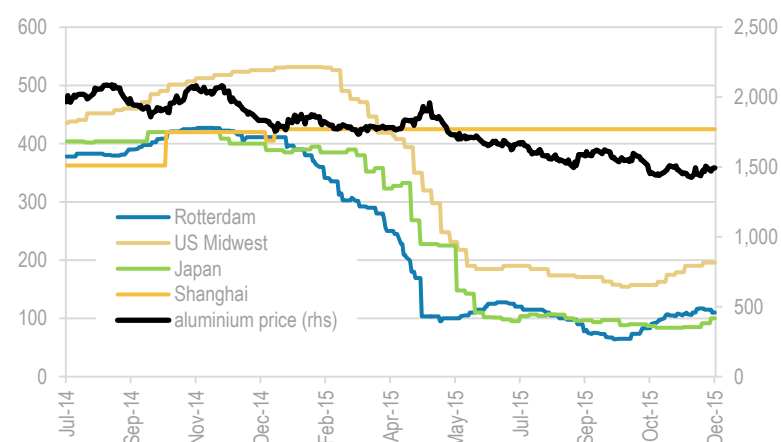
Ex-price signals point to stable metal demand growth

- **Looking for demand growth:** Trends in China's property sector have improved during 2015. A mid-year lift in sales and building completions in turn supported demand for extrusions (doors, frames) and home appliances. Stimulus for auto sector was effective in reversing the decline in private vehicle sales, boosting production. A late-year pick-up in power grid investment suggests cable orders/production will improve next year, probably post-Chinese New Year.
- **Demand signals vs. price collapse:** Key regional premia (extra paid, over spot, for prompt delivery; useful short-term demand indicators for metal trades) of Europe and the US, lifted in 4Q15, suggesting that demand has stabilized and perhaps improved; cash-to-3mth has moved from contango to parity, implying trade tightness; global exchange inventories have fallen 30%ytd to 3.3Mt; the LME-SHFE differential favours a lift in imports for China. US production cuts (460ktpa, Q4) have partly buoyed premia, as buyers seek new sources.
- **In the US,** strong construction and automotive sectors are likely to support +3.0%yoy demand growth in 2016. In **Europe,** car sales are +8%yoy/ytd, regardless of the VW emissions scandal, while non-autos demand remains lacklustre. By contrast, the slowdown in **Japan's** economic activity is reflected in the aluminium trade, reported via transportation and building/construction sectors.

China's apparent consumption vs. semis production



Aluminium's spot price vs. merchant premia

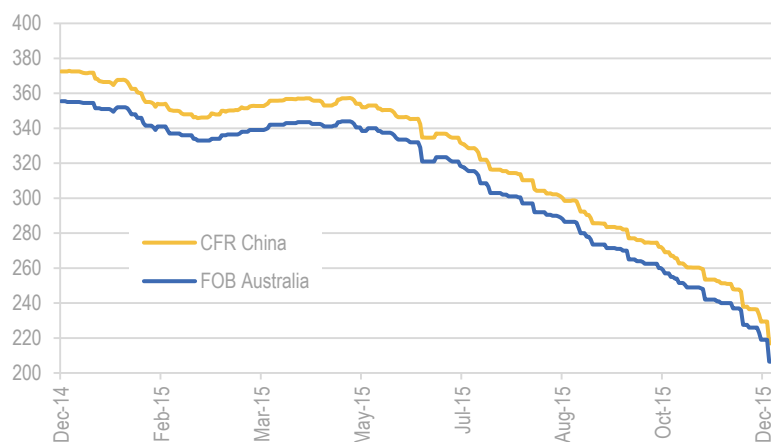


Alumina

China's domestic imbalance fuelling global oversupply

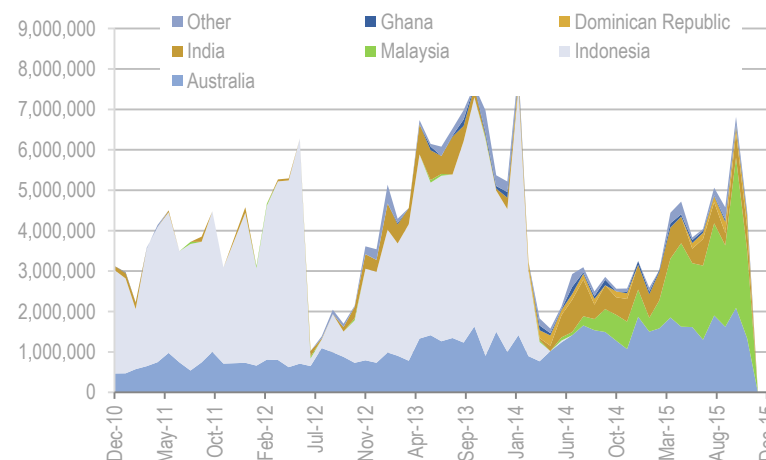
- China delivers more:** Despite weak prices, China's alumina refineries have yet to cut capacity/production, reflecting actions taken downstream among the smelters. Indeed, refinery output was up 12% in 2015; we forecast another 8%/yr growth in 2016 (vs. 11%; 5% for smelting). With adequate bauxite supply from Malaysia + Guinea to replace Indonesia's trade, and many refineries delivering almost 70Mtpa of oxide – this highly competitive industry lacks the discipline to manage capacity growth in this weak market. We forecast a ballooning of the existing surplus in 2016, constraining the upside for the spot price.
- Less imports, more exports:** An expanded China alumina surplus has two implications for the global market: 1) a lower import requirement; 2) potential lift in exports (i.e. like steel, aluminium itself). China's alumina exports for Jan-Oct 2015 are up 86%yoy to 207kt – a record high. This threatens profitability and capacity growth, ex-China.
- Capacity cuts ex-China:** Capacity cuts in 2015 total 2.9Mtpa, 2.4% of 2015e global production. While much more is required to support the weakened spot price, we expect rebalancing will take months/years. There are too many players in the market for a short-term meaningful adjustment. As a result, we have cut our forecast price profile for spot alumina, featuring a 2016 price forecast of US\$236/t fob Aust.

Alumina spot prices



Source: Bloomberg, Morgan Stanley Research

China's bauxite imports, by source



Source: Bloomberg, Morgan Stanley Research

Aluminium & Alumina

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
World Bauxite Production	Mt	209	218	196	215	257	269	318	293	326	343	349	367	387	390
World Smelter Grade Alumina Production	Mt	75	80	73	82	92	96	100	104	111	117	125	133	143	145
Chemical-grade production	Mt	5.5	5.6	4.7	6.0	6.5	6.5	6.9	7.0	7.5	8.1	8.7	9.5	9.7	9.6
total production	Mt	80	86	78	88	98	103	107	111	119	125	134	143	153	155
YoY change	%	9.4%	7.3%	-9.6%	13.3%	11.2%	4.8%	4.4%	3.9%	6.3%	5.6%	6.8%	7.0%	6.7%	1.7%
World Metallurgical Alumina Consumption	Mt	74	78	73	83	90	94	99	104	110	115	123	133	140	141
YoY change	%	12.6%	4.8%	-6.2%	12.9%	9.3%	4.5%	4.7%	5.6%	5.6%	4.7%	6.6%	8.0%	5.6%	0.7%
Apparent Alumina Surplus/(Deficit)	Mt	0.3	2.5	-0.1	-0.4	1.3	2.0	1.7	0.2	0.9	1.8	2.0	0.7	2.5	4.2
Average Spot Alumina Prices	US\$/t	\$369	\$354	\$244	\$337	\$376	\$404	\$367	\$317	\$334	\$347	\$375	\$394	\$417	\$432
Australia's average contract price	US\$/t	\$228	\$301	\$310	\$322	\$362	\$306	\$318	\$323	\$331	\$345	\$373	\$391	\$414	\$430
World Primary Aluminium Production	Mt	38.2	40.0	37.5	42.4	46.3	48.3	50.6	53.5	56.5	59.1	63.1	67.8	70.5	72.9
YoY change		12.6%	4.8%	-6.2%	12.9%	9.3%	4.5%	4.7%	5.6%	5.6%	4.7%	6.8%	7.4%	4.0%	3.4%
China primary production	Mt	12.6	13.6	13.5	17.4	19.9	22.6	24.9	27.7	30.5	32.2	35.0	38.1	39.9	40.2
YoY change		34.6%	8.0%	-0.7%	29.1%	14.3%	13.5%	10.2%	11.1%	10.2%	5.5%	8.7%	9.0%	4.5%	0.9%
non-China primary production	Mt	25.5	25.3	23.3	24.9	26.2	24.8	25.4	25.4	25.7	26.1	26.9	27.3	27.2	29.9
YoY change		6.3%	-0.7%	-7.9%	7.0%	5.2%	-5.4%	2.6%	-0.2%	1.2%	1.5%	3.1%	1.7%	-0.5%	10.0%
World Primary Aluminium Demand	Mt	38.35	38.26	36.27	40.70	44.47	47.52	50.13	53.73	56.17	58.82	61.92	65.10	68.36	71.57
YoY change		11.0%	-0.2%	-5.2%	12.2%	9.3%	6.8%	5.5%	7.2%	4.5%	4.7%	5.3%	5.1%	5.0%	4.7%
Regional Demand Breakdown															
China	Mt	12.5	12.8	14.2	16.7	19.5	21.5	23.9	26.3	28.1	29.7	31.8	33.9	36.1	38.3
India	Mt	1.2	1.3	1.5	1.5	1.6	1.7	1.7	1.8	1.8	1.9	2.1	2.2	2.3	2.4
USA	Mt	5.2	5.0	3.9	4.2	4.3	4.8	4.9	5.1	5.3	5.5	5.7	6.0	6.2	6.5
Europe	Mt	8.6	8.4	7.1	7.9	8.3	8.4	8.5	8.8	9.0	9.2	9.4	9.6	9.8	10.0
Japan	Mt	2.5	2.4	1.8	2.2	2.1	2.2	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2
ROW	Mt	8.3	8.4	7.9	8.2	8.7	8.9	9.1	9.5	9.9	10.3	10.8	11.3	11.8	12.3
Primary Aluminium Market Balance (before inventory)	Mt	-0.20	1.72	1.24	1.67	1.81	0.83	0.47	-0.27	0.30	0.28	1.19	2.67	2.13	1.31
Reported inventories	Mt	3.24	5.20	7.12	6.91	7.38	7.78	7.78	6.65	6.94	7.23	8.41	11.08	13.21	14.52
Change in reported inventories	Mt	0.30	1.96	1.92	-0.21	0.47	0.40	0.00	-1.13	0.30	0.28	1.19	2.67	2.13	1.31
Apparent change in off-warrant inventories	Mt	0.16	0.26	-0.44	2.55	-0.53	-0.91	0.04	0.38	-0.86	0.00	0.00	0.00	0.00	0.00
Inventory-to-Consumption Ratio	wks	4.40	7.08	10.23	8.86	8.66	8.54	8.09	6.45	6.45	6.41	7.08	8.87	10.08	10.58
Primary Aluminium Market Balance	Mt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.28	1.19	2.67	2.13	1.31
Price	US\$/t	\$2,641	\$2,578	\$1,667	\$2,172	\$2,400	\$2,021	\$1,847	\$1,866	\$1,664	\$1,554	\$1,631	\$1,764	\$1,764	\$2,017
	US\$/lb	\$1.20	\$1.17	\$0.76	\$0.99	\$1.09	\$0.92	\$0.84	\$0.85	\$0.75	\$0.71	\$0.74	\$0.80	\$0.80	\$0.92
US Mid-West premium	US\$/t			\$104	\$138	\$169	\$218	\$245	\$446	\$283	\$170	\$170	\$160	\$155	\$155
'all-in' US price	US\$/t			\$1,772	\$2,311	\$2,569	\$2,239	\$2,093	\$2,312	\$1,947	\$1,724	\$1,801	\$1,924	\$1,919	\$2,172

*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

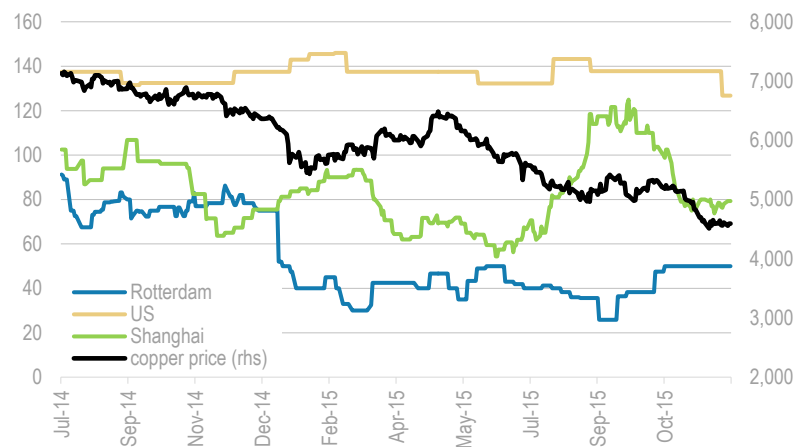
China's share of global aluminium demand

Copper

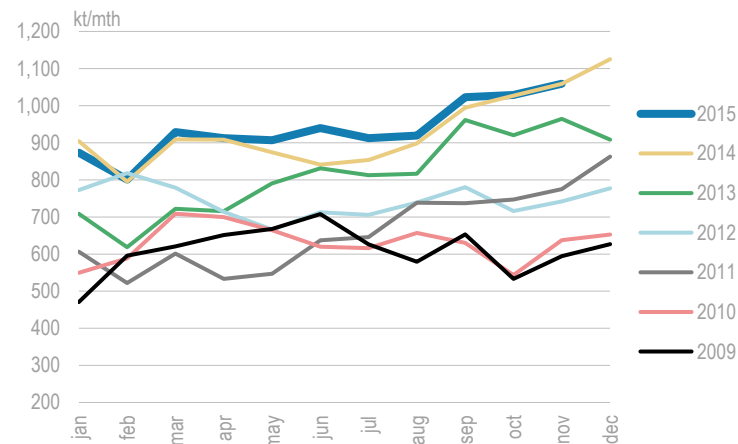
Being bullied by the speculators

- Macro-focus drives investor exodus:** With little positive news to lift the bearish mood, copper has fallen to fresh lows just above \$4,500/t in 4Q – close to the 9th decile of C1 cash costs. The absence of significant gains in macroeconomic indicators – particularly in China – has left the market exposed to investor selling, despite stable market fundamentals and falling inventories.
- 2016 forecast demand cut:** In China, rising domestic production and falling scrap usage have partly offset flat refined copper imports and subdued end-use demand in 2015, resulting in demand growth of around 2.8%. Bearish feedback from our November visit to China ([China field trip: more stimulus needed for cyclical boost in metal demand, 17-Nov-15](#)) and weak 4Q macro data (PMI <50, tepid IP growth, weak residential construction) suggest that a strong recovery is unlikely next year. However, early signs of improvement in the power and infrastructure sectors are expected to be supportive and we forecast another year of 2.8% growth in 2016 before a broader recovery in 2017.
- Price forecast to lift from lows:** Together with modest supply growth of 2.7%, global demand growth of 2.8% will leave the copper market close to balance for 2H16. Further supply cuts are likely, but these alone will be insufficient to spur a price recovery, which is contingent upon a significant improvement in macroeconomic news-flow and end-use demand.

Copper's spot merchant premia



China's apparent consumption of copper



Copper

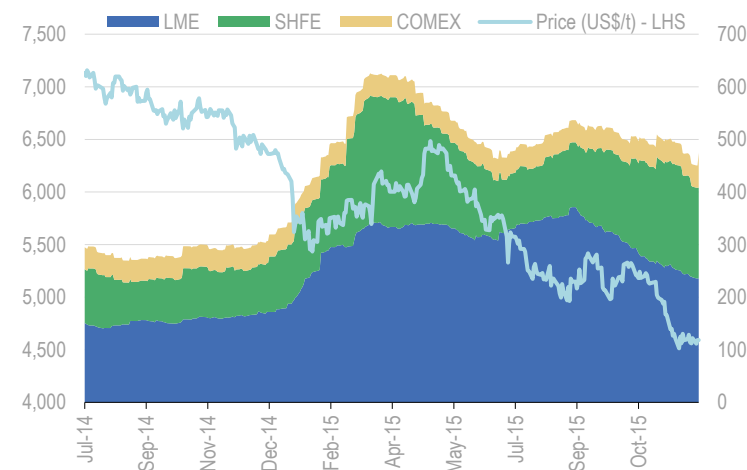
Production cuts hit SxEw supply, but concentrates growing

- Mine capability cuts continue:** Mine capacity cuts now total 620ktpa (2016 impact; 3.2% of mine supply), with Freeport's full shutdown of Sierrita (90ktpa) and Vedanta's suspension of Nchanga underground (15ktpa) key additions since our last *Playbook*. These cuts will result in a decline in SxEw production next year; but concentrate supply is expected to grow as projects and expansions ramp up production (see table), outweighing a fall in output from Escondida on lower grades.
- Concentrate market:** Annual contract TC/RC negotiations are underway, occurring on a challenging backdrop. While the concentrate market is on track to report a modest surplus in 2016, this is heavily dependent on output from projects, around which there is delivery risk. China's efforts to restrict smelter production have helped boost spot TC/RCs to local highs in recent months; there are suggestions of coordinated output cuts in 2016 too. Nonetheless, new smelters entering production are set to drive higher demand for concentrates overall, limiting upside potential from here, in our view.
- Risks to outlook:** Underperformance of new mine projects; further capacity cuts; restocking in Q1, and perhaps some stability or even recovery in China's demand, underpin our constructive outlook for 2016. Downside risks centre on further bearish macro-shocks globally, or the absence of a recovery in China's demand (e.g. like 2015Q1), which would see prices maintained at-or-below 2015Q4's subdued levels.

Copper mine production: major changes 2016

2016 gains	+kt	2016 losses	-kt
Grasberg	403	Escondida	-190
Cerro Verde Mill	297	Katanga Mining	-114
Las Bambas	200	Sierrita	-86
Bingham Canyon	125	Mopani Copper	-67
Sentinel	116	El Abra SxEw	-46
Buenavista Conc Exp	114	Candelaria	-36
Buenavista SxEw III & IV	90	Michilla (Lince) SxEw	-30
Toromocho	88	Kansanshi	-29
Antucoya SxEw	70	Chuquicamata	-28
Olympic Dam	63	El Teniente	-26

Copper's exchange inventories vs. price



Copper

Global supply-demand outlook

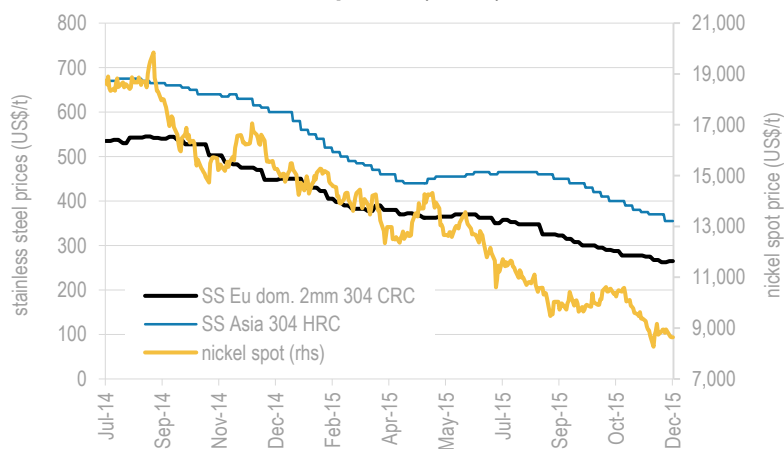
	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
World Mine Production															
concentrates	Mt	12.6	12.6	12.6	12.9	12.7	13.2	14.4	14.8	15.5	17.2	18.0	18.7	19.0	19.2
SX/EW	Mt	3.0	3.1	3.3	3.3	3.4	3.7	3.8	3.8	3.8	3.9	4.0	4.1	4.1	3.9
disruption allowance	%									0.0%	5.5%	5.5%	5.5%	5.5%	5.5%
Total Mine Production	Mt	15.6	15.7	15.9	16.2	16.2	16.8	18.2	18.5	19.3	19.9	20.8	21.6	21.9	22.3
YoY change	%	3.0%	0.5%	1.2%	1.8%	0.1%	3.9%	8.1%	1.9%	4.2%	3.0%	4.5%	3.9%	1.3%	2.1%
Concentrate balance															
TC/RC contract	US\$/t,¢/lb	60/6	45/4.5	75/7.5	46.5/4.65	56/5.6	63.5/6.35	70/7	92/9.2	107/10.7	95/9.5	100/10	95/9.5	90/9	88/8.8
composite TC/RC/PP charge	US¢/lb	15.4	11.5	19.2	11.9	14.4	16.3	18.0	23.6	27.4	24.4	25.6	24.4	23.1	22.6
World Smelter Production															
primary	Mt	11.9	12.1	12.0	12.0	12.4	12.5	13.1	14.4	14.7	15.5	16.1	16.5	16.5	16.4
secondary	Mt	2.0	2.1	2.0	2.6	2.9	3.0	3.1	2.9	3.0	3.0	3.0	3.0	3.0	3.0
Total Smelter Production	Mt	13.9	14.2	14.0	14.6	15.3	15.5	16.2	17.2	17.7	18.5	19.1	19.5	19.4	19.5
imputed concentrate balance	Mt	0.2	0.1	0.1	0.4	-0.1	0.2	0.8	-0.1	0.3	0.1	0.3	0.6	0.8	1.1
World Refinery Production															
electrowon	Mt	3.1	3.2	3.3	3.4	3.5	3.7	3.8	3.8	3.9	3.7	3.8	3.8	3.6	3.4
primary	Mt	13.5	13.7	13.5	14.0	14.6	14.8	15.4	16.3	16.8	17.6	18.5	19.0	18.9	19.4
secondary	Mt	1.4	1.3	1.4	1.6	1.6	1.7	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.5
Total Refinery Production	Mt	18.0	18.2	18.2	18.9	19.7	20.2	20.8	21.6	22.1	22.7	23.7	24.2	24.0	24.2
YoY change	%	4.0%	1.2%	0.1%	3.8%	4.1%	2.6%	3.2%	3.7%	2.2%	2.8%	4.3%	2.2%	0.9%	2.4%
World Copper Demand															
YoY change	%	3.6%	-0.8%	-4.3%	10.8%	3.2%	0.8%	5.3%	4.2%	1.8%	2.9%	3.6%	3.2%	2.4%	2.0%
China demand	4.6	5.0	6.4	7.2	7.8	8.2	9.2	10.0	10.3	10.7	11.1	11.5	11.8	11.8	11.8
China's YoY change	%	17.2%	8.2%	27.0%	13.0%	8.0%	5.2%	11.7%	6.4%	2.8%	2.8%	4.0%	3.6%	3.2%	2.8%
non-China's YoY change	%	-0.4%	-3.9%	-16.6%	9.6%	0.2%	-2.1%	0.8%	2.5%	1.0%	3.0%	3.2%	2.8%	1.8%	1.3%
Implied Market Balance (before inventory)	Mt	-0.05	0.32	1.12	-0.05	0.13	0.48	0.07	-0.04	0.06	0.04	0.19	-0.03	-0.84	-1.16
Refined Stocks End of Period															
reported refined inventory change	kt	682	807	1,076	1,017	957	1,059	906	756	813	848	1,038	1,011	174	0
apparent change in unreported inventories	kt	-21	125	269	-58	-60	102	-153	-151	57	35	190	-27	-837	-174
Inventory-to-usage rate	wks	2.0	2.4	3.3	2.8	2.6	2.8	2.3	1.8	1.9	1.9	2.3	2.2	0.4	0.0
Market Balance	Mt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.04	0.19	-0.03	-0.84	-1.16
Price															
	US\$/t	\$7,145	\$6,968	\$5,163	\$7,537	\$8,816	\$7,957	\$7,332	\$6,863	\$5,526	\$5,236	\$5,484	\$6,200	\$6,504	\$6,614
	US\$/lb	\$3.24	\$3.16	\$2.34	\$3.42	\$4.00	\$3.61	\$3.33	\$3.11	\$2.51	\$2.38	\$2.49	\$2.81	\$2.95	\$3.00
China's share of global refined copper production	%	20%	21%	23%	24%	26%	29%	30%	32%	34%	38%	39%	42%	45%	45%
China's share of global refined copper demand	%	26%	28%	37%	38%	40%	42%	44%	45%	45%	45%	46%	46%	46%	47%

Nickel

Stainless steel destocking still hitting nickel's price

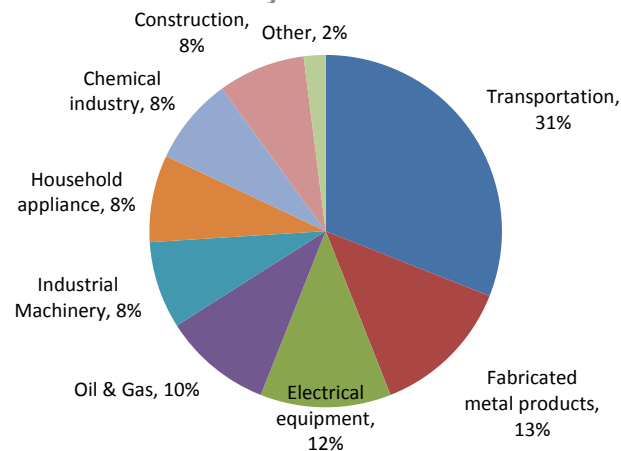
- Price hammered:** Nickel's 2015 price performance is the worst of the base metals, down 50% (vs. 30% for others) to GFC-lows (vs. Dec-08) – a big move at odds with the metal's other fundamental signals (this disconnect exists across most metal markets): merchant premia, cancelled warrants, the forward curve – all reporting stability in 2015, not reflecting the price fall. Trade flows, apparent consumption rate and stainless production rates are still generally stable, not out-of-line with seasonal shifts. Even the LME's very high inventories have been drawn down by 13% during 2016H2.
- Demand growth flat, not negative:** Global stainless steel production rate, which takes up 65% of all primary nickel, remained flat year-on-year in 2015 at 41.9Mt (-1%yoy). While China (produces 51% of global total) continues to report a rapid structural change to its stainless steel industry (24 closures since 2014 = 2Mtpa melt capacity, 10% of China's total; Wood Mackenzie, Nov-15), its total production rate remains relatively stable (-2%yoy to 21.5Mt), since big expansions were also reported – mainly by Tsingshan, Tisco, Behei Chengde, Huale and Taishan – totalling almost 2Mtpa.
- Q1's seasonal uptick too:** Short-term upside risk exists for nickel, but only on a seasonal restock rather than a sustained lift in demand growth. Trade flows in raw materials for all forms of steel production, including stainless, generally lift post-northern winter. Signals to track for upside price risk include: recovery in stainless steel price (lifting when nickel price stable/falling = bullish); expansion in China's NPI output (leading demand indicator); improved sentiment in GDP growth rates in China, Europe, US (mills are sensitive to changes in macro outlook; face substitution risk with Al + galv. steels).

Stainless steel and nickel prices (US\$/t)



Source: Bloomberg, Morgan Stanley Research

Stainless steel demand by end-use



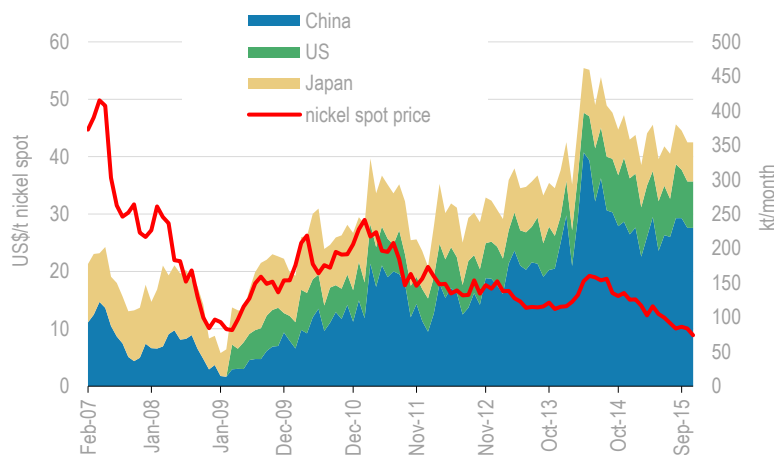
Source: USGS, Morgan Stanley Research

Nickel

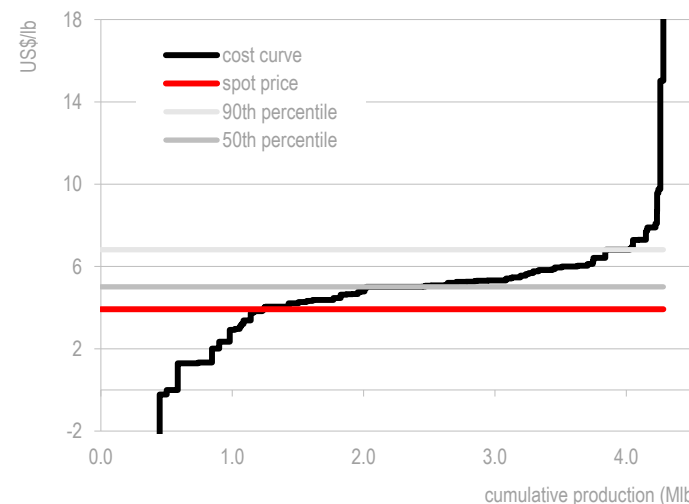
Miners' standoff continues

- Price vs. cost:** Nickel's price remains at the 3rd decile of the global cost curve: 70% of the market has been loss-making during 2015. More remarkably, only 16ktpa of capability has been cut in response. At this stage, we disregard the coordinated cut by China's smelters (100ktpa, until price recovers; [Commodity Matters: Why China's solidarity won't work, 2-Dec-15](#)). Why's the supply-side not rebalancing? Two factors, in our view: 1. many producers in this tiny market are waiting for several big, high cost assets to close first (Goro/VNC (60ktpa); Koniambo; (60ktpa)); 2. miners are also waiting for a reversal of the mills/distributors strategy to destock steel/nickel products.
- Trade flows explained:** China's total imports of all forms of nickel (metal, matte, concentrate, laterite) were strong in 2015, creating confusion mid-year, given the metal's poor price performance: on track for +21%yoy to 1.2Mt. But if the Norilsk-SHFE metal transfer is removed from the data (130kt in 2014; +100kt, 2015), contained-Ni imports are only up 1%yoy.
- Price outlook, 2016:** We are stubborn nickel bulls in 2016: \$10,692/t (-10%yoy; +25% vs. spot). We see speculative trading and destocking as having acted excessively on the price, exposing more of the industry to losses than could be reasonably expected in a global economy that is reporting positive stable growth. Our forecast price lifts at 7%/yr to a long-term price of \$18,550/t (\$16,755/t real).

Stainless steel trade, key regions



Nickel industry cost curve, 2015



Nickel

Global supply-demand outlook

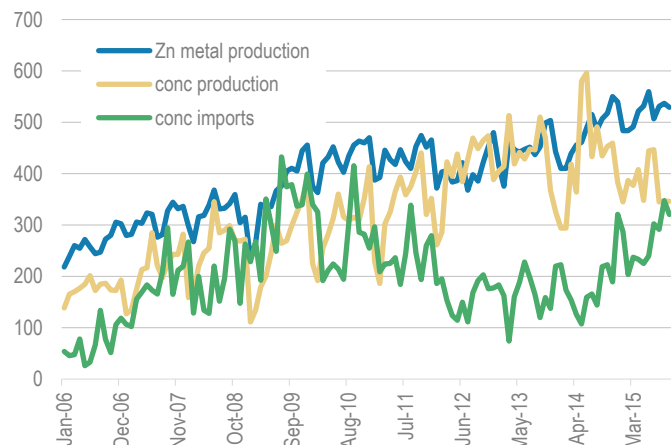
	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Total Mine Production	kt	1,633	1,611	1,442	1,620	2,042	2,257	2,444	2,011	2,006	2,019	2,074	2,149	2,197	2,211
World mine production growth rate	%	10.2%	-1.3%	-10.5%	12.4%	26.1%	10.5%	8.3%	-17.7%	-0.3%	0.7%	2.7%	3.6%	2.2%	0.6%
Regional Mined Production Breakdown															
Indonesia	kt	257	259	203	286	546	631	825	174	118	139	172	227	268	278
Philippines	kt	90	81	135	173	202	218	239	417	467	417	404	406	406	406
Russia	kt	264	257	261	272	279	280	265	238	232	213	198	198	198	198
Canada	kt	245	248	164	146	208	212	223	214	215	232	214	209	209	235
New Caledonia	kt	125	103	93	130	129	138	140	184	163	182	216	229	245	245
Australia	kt	212	248	180	181	191	230	224	193	180	185	173	167	157	149
Brazil	kt	52	51	44	55	95	126	95	111	98	112	110	110	111	111
Total world primary availability	kt	1,417	1,390	1,346	1,467	1,644	1,757	1,992	1,992	1,955	1,941	2,013	2,077	2,115	2,080
World refined availability growth rate	%	3.5%	-1.9%	-3.2%	9.0%	12.1%	6.8%	13.4%	0.0%	-1.9%	-0.7%	3.7%	3.2%	1.8%	-1.6%
Total world refined production	kt	1343	1303	1243	1287	1377	1449	1495	1535	1577	1632	1703	1737	1748	1708
China NPI production	kt	74	87	102	180	267	307	493	453	356	306	262	257	257	257
New Indonesia production	kt										17	61	106	134	143
Total World Nickel Demand	kt	1,344	1,240	1,266	1,481	1,592	1,656	1,773	1,859	1,891	1,942	2,011	2,088	2,143	2,190
Primary Nickel in Stainless	kt	851	760	806	970	1051	1080	1190	1245	1276	1311	1357	1409	1446	1478
Primary Nickel in Non-Stainless	kt	493	480	460	511	541	576	583	614	615	631	654	678	696	712
World Nickel Demand Growth	%	-3.3%	-7.7%	2.1%	17.0%	7.5%	4.0%	7.1%	4.8%	1.7%	2.7%	3.5%	3.8%	2.6%	2.2%
China Nickel Usage Growth	%	36.1%	-5.8%	42.8%	20.5%	22.4%	8.4%	16.8%	7.1%	2.0%	3.0%	5.0%	5.3%	3.3%	2.7%
World ex-China Usage Growth	%	-12.5%	-8.4%	-13.1%	14.8%	-2.1%	0.5%	-1.4%	2.4%	1.4%	2.4%	1.9%	2.1%	1.9%	1.6%
Regional Usage Breakdown															
China	kt	359	338	483	581	712	771	901	965	985	1,014	1,065	1,121	1,158	1,190
USA	kt	134	127	99	127	130	138	141	149	153	153	155	162	169	173
Europe	kt	398	372	291	344	342	340	327	332	327	336	347	349	350	352
ROW	kt	452	403	394	429	409	406	404	412	426	439	444	456	466	475
Refined Nickel Market Balance (before inventory)	kt	73	150	79	-14	52	101	219	134	64	-1	2	-10	-28	-110
Reported total commercial stocks	kt	138	168	248	227	180	231	351	503	567	566	568	558	530	420
Reported stock to consumption ratio	wks	5.3	7.1	10.2	8.0	5.9	7.3	10.3	14.1	15.6	15.2	14.7	13.9	12.9	10.0
Refined Nickel Market Balance	kt	0	0	0	0	0	0	0	0	64	-1	2	-10	-28	-110
Price (LME Settlement)	US\$/t	\$37,183	\$21,145	\$14,665	\$21,813	\$22,866	\$17,524	\$15,034	\$16,891	\$11,905	\$10,692	\$12,236	\$14,550	\$16,535	\$17,637
	US\$/lb	\$16.87	\$9.59	\$6.65	\$9.89	\$10.37	\$7.95	\$6.82	\$7.66	\$5.40	\$4.85	\$5.55	\$6.60	\$7.50	\$8.00
China's share of global refined nickel production	%	14%	15%	19%	23%	27%	29%	36%	34%	30%	29%	26%	24%	24%	24%
China's share of global refined nickel demand	%	27%	27%	38%	39%	45%	47%	51%	52%	52%	52%	53%	54%	54%	54%

Zinc

Supply cuts offer only fleeting price support

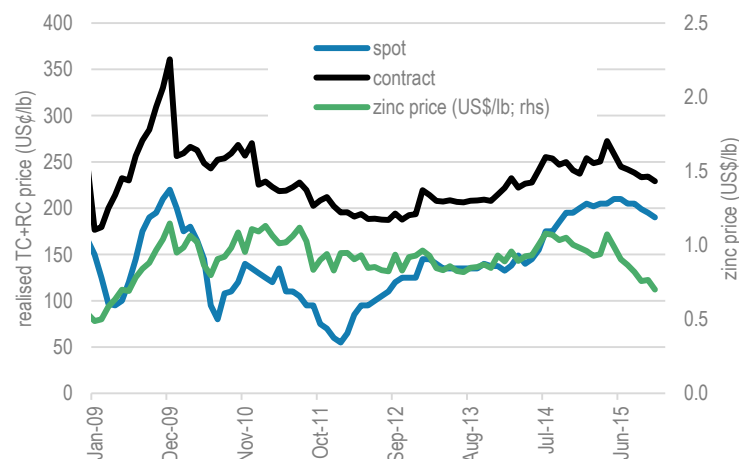
- Cuts discounted:** Announcements of supply cuts at both the mine and smelter level stimulated brief rallies in the zinc price before the down-trend resumed. At \$1,500/t, zinc price is 15-20% below its Glencore-inspired peak in Oct-15, when the miner announced its production cuts. The price actually slipped a little since Nov-15, when China's smelters proposed a 500kt cut to production. Zinc's price upside clearly depends more on a demand recovery (lift in steel output, mainly), rather than large production cuts.
- Are the doubters right?** The failure of the price to sustainably respond to what at face value are substantial production/capacity cuts (total mine capacity cuts = 650kt = 5% of total mine production; China's smelter cuts = 500kt = 8% of China's smelter output); is probably down to two factors: 1. outright scepticism that the cuts will be made; 2. weak demand growth and high inventories of both concentrate and refined metal, which render even these cuts insufficient to return the market to balance in the near term.
- High concentrate stocks** are also limiting the impact of supply cuts on zinc TCs, which have fallen through 4Q to \$190/t in November. However, as stocks are drawn down through the year, mine supply cuts will begin to limit smelter production, feeding through into refined supply. We forecast annual TCs of \$210/t – slightly down on 2015's elevated level.

China's zinc material flows (kt/mth)



Source: ILZSG, Morgan Stanley Research

Zinc treatment charges (TCs)



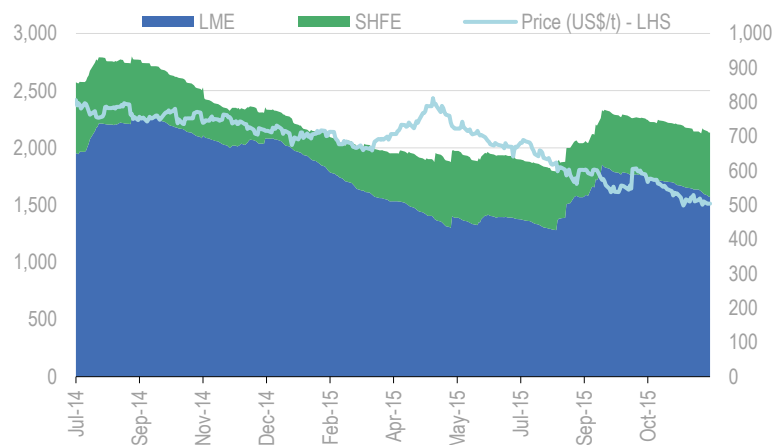
Source: Wood Mackenzie, Morgan Stanley Research

Zinc

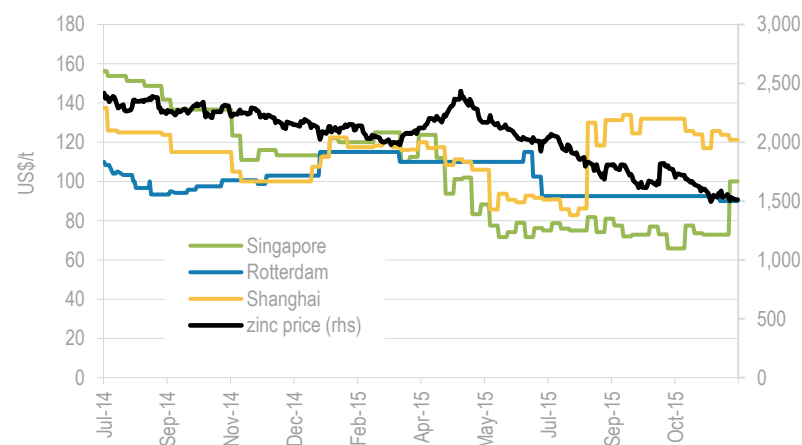
Sustained price support needs a demand recovery

- Demand key to recovery:** Without a substantial recovery in demand growth, the refined zinc market will remain in oversupply in 2016, regardless of announced supply cuts. China's steel output has fallen 2% year-to-date, and a feature of the outlook for the steel market next year is consolidation, not recovery. As has been the case across the base metals this year, China has increasingly exported its surplus – zinc exports are up 7% yoy to 94kt; while imports have declined by 25% over the same period.
- End-use indicators improving, slowly:** Increased infrastructure spending, stronger property sales and a lift in automotive output in China in 4Q are early positive macro signals; but these will take time to report through to a recovery in consumption growth. Elsewhere, end-use demand in the US has been robust in 2015, but increased imports of end-use goods are limiting growth in zinc consumption to around 2%/yr.
- Modest recovery in 2016:** We forecast a lift in global demand growth to 2.3% next year, supporting a modest price recovery. As concentrate stocks are drawn down through the year, smelter production will be constrained by mine supply, returning the refined market to deficit in 2017.

Zinc exchange inventories vs. LME price (kt, US\$/t)



Zinc's merchant premia (US\$/t)



Zinc

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
World Mine Production	Mt	10.9	11.6	11.3	12.1	12.5	12.8	12.9	13.0	13.2	13.0	13.7	14.3	14.7	15.2
YoY change	%	5.9%	5.9%	-2.4%	7.2%	3.8%	1.6%	1.2%	0.7%	1.4%	-1.5%	5.8%	3.9%	2.7%	3.5%
concentrate balance	Mt	35	334	266	-397	-177	626	423	98	-592	-1,094	-1,234	-1,163	-937	-262
treatment charge	US\$/t	287	292	248	259	217	190	209	237	214	195	198	194	191	186
World Refined Production															
Primary Refined Production	Mt	10.3	10.6	10.4	11.8	12.0	11.5	11.8	12.2	13.0	13.3	13.5	13.5	14.0	14.8
Secondary Refined Production	Mt	0.9	0.9	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	1.3	1.3	1.3
Total Refined Supply	Mt	11.2	11.5	11.2	12.7	13.0	12.5	12.9	13.3	14.2	14.6	14.8	14.8	15.3	16.1
World Refined Demand	Mt	11.4	11.2	10.1	11.7	12.6	12.8	13.3	13.9	14.1	14.4	14.9	15.3	15.9	16.6
YoY change	%	2.5	-2.1	-9.7	15.7	7.3	2.2	3.8	4.3	1.5	2.5	3.5	2.7	3.7	4.2
China refined usage growth	%	11.5	7.5	8.0	14.8	11.7	6.6	8.2	7.0	1.5	2.7	4.5	3.0	5.8	6.3
YoY change	%	-1.1	-6.4	-18.9	16.4	4.4	-1.0	0.4	2.0	1.5	2.3	2.6	2.4	1.9	2.3
Regional Demand Breakdown															
China	Mt	3.5	3.8	4.1	4.7	5.3	5.6	6.1	6.5	6.6	6.8	7.1	7.3	7.7	8.2
BRI (Brazil, Russia, India)	Mt	0.9	0.9	0.8	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5
USA	Mt	1.1	1.0	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2
Europe	Mt	2.8	2.5	1.9	2.3	2.4	2.2	2.2	2.3	2.3	2.3	2.3	2.4	2.4	2.4
ROW	Mt	3.1	3.0	2.4	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.1	3.2	3.2	3.3
Implied Market Balance (before inventory)	Mt	-0.27	0.30	1.08	1.03	0.43	-0.36	-0.37	-0.61	0.08	0.14	-0.14	-0.57	-0.64	-0.53
Inventories															
Reported commercial inventories	Mt	0.53	0.72	1.02	1.35	1.60	1.93	1.55	1.31	1.39	1.53	1.39	0.82	0.19	-0.34
Inventory-to-demand ratio	wks	2.4	3.4	5.2	6.0	6.6	7.8	6.1	4.9	5.1	5.5	4.9	2.8	0.6	-1.1
Market Balance	Mt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.14	-0.14	-0.57	-0.64	-0.53
Price (LME)	US\$/t	\$3,260	\$1,886	\$1,658	\$2,158	\$2,193	\$1,948	\$1,910	\$2,161	\$1,936	\$1,747	\$1,984	\$2,094	\$2,161	\$2,205
	US\$/lb	\$1.48	\$0.86	\$0.75	\$0.98	\$0.99	\$0.88	\$0.87	\$0.98	\$0.88	\$0.79	\$0.90	\$0.95	\$0.98	\$1.00
China's share of global refined zinc production	%	33%	34%	38%	40%	39%	39%	40%	43%	44%	48%	51%	53%	53%	51%
China's share of global refined zinc demand	%	31%	34%	41%	40%	42%	44%	46%	47%	47%	47%	47%	47%	48%	49%

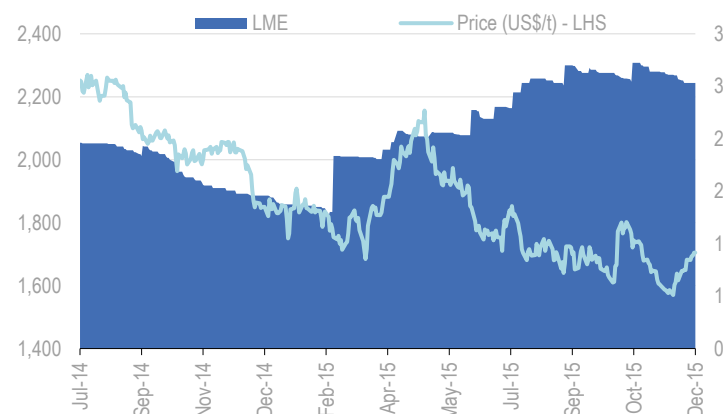
Source: ILZSG, Wood Mackenzie, Morgan Stanley Research e = Morgan Stanley Research estimates.

Lead

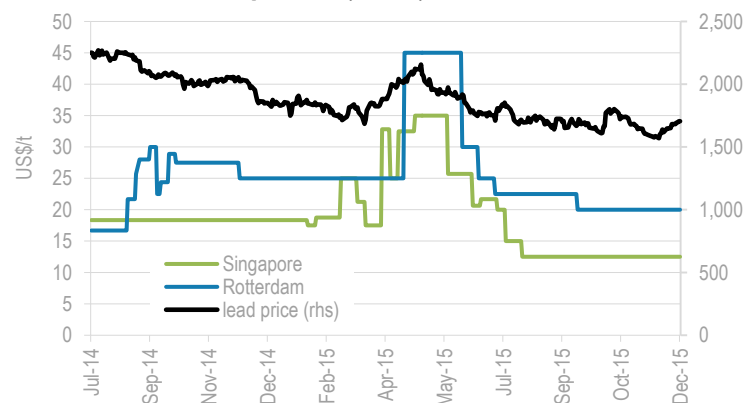
Defensive play of Base Metals World

- Leading the complex:** Less exposed to speculative activity and with a dominant end use (batteries) that is partly insulated from most short-term macro-events, lead has outperformed the other base metals in 2015 - down 8%ytd vs double digit declines elsewhere. LME inventories have fallen 40% during the year (to 132kt), although a proportion of this material is thought to have been switched to off-warrant inventory.
- Supply cut by default:** With its supply side dominated by output from zinc mines, lead has seen significant supply cuts despite a price well above the cost curve. Glencore and Nyrstar's cuts to zinc mines have removed >100ktpa of lead mine capacity, on top of the closure of Ivern's 80ktpa Paroo station mine in Jan-15; exit of Century (60ktpa) and Lisheen (20ktpa). Meanwhile, China's tighter enforcement of environmental regulations at both mines and smelters has driven domestic production lower (-6%ytd).
- Concentrate deficit drives TCs higher:** These supply cuts have left the market short of concentrate and spot TCs have risen through 2H as a result (\$185/t, Oct-15). The market is likely to remain tight through 2016, keeping TCs at a high level (MSe 2016, \$200/t).
- Weak demand keeps refined market in surplus:** Weak demand in the USA, Japan and China has preserved the market's forecast surplus. Weakness in China's autos sector has driven high exports of both lead acid batteries (+12%yoy) and refined lead (+73%yoy). Oct-15's recovery in vehicle production rates was a response to a tax incentive on purchases. The policy may support a lift in China's lead demand into 2016, but it really only pulls demand forward for now.

Lead's exchange inventories vs. LME price (kt, US\$/t)



Lead's merchant premia (US\$/t)



Lead

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
World Mine Production	Mt	3.3	3.5	3.6	4.0	4.5	4.7	5.2	5.2	5.3	5.2	5.2	5.3	5.3	5.3
YoY change	%	0.9%	3.6%	2.9%	12.1%	12.7%	5.0%	10.7%	0.4%	1.3%	-3.1%	1.7%	1.6%	0.1%	0.0%
concentrate balance	Mt	-45	-57	-2	27	102	58	136	-193	-216	-690	-971	-1,095	-1,186	-1,232
treatment charge	US\$/t	234	320	234	235	235	217	200	197	219	199	192	199	196	183
World Refined Production															
Primary Refined Production	Mt	4.3	4.5	4.5	4.6	5.1	5.2	5.5	5.7	5.8	6.2	6.0	5.9	5.9	5.9
Secondary Refined Production	Mt	4.1	4.4	4.6	5.1	5.4	5.7	5.9	6.0	5.9	6.1	6.2	6.2	6.2	6.2
Total Refined Supply	Mt	8.4	8.9	9.1	9.7	10.5	10.9	11.4	11.7	11.7	12.2	12.0	11.9	12.0	11.9
World Refined Demand	Mt	8.4	9.0	8.9	9.7	10.1	10.8	11.3	11.7	11.7	12.0	12.5	12.8	13.1	13.4
YoY change	%	3.6	5.5	2.7	5.6	8.5	4.0	4.9	2.2	0.5	3.9	-1.2	-0.9	0.2	0.0
China refined usage growth	%	16.8	19.9	12.3	12.2	6.0	11.9	8.1	4.7	-2.0	3.0	4.9	2.9	2.9	2.9
YoY change	%	-2.9	0.7	-7.7	5.8	4.1	2.1	2.1	2.7	1.8	2.8	2.7	1.7	1.6	2.2
Regional Demand Breakdown															
China	Mt	2.7	3.2	3.6	4.0	4.2	4.7	5.1	5.4	5.3	5.4	5.7	5.9	6.0	6.2
BRI (Brazil, Russia, India)	Mt	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.6
USA	Mt	1.5	1.6	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.7	1.7	1.8
Europe	Mt	2.0	1.8	1.6	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8
ROW	Mt	1.7	1.7	1.6	1.7	1.8	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.0	2.0
Market Balance (before inventory)	Mt	0.03	-0.08	0.22	-0.02	0.33	0.12	0.14	-0.02	0.03	0.15	-0.45	-0.84	-1.10	-1.43
Inventories															
Reported commercial inventories	Mt	0.28	0.30	0.38	0.45	0.57	0.62	0.67	0.58	0.60	0.75	0.30	-0.54	-1.64	-3.07
Inventory-to-demand ratio	wks	1.7	1.8	2.2	2.4	2.9	3.0	3.1	2.6	2.7	3.2	1.2	-2.2	-6.6	-12.0
Market Balance	Mt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.15	-0.45	-0.84	-1.10	-1.43
Price (LME)	US\$/t	\$2,592	\$2,096	\$1,720	\$2,146	\$2,398	\$2,061	\$2,139	\$2,094	\$1,785	\$1,786	\$1,874	\$1,940	\$1,962	\$1,984
	US\$/lb	\$1.18	\$0.95	\$0.78	\$0.97	\$1.09	\$0.93	\$0.97	\$0.95	\$0.81	\$0.81	\$0.85	\$0.88	\$0.89	\$0.90
China's share of global refined lead production	%	51%	50%	57%	60%	62%	62%	63%	66%	67%	76%	81%	82%	83%	84%
China's share of global refined lead demand	%	31%	35%	40%	41%	42%	44%	45%	46%	45%	45%	46%	46%	46%	46%

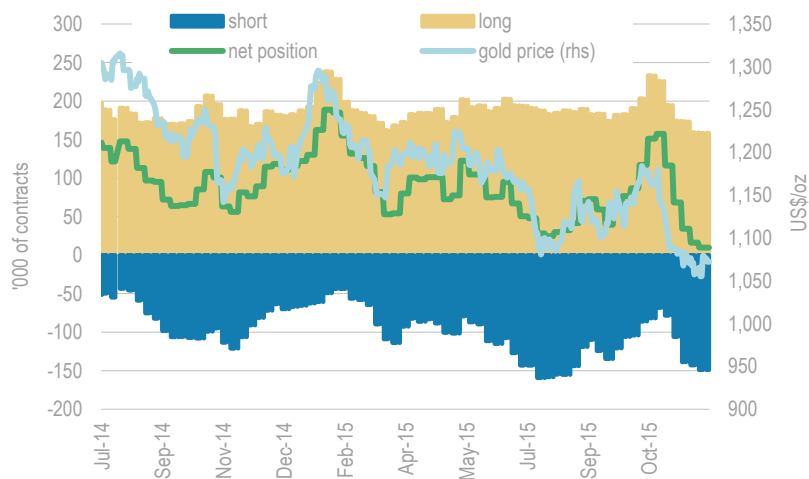
Precious Metals

Gold

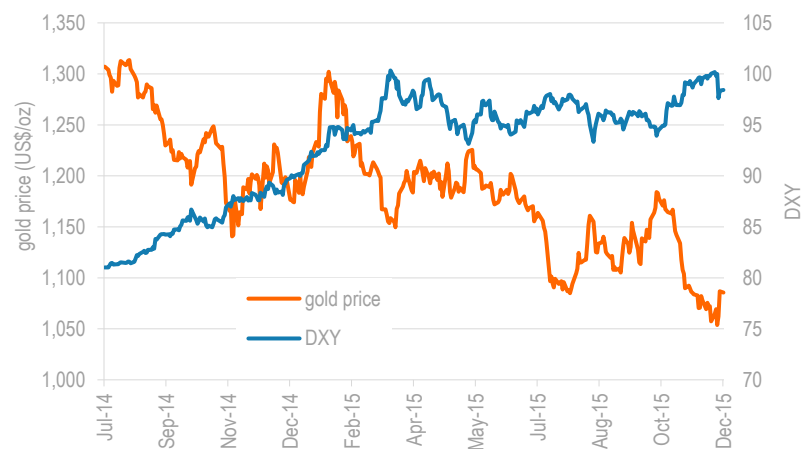
Awaiting the hike cycle, still

- Imminent hike:** After a year of debate and uncertainty, the US Federal Reserve chairman finally expressed in Nov a strong intention to begin a rate hike cycle soon, probably Dec-15 in our view. The move is reportedly a response to robust US economic activity; the biggest risk to the timing is the deterioration in global economic growth and trade flows. The Fed Funds Futures market is pricing in a 60% chance of a rate hike in Dec-15.
- Short-term weakness; longer term stability:** Our cross-asset strategy team forecast persistent strengthening of the USD in 2016, in response to rate hikes ([2016 Global Strategy Outlook: The Lower Frontier \(29 Nov 2015\)](#)), a view that implies downside risk for the gold price over the same period. An historical guide on the impact of the start of rate hike cycles on the gold price (1976, 1986, 1994, 2004) shows that it typically remains capped for 1-2 quarters, then lifts thereafter – implying that rate hike strategies do not completely offset inflation. It follows that we may be at a local low for the gold price, at least in relation to rate hike risk (i.e. assuming no other changes).
- CFTC's gold price guide:** The high/positive correlation between non-commercial positioning on CFTC and gold's price makes the US platform a useful short-term guide on investor views, with some lead-indicator capability for the price. Oct-Nov's net long-to-parity move undermined the price; more recent balanced positioning has helped deliver a floor.

Gold's CFTC CoT – non-commercial



Gold price vs. DXY

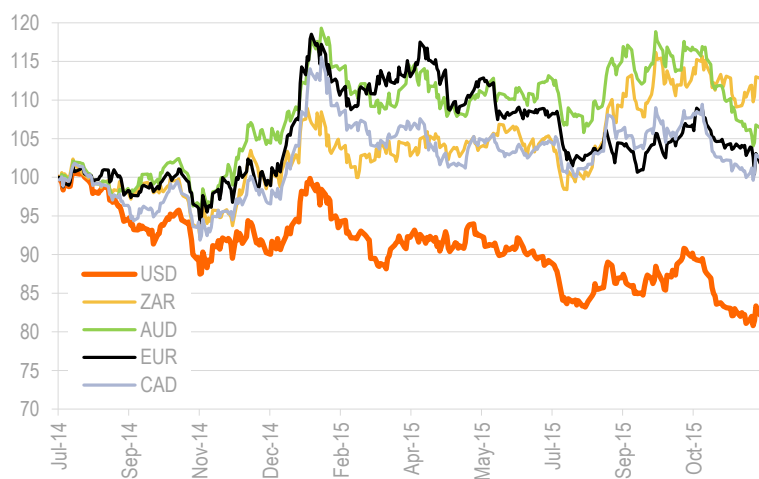


Gold

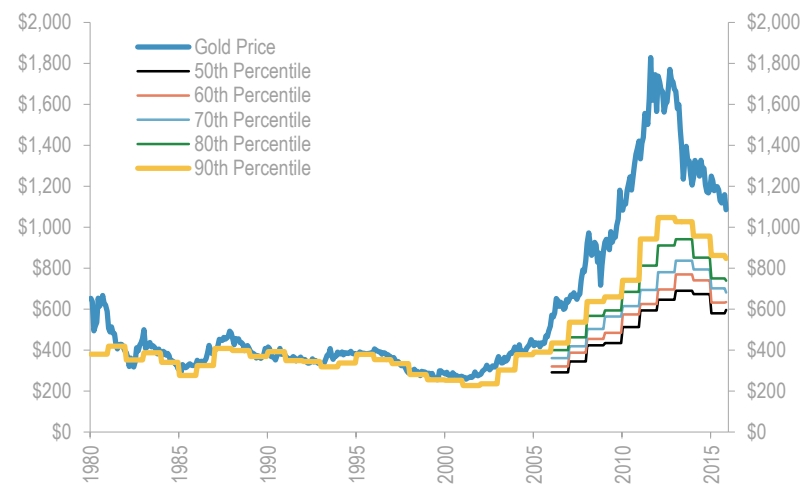
Other price drivers are balanced

- **Other bear factors persist:** In addition to the Fed's much anticipated interest rate hike, gold remains under pressure as other bear factors persist (most at least partly linked), including: reduced rate of central bank buying; persistent ETF net-outflows (-8%YTD); aggressive opex cutting by miners (supported by falling energy prices/producer currencies).
- **Seasonal lift in Q4 Indian demand muted:** Demand typically lifts in Q4 in India, with the wedding season and festivals. However, subdued rural demand, reflecting a poor monsoon (14% below average), and high inventories (built Jul-Aug) are likely to undermine gold imports.
- **Where's the upside?** A bull case for gold's price depends heavily on an 'anxiety' trade – such as growing financial risk in relation to China's economy or Syria-centric geo-political risk. Beyond that, upside requires not only the actual emergence of inflation (most likely oil-related, perhaps OPEC cutting more than Iran expands, etc.), but a poor interest rate hike strategy by the US Fed to deal with such a development. We forecast a gold price of \$1,081/oz and \$1,150/oz in 2016, and 2017 respectively.

Gold price in various consumer currencies



Gold cash costs vs. price (US\$/oz)



Gold

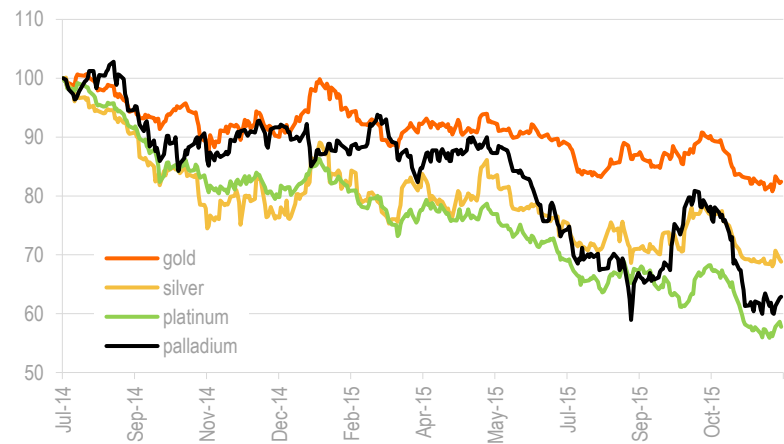
Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Supply															
Total Mine Supply	tonnes	2437	2377	2521	2581	2648	2738	2829	2910	2986	3020	3003	2983	3017	3053
YoY change	%	-0.2	-2.5	6.1	2.4	2.6	3.4	3.3	2.9	2.6	1.1	-0.5	-0.7	1.1	1.2
Scrap supply	tonnes	982	1316	1695	1645	1605	1580	1247	1168	1142	1125	1025	990	1026	1064
YoY change	%	-13.3	34.0	28.8	-2.9	-2.4	-1.6	-21.1	-6.3	-2.2	-1.5	-8.9	-3.4	3.7	3.7
Official sector net sales/(purchases)	tonnes	484	235	34	-79	-481	-569	-626	-591	-568	-500	-350	-350	-280	-224
YoY change	%	32.4	-51.3	-85.7	-335.7	507.1	18.4	9.9	-5.6	-3.9	-11.9	-30.0	0.0	-20.0	-20.0
Net producer hedging	tonnes	-444	-352	-254	-121	12	-40	-32	104	7	125	180	220	231	243
Total Supply	%	3458	3577	3996	4025	3784	3709	3419	3591	3567	3770	3858	3843	3994	4136
YoY change	%	-1.3	3.4	11.7	0.7	-6.0	-2.0	-7.8	5.0	-0.7	5.7	2.3	-0.4	3.9	3.5
Demand															
Carat Jewellery	tonnes	2425	2306	1816	2051	2091	2134	2669	2461	2334	2270	2426	2474	2524	2574
YoY change	%	5.4	-4.9	-21.2	12.9	1.9	2.1	25.1	-7.8	-5.2	-2.7	6.9	2.0	2.0	2.0
Electronics	tonnes	322	311	275	326	320	285	249	278	264	250	250	263	276	289
YoY change	%	1.8	-3.4	-11.6	18.6	-1.9	-11.1	-12.6	11.6	-4.8	-5.4	0.0	5.0	5.0	5.0
Dental	tonnes	58	56	53	49	43	39	23	20	19	20	20	19	19	18
YoY change	%	-4.8	-3.6	-5.4	-7.6	-10.9	-11.1	-40.4	-13.5	-4.9	5.6	0.0	-3.0	-3.0	-3.0
Official Coins, Medals & Imitation coins	tonnes	204	262	293	302	333	326	366	277	276	260	260	297	340	388
YoY change	%	7.9	28.4	11.8	2.9	10.5	-2.1	12.1	-24.4	-0.3	-5.8	0.0	14.3	14.3	14.3
Total Fabrication Demand	tonnes	3009	2935	2437	2728	2787	2783	3307	3036	2893	2800	2956	3053	3158	3270
YoY change	%	4.9	-2.4	-17.0	11.9	2.2	-0.1	18.8	-8.2	-4.7	-3.2	5.6	3.3	3.4	3.6
Change in ETF Holdings	tonnes	208	317	680	333	184	265	-780	-225	-127	-50	-50	-50	-50	-50
Bar Hoarding	tonnes	240	622	498	886	1197	963	1335	725	704	668	635	603	573	544
YoY change	tonnes	2	-297	381	79	-385	-302	-443	55	98	352	318	236	313	371
Total Investment Demand		450	642	1559	1298	997	926	112	556	675	970	903	789	836	865
YoY change	%	13.0	24.2	32.6	30.9	33.1	30.6	14.4	14.2	16.6	18.1	16.5	15.3	14.2	13.1
Total Demand (Fabrication + Investment)	tonnes	3,458	3,577	3,996	4,025	3,784	3,709	3,419	3,591	3,567	3,770	3,858	3,843	3,994	4,136
Gold Price	US\$/oz	\$696	\$872	\$972	\$1,225	\$1,570	\$1,668	\$1,412	\$1,266	\$1,162	\$1,081	\$1,150	\$1,200	\$1,210	\$1,220

Source: World Gold Council, Goldfields Minerals Services, CPM Group, Morgan Stanley Research e = Morgan Stanley Research estimates.

Silver

Precious metals price indices



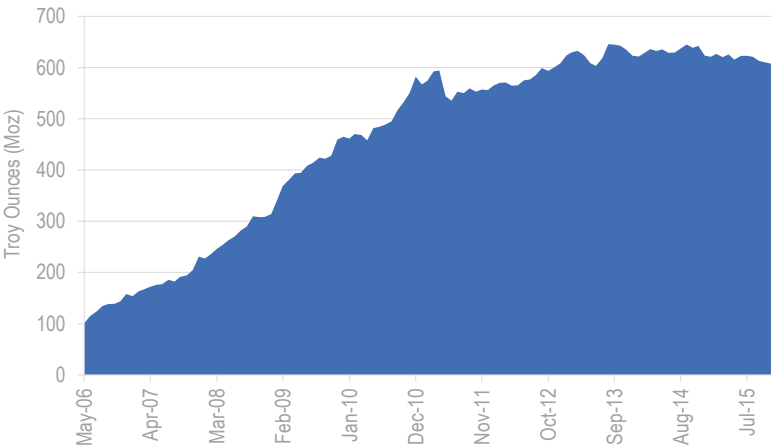
Source: Bloomberg

Silver spot price (US\$/oz)

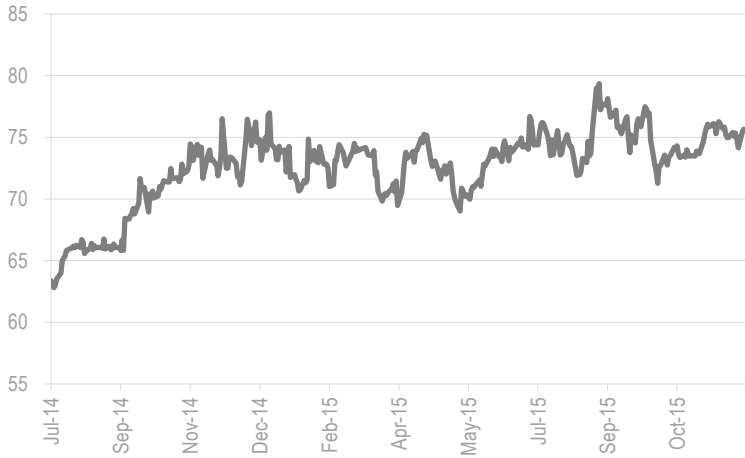


Source: Bloomberg

Silver ETF holdings



Gold-to-silver ratio



Silver

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Supply															
Mine Production	tonnes	20,734	21,234	22,279	23,365	23,492	24,550	25,981	27,293	25,560	25,304	25,431	25,940	26,458	26,987
YoY change	%	3.6	2.4	4.9	4.9	0.5	4.5	5.8	5.1	-6.4	-1.0	0.5	2.0	2.0	2.0
Net Government Sales/(Purchase)	tonnes	1,322	949	485	1,375	373	230	246	200	200	-50	-50	-50	-50	-50
YoY change	%	-45.9	-28.2	-48.9	183.3	-72.9	-38.3	6.8	-18.6	0.0	-125.0	0.0	0.0	0.0	0.0
Silver Scrap	tonnes	6,351	6,283	6,258	7,076	8,134	7,947	5,994	5,241	6,015	5,991	6,155	6,547	6,678	6,811
YoY change	%	-1.4	-1.1	-0.4	13.1	14.9	-2.3	-24.6	-12.6	14.8	-0.4	2.7	6.4	2.0	2.0
Net Producer Hedging	tonnes	-750	-271	-541	1568	379	-1465	-1101	491	0	0	0	0	0	0
Total Supply	tonnes	27,657	28,195	28,481	33,385	32,378	31,262	31,119	33,226	31,775	31,244	31,536	32,436	33,086	33,749
YoY change	%	-3.1	1.9	1.0	17.2	-3.0	-3.4	-0.5	6.8	-4.4	-1.7	0.9	2.9	2.0	2.0
Demand															
Electronics	tonnes	8,165	8,451	7,073	9,368	9,045	8,305	8,280	8,208	8,282	8,530	8,786	9,050	9,321	9,601
YoY change	%	8.3	3.5	-16.3	32.5	-3.5	-8.2	-0.3	-0.9	0.9	3.0	3.0	3.0	3.0	3.0
Photography	tonnes	3,639	3,054	2,376	2,078	1,838	1,620	1,493	1,418	1,680	1,630	1,581	1,533	1,487	1,443
YoY change	%	-17.7	-16.1	-22.2	-12.6	-11.5	-11.8	-7.9	-5.0	18.5	-3.0	-3.0	-3.0	-3.0	-3.0
Brazing Alloys and Solders	tonnes	1,813	1,916	1,667	1,894	1,950	1,885	1,963	2,056	2,118	2,181	2,247	2,314	2,383	2,455
YoY change	%	6.6	5.7	-13.0	13.6	3.0	-3.3	4.1	4.8	3.0	3.0	3.0	3.0	3.0	3.0
Coins & Medals	tonnes	1,593	5,826	2,722	4,457	6,550	4,292	7,577	6,096	1,371	1,440	1,512	1,587	1,667	1,750
YoY change	%	5.1	265.8	-53.3	63.8	47.0	-34.5	76.5	-19.5	-77.5	5.0	5.0	5.0	5.0	5.0
Other Applications	tonnes	6,501	6,149	4,812	5,148	4,560	4,821	5,123	4,958	5,337	5,380	5,423	5,466	5,510	5,554
YoY change	%	5.2	-5.4	-21.8	7.0	-11.4	5.7	6.3	-3.2	7.6	0.8	0.8	0.8	0.8	0.8
Total Fabrication Demand	tonnes	29,660	33,533	26,761	32,058	33,433	29,959	34,596	33,181	29,411	29,969	30,546	31,145	31,766	32,409
YoY change	%	2.2	13.1	-20.2	19.8	4.3	-10.4	15.5	-4.1	-11.4	1.9	1.9	2.0	2.0	2.0
Balance															
Change in ETF Holdings	tonnes	2,274	2,582	4,696	3,648	-812	1,621	459	5	-480	-500	-750	-100	-100	-100
Reported ETF Holdings	tonnes	7,181	9,763	14,459	18,107	17,296	18,917	19,376	19,381	18,901	18,401	17,651	17,551	17,451	17,351
YoY change	%	46.3	36.0	48.1	25.2	-4.5	9.4	2.4	0.0	-2.5	-2.6	-4.1	-0.6	-0.6	-0.6
Implied Other Investment	tonnes	-3,367	-3,679	119	-547	5,427	4,122	5,116	4,654	0	0	0	0	0	0
Total Demand	tonnes	28,567	32,435	31,576	35,160	38,048	35,702	40,172	37,839	28,931	29,469	29,796	31,045	31,666	32,309
Price	US\$/oz	13.39	15.01	14.69	20.19	35.15	31.17	23.87	19.09	15.77	14.55	15.40	16.20	17.00	18.50

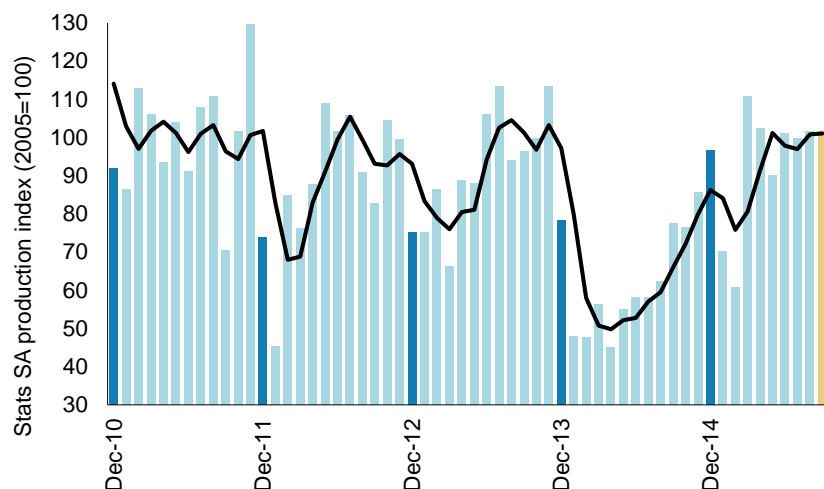
Source: CPM Group, Goldfields Mineral Services, Silver Institute, Morgan Stanley Research; e = Morgan Stanley Research estimates.

Platinum

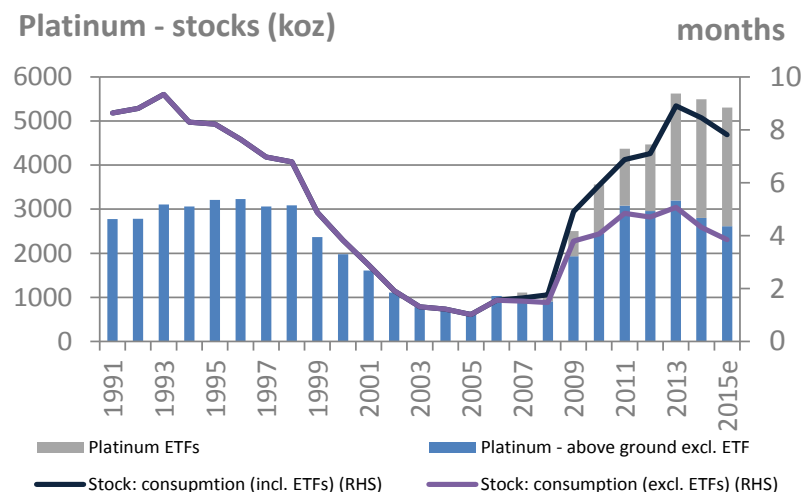
Absence of catalysts caps the price outlook

- **Barriers to exit:** Adverse market structures exist for PGMs, including high fixed cost base + flat cost curve + labour intensive industry + BEE financing structures. This market condition was recently reinforced by the third Lonmin capital raising in 6 years. Perversely, South Africa's supply is set to rise in 2015 (MSe +2% vs. 2013).
- **Anaemic demand drivers:** 1) Global auto demand grew in 2015, with Euro VI emission legislation providing a boost to platinum loadings. Assuming an improvement in global auto sales, we expect platinum auto demand to lift in 2016. But this is likely to be offset by a 154koz lift in recycled volumes after a fall in scrap with a lower price in 2015. 2) VW emissions testing scandal has hit sentiment for diesel vehicles. While we believe diesel penetration in Europe will not change significantly pre-2020 due to OEM CO2 targets/ installed capacity, the longer term outlook appears weakened now, exposed to alternative technology options. 3) Decline in jewellery demand in 2015 y/y was primarily driven by China (62% global demand), with our indicators highlighting persistent weakness into 2016.
- **No respite in ETFs:** If ETF holdings do not prove 'sticky', then metal inventories-to-consumption ratio is below a level required for a tight market. The recent sell off in PGM ETF holdings (-307koz) was central to the price fall.

South Africa's PGM production is up 3% YTD to Sep



ETF holdings' stock-to-consumption ratio says market's not tight



Platinum

Global supply-demand outlook

	Unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e	2021e
Supply																
South Africa	Koz	5070	4515	4635	4635	4860	4110	4205	3547	4295	4292	4840	4803	4818	4797	4305
Russia	Koz	915	805	785	825	835	801	725	709	699	700	694	718	718	718	718
United States	Koz	325	325	260	200	350	306	318	339	331	333	338	343	337	337	337
Zimbabwe & Others	Koz	290	295	345	390	440	463	553	531	516	550	550	556	562	562	560
Total Mine production	Koz	6600	5939	6025	6050	6485	5680	5801	5126	5841	5875	6421	6420	6434	6414	5919
YoY change	%	-3%	-10%	1%	0%	7%	-12%	2%	-12%	14%	1%	9%	0%	0%	0%	-8%
Autocatalyst recycling	Koz	935	1130	830	1085	1240	1120	1205	1282	1156	1310	1491	1641	1763	1850	1871
Jewellery recycling	Koz	655	695	565	735	810	895	790	762	623	620	663	748	851	954	1058
Total supply	Koz	8191	7764	7420	7870	8535	7695	7796	7170	7620	7804	8575	8809	9049	9218	8848
Demand																
Autocatalyst	Koz	4145	3655	2185	3075	3185	3158	3114	3270	3468	3555	3632	3695	3781	3871	3965
Jewellery	Koz	2110	2060	2810	2420	2475	2783	3028	2894	2648	2699	2848	2891	2864	2917	2918
Chemical	Koz	420	400	290	440	470	452	546	549	566	587	609	631	655	679	704
Electronics	Koz	255	225	180	220	220	154	194	198	214	222	230	239	247	257	266
Glass	Koz	470	315	10	385	515	153	97	191	243	213	238	247	256	265	275
Petroleum	Koz	205	240	210	170	210	112	159	165	121	105	109	113	117	121	126
Other industrial demand	Koz	495	535	440	530	550	618	632	634	645	669	694	719	746	773	802
Total demand	Koz	8100	7430	6125	7240	7625	7430	7770	7901	7905	8049	8359	8535	8666	8885	9056
Gross surplus/(deficit)	Koz	91	334	1295	631	910	265	26	(731)	(285)	(245)	216	274	382	334	(208)
Investment/ stock movements	Koz	170	555	660	655	460	450	871	273	-46	0	0	0	0	0	1
Residual surplus/(deficit)		(79)	(221)	635	(24)	450	(185)	(845)	(1004)	(239)	(245)	216	274	382	334	(209)
Average Price (US\$/oz)	US\$/oz	1308	1583	1210	1614	1722	1553	1489	1390	1059	892	954	1078	1228	1378	1528
% price change	%	14%	21%	-24%	33%	7%	-10%	-4%	-7%	-24%	-16%	7%	13%	14%	12%	11%

Source: Johnson Matthey, World Platinum Investment Council, SFA Oxford, Morgan Stanley Research; e = Morgan Stanley Research estimates.

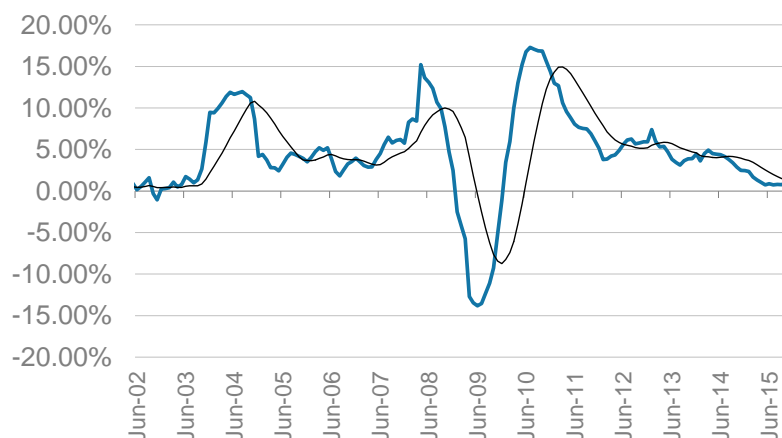
Palladium

Price upside requires stability in demand growth + investment flows

- Palladium market deficit remains substantial in 2015: MSe 827koz, 9% of global supply, before investment flows. However, ETF sales appear to have overwhelmed the market (629koz liquidated since Jul-15). This has accelerated the sell off in the price, given weak demand growth and macroeconomic outlook (stronger USD, slowing auto sales). Post investment flows, we forecast that the palladium market deficit narrowed from 1.8Moz in 2014 to 0.43Moz in 2015.
- Global auto sales outlook remains a key driver of relative performance, slowing materially in 2015. The decline relates to a pullback in EMs, critical for palladium, given that autocat demand itself represents 77% of gross demand; 44% of this from EMs. Our demand forecast assumes a recovery in EM auto demand growth in 2016, +3.2%yoy vs 0.8%yoy in 2015. The risk to our outlook is that current weakness persists.
- Our model still reports a sizeable deficit for 2016, assuming both stabilising investment flows and an uptick in auto growth, which would be likely to result in a continuation of the appreciation of palladium price relative to platinum, in our view.

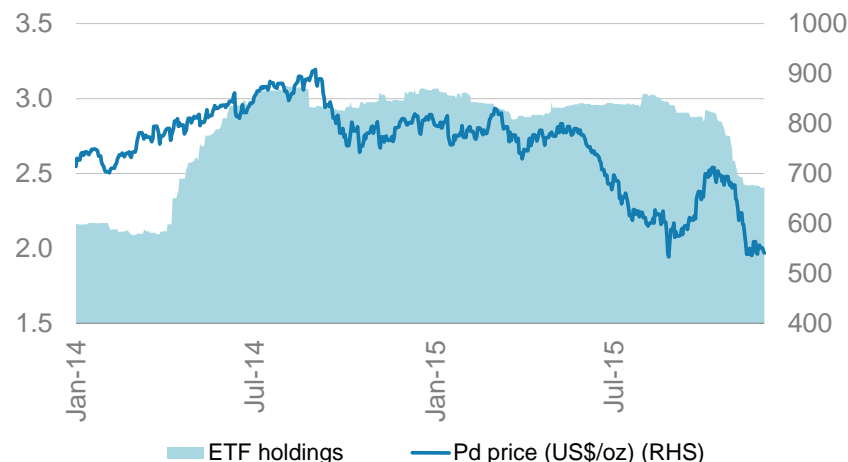
Global SAAR auto growth <1% y/y since May on EM weakness...

Global tracked sales growth yoy



Liquidation of 629koz palladium ETF holdings appears to have created a surplus, undermining the price

ETF holdings (moz) vs price)



Palladium

Global supply-demand outlook

	Unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Supply															
South Africa	Koz	2765	2430	2370	2640	2560	2359	2464	2127	2547	2568	2868	2851	2853	2819
Russia	Koz	3050	2700	2675	2720	2705	2627	2510	2614	2603	2657	2662	2780	2780	2780
North America	Koz	990	910	755	590	900	811	829	912	873	877	884	893	882	882
Others	Koz	285	310	340	405	420	428	471	451	427	457	457	462	467	467
Total mine production	Koz	7090	6350	6140	6355	6585	6225	6274	6104	6450	6559	6871	6985	6982	6948
Yoy change	%	-2%	-10%	-3%	4%	4%	-5%	1%	-3%	6%	2%	5%	2%	0%	0%
Autocatalyst recycling	Koz	1015	1140	965	1310	1695	1675	1910	2189	1980	2035	2070	2194	2315	2403
Electrical recycling	Koz	315	345	395	440	480	443	463	474	477	495	513	532	552	572
Jewellery recycling	Koz	235	130	70	100	210	194	157	89	60	62	65	67	69	72
Total supply	Koz	8655	7965	7570	8205	8970	8537	8804	8856	8967	9150	9519	9778	9918	9995
Demand															
Autocatalyst	Koz	4545	4465	4050	5580	6155	6673	7026	7433	7495	7737	7954	8104	8353	8612
Jewellery	Koz	950	985	775	595	505	442	355	274	242	242	220	196	193	194
Dental	Koz	630	625	635	595	540	510	457	468	452	452	411	366	361	362
Chemical	Koz	375	350	325	370	440	524	496	406	454	471	429	381	376	377
Electronics	Koz	1550	1370	1370	1410	1375	1190	1070	1049	1039	1077	981	873	860	863
Other industrial demand	Koz	85	75	70	90	110	104	104	110	112	116	106	94	93	93
Total Demand	Koz	8135	7870	7225	8640	9125	9443	9508	9740	9794	10095	10101	10014	10237	10502
Gross surplus / (deficit)	Koz	520	95	345	(435)	(155)	(906)	(704)	(884)	(827)	(945)	(582)	(236)	(319)	(507)
Identifiable stock movements															
Investment/ Stock movements	Koz	(1230)	(540)	(335)	95	(1340)	207	(108)	931	(400)	-	-	-	-	-
Residual surplus/(deficit)	Koz	1750	635	680	(530)	1185	(1113)	(596)	(1815)	(427)	(945)	(582)	(236)	(319)	(507)
Average Price (US\$/oz)	US\$/oz	358	354	265	529	735	645	727	810	697	627	715	833	876	905
Yoy change		11%	-1%	-25%	99%	39%	-12%	13%	11%	-14%	-10%	14%	17%	5%	3%

Source: Johnson Matthey, SFA Oxford, Morgan Stanley Research; e = Morgan Stanley Research estimates.

Rhodium

Global supply-demand outlook

	Unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Rhodium Production															
South Africa	Koz	640	610	660	632	641	577	551	467	593	596	667	663	663	658
Russia	Koz	90	80	80	70	70	90	80	91	82	84	84	88	88	88
North America	Koz	20	18	15	10	23	22	23	24	22	22	22	22	22	22
Others	Koz	20	22	25	22	31	31	40	41	39	43	43	44	44	44
Total Supply	Koz	770	730	780	734	765	720	694	623	736	744	816	817	817	812
Yoy change	%	-7%	-5%	7%	-6%	4%	-6%	-4%	-10%	18%	1%	10%	0%	0%	-1%
Rhodium Consumption															
Autocatalyst (net)	Koz	810	720	430	486	438	523	508	517	540	552	560	565	577	597
gross	Koz	1,000	910	600	727	715	775	786	824	820	846	872	902	935	970
recycling	Koz	190	190	170	241	277	252	278	307	280	294	313	337	358	373
Industrial	Koz	140	120	110	160	173	144	163	169	202	200	207	215	223	231
ETF	Koz					20	40	50	10	(39)					
Total Demand	Koz	950	840	540	646	631	707	721	696	703	752	767	780	800	828
Oversupply/(Undersupply)	Koz	(180)	(110)	240	88	134	13	(27)	(73)	33	(8)	49	36	17	(16)
Average Price (US\$/oz)	US\$/oz	6195	6545	1593	2455	2020	1276	1067	1171	972	746	1004	1401	1798	2195
Yoy change	%	36%	6%	-76%	54%	-18%	-37%	-16%	10%	-17%	-23%	35%	40%	28%	22%

Source: Johnson Matthey, SFA Oxford, Morgan Stanley Research; e = Morgan Stanley Research estimates.

Steel & Steel-Making Raw Materials

Steel

Most preferred regions: Russia & Japan*Most preferred regions*

- **Russia:** despite our view that Russia's equity premia could continue to compress, key quantitative metrics are still positive. As the lowest cost producer in the world, we expect double digit free cash flow from most companies; valuations are low relative to historical norms; expected returns are high – making Russian steel equities our most preferred.
- **Japan:** domestic market is still destocking; look to stability in inventory levels as an indicator of emerging upside price risk for this industry. Despite headwinds from destocking, on a relative basis Japan's equity valuations and expected 2016 ROICs are attractive on a relative basis compared to those of other regions.

Middle-of-pack

- **North America:** on our new deck, North American mini-mill producers appear attractive on quantitative and fundamental factors. They compare favourably on valuation relative to historical levels and expected returns on net operating assets. Also, we believe US steel prices are set to lift, as imports slow on trade cases; scrap deflation headwinds abate and outages limit supply growth. However, avoid more levered integrated mills. These will continue to struggle to generate a return, in our view.

Least preferred regions

- **China:** equities' relative valuations and expected returns on capital are poor compared to those of its regional peers. Excess steel-producing capacity is the key concern of this industry. However, near-term prices could see some recovery as mills restrict production on weakening margins and a seasonal pullback in demand.
- **Korea:** industry faces subdued demand growth, with the activity in the construction industry being offset by tepid auto and shipbuilding activity. Elsewhere, mills continue to expand capacity, undermining the outlook. High relative valuations and lower expected returns on capital are deterrents.
- **Latin America:** Brazil's steel market faces challenging demand conditions, featuring a persistent decline in steel prices. Brazil also faces meaningful macro headwinds. Valuations are modestly above normal levels; expected returns on capital are low, as in non-Japan Asia. Mexico is on a better footing than Brazil. Featuring a more stable demand growth outlook.

Steel

Global supply-demand outlook

	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Demand - Finished Steel (mmt)														
EU (27)	204	187	121	148	158	141	143	150	151	153	156	159	162	163
Other Europe	30	28	23	29	33	34	37	37	36	38	39	41	43	44
CIS/Russia	56	50	36	48	55	58	59	58	52	52	54	55	57	58
North America	141	130	84	112	123	132	130	145	139	147	152	155	159	163
South America	41	44	34	45	46	46	46	47	44	42	44	47	49	51
China	423	435	548	576	624	656	730	713	668	662	665	668	672	665
Japan	81	78	53	64	64	61	64	64	62	63	63	63	62	59
S.Korea	55	59	45	52	56	54	52	56	56	56	57	57	58	58
India	51	41	58	65	70	72	74	76	80	87	94	103	112	122
Other Asia/Pacific	75	101	72	95	106	102	107	109	112	119	124	129	134	135
Africa/Middle East	67	76	77	78	81	85	90	88	90	95	100	104	108	113
Global Demand - Finished Steel	1,225	1,229	1,152	1,312	1,416	1,442	1,532	1,543	1,490	1,512	1,548	1,582	1,615	1,630
% change Y-o-Y	6.9%	0.3%	-6.3%	13.9%	7.9%	1.9%	6.2%	0.7%	-3.4%	1.5%	2.4%	2.2%	2.1%	0.9%
World ex-China	802	794	603	736	792	786	802	830	821	851	883	914	943	965
% Change	4.4	-1.1	-24.0	21.9	7.7	-0.8	2.1	3.4	-1.0	3.6	3.8	3.5	3.2	2.3
China	423	435	548	576	624	656	730	713	668	662	665	668	672	665
% Change	11.9	2.9	26.1	5.1	8.3	5.2	11.2	-2.3	-6.3	-1.0	0.5	0.5	0.5	-1.0
Global Demand - Crude Steel	1,346	1,350	1,265	1,441	1,556	1,585	1,683	1,695	1,637	1,662	1,701	1,738	1,774	1,791
% change Y-o-Y	8.6%	0.3%	-6.3%	13.9%	7.9%	1.9%	6.2%	0.7%	-3.4%	1.5%	2.4%	2.2%	2.1%	0.9%
Ratio Finished/Crude - %	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
Production - Crude Steel (mmt)														
EU (27)	210	199	139	173	178	169	166	169	169	169	171	173	174	177
Other Europe	31	32	29	34	39	40	39	38	39	40	41	41	42	42
CIS/Russia	124	114	98	108	113	111	108	106	102	104	107	109	111	113
North America	132	125	84	112	119	122	119	121	114	128	131	132	134	135
South America	48	47	38	44	48	47	46	45	46	47	49	50	50	50
China	489	500	574	627	684	730	815	823	793	777	785	793	799	794
Japan	120	119	88	110	108	107	111	111	105	108	108	109	109	109
S.Korea	52	54	49	59	69	69	69	74	75	75	76	76	77	78
India	53	58	64	69	73	77	81	87	90	99	106	113	120	127
Other Asia/Pacific	53	62	45	62	69	49	52	50	52	54	56	58	59	60
Africa/Middle East	36	34	33	37	39	40	43	45	47	52	56	58	60	63
Global Production	1,348	1,343	1,239	1,433	1,538	1,560	1,650	1,670	1,631	1,653	1,684	1,712	1,735	1,748
% change Y-o-Y	7.8%	-0.3%	-7.8%	15.7%	7.3%	1.4%	5.8%	1.2%	-2.3%	1.3%	1.9%	1.6%	1.4%	0.7%
World ex-China	859	843	665	807	854	830	835	847	838	876	900	919	936	954
% Change	3.3	-1.8	-21.1	21.3	5.9	-2.8	0.6	1.4	-1.1	4.5	2.7	2.2	1.9	1.9
China	489	500	574	627	684	730	815	823	793	777	785	793	799	794
% Change	16.8%	2.2%	14.7%	9.3%	9.1%	6.7%	11.6%	0.9%	-3.6%	-2.0%	1.0%	1.0%	0.8%	-0.6%
Operating Rate - Crude Steel														
Global Operating Rate	85%	82%	72%	77%	79%	74%	76%	77%	76%	78%	79%	81%	81%	82%

Source for historical figures: capacity data sourced from CRU; production data IISI Statistical Year Book & World Steel in Numbers; demand data from IISI World Steel in Numbers; Morgan Stanley Research estimates

Steel

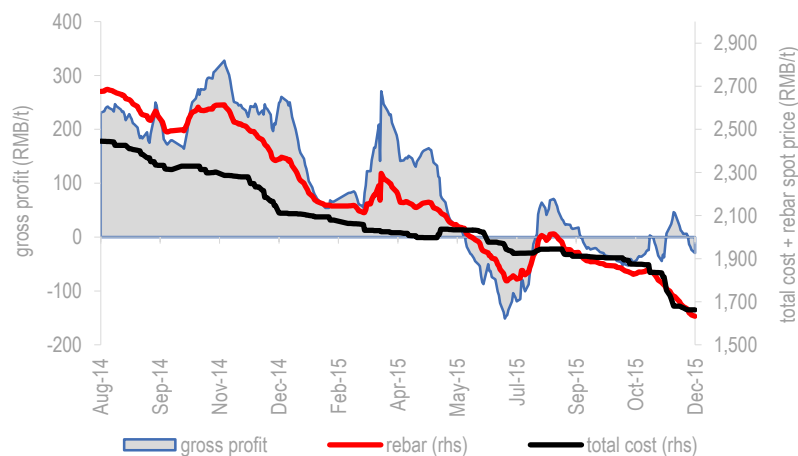
China's supply-demand outlook

MS China Steel Supply & Demand Model

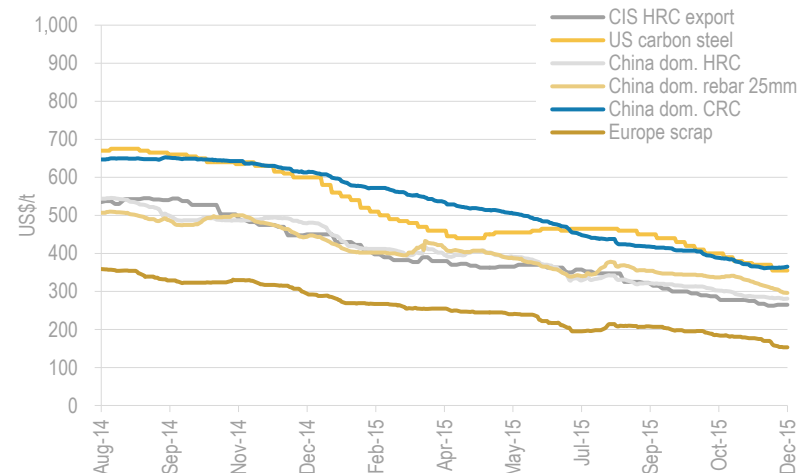
	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Crude steel production	Mt	489	500	574	627	684	730	815	823	793	777	785	793	799	794
YoY growth	%	16.8%	2.2%	14.7%	9.3%	9.1%	6.7%	11.6%	0.9%	-3.6%	-2.0%	1.0%	1.0%	0.8%	-0.6%
Net imports/(exports)	Mt	63	59	22	43	49	54	62	94	111	100	104	109	112	114
YoY growth	%	-104.0%	-4.0%	-62.9%	93.3%	14.9%	10.0%	15.8%	50.4%	17.9%	-9.5%	4.4%	4.4%	2.6%	1.8%
Est. Mill + trader inventories Ince/(Decr)	Mt	3	4	-4	2	-5	2	5	-3	-1	0	0	0	0	0
Apparent steel consumption	Mt	440	453	571	600	650	665	761	743	696	690	693	696	700	693
YoY growth	%	11.9%	2.9%	26.1%	5.1%	8.3%	2.3%	14.4%	-2.3%	-6.3%	-1.0%	0.5%	0.5%	0.5%	-1.0%
Crude steel capacity	Mt	610	644	718	800	863	1,001	1,040	1,015	963	937	927	922	917	912
YoY growth	%	29.2%	5.6%	11.4%	11.5%	7.9%	16.0%	3.9%	-2.4%	-5.1%	-2.7%	-1.1%	-0.5%	-0.5%	-0.5%
Average utilization rate	%	80%	78%	80%	78%	79%	73%	78%	81%	82%	83%	85%	86%	87%	87%

Source: Production & Consumption, WorldSteel Statistical Yearbook; capacity, CRU; net trade, MySteel; Morgan Stanley Research estimates (e)

Evolution underway: China + seaborne iron ore cost curve



Selection of finished steel product prices

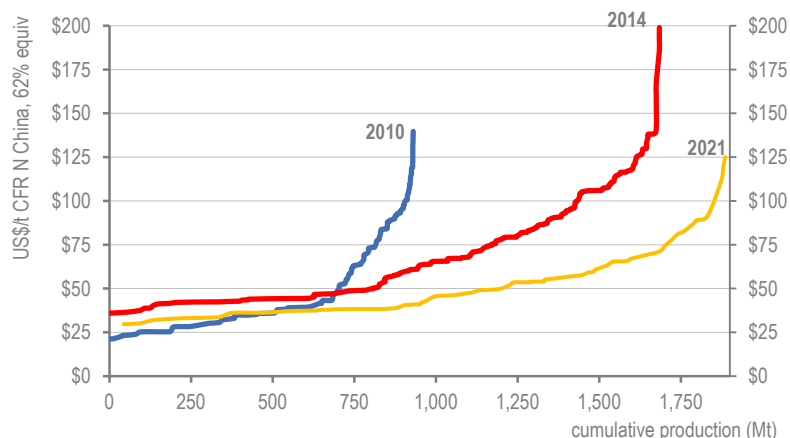


Iron Ore

Next move? Q1's seasonal uptick

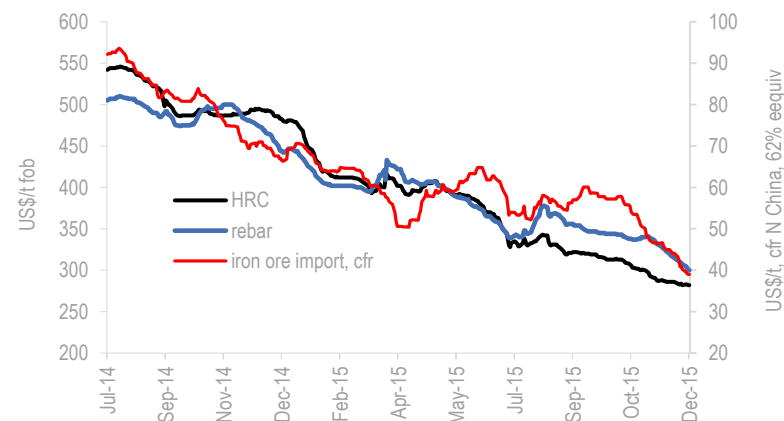
- **Price plunging, again:** Seaborne iron ore's year of turbulence went to the bitter end, slipping below US\$40/t cfr – the lowest level in the spot trade's short history – and the third sell-off event of 2015 alone (Apr; Jul; Nov). The year featured the substantial displacement of China's domestic production with imports, a substitution event encouraged by a local steel industry determined to competitively cut production costs. Much of the ore supply switch actually occurred at a stable price range of US\$55-60/t cfr.
- **Yes, there's still more supply coming:** Australia's Big 2 (2016e, Rio Tinto, 345Mtpa; BHPB, 274Mtpa) still have more growth to deliver during 2016-17e. Together, we forecast +40Mtpa, 2016e; +15Mtpa, 2017e (to top rates of 360Mtpa for Rio Tinto; >270Mtpa for BHPB). FMG has reached its target of +160Mtpa this year. Vale continues to push for another 90Mtpa over 3 years (which we model simply as additional capability; 342Mtpa to 430Mtpa by 2020).
- **Crisis of confidence:** One of the features of 2015's ore trade is the 3 x key seasonal turning points (Q1 rally + stable trade of May-Sep + Oct pullback) were all delayed by 1-2 months. Why? MS' China tours identified a loss in confidence in the metals processing industry, unsettled by an anti-corruption campaign + outlook uncertainty for steel-intensive sectors of property/infrastructure. We forecast surpluses of <70Mt for the seaborne ore trade, the smallest surplus in over 10 years, reflecting slowing supply growth. This underpins a flat price outlook to US\$45-60/t cfr (nominal). Upside risk to this forecast depends on the Big 3 acting less competitively, and more strategically – on supply growth.

Evolution underway: China + seaborne iron ore cost curve



Source: Wood Mackenzie, Morgan Stanley Research

Spot iron ore vs China's steel prices



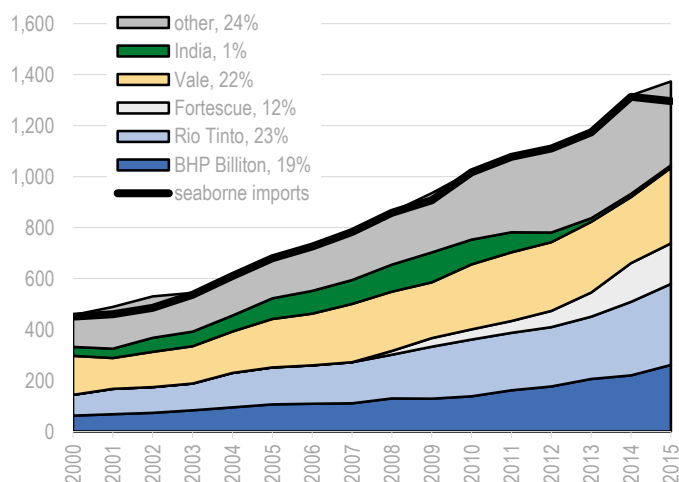
Source: Bloomberg, Morgan Stanley Research

Iron Ore

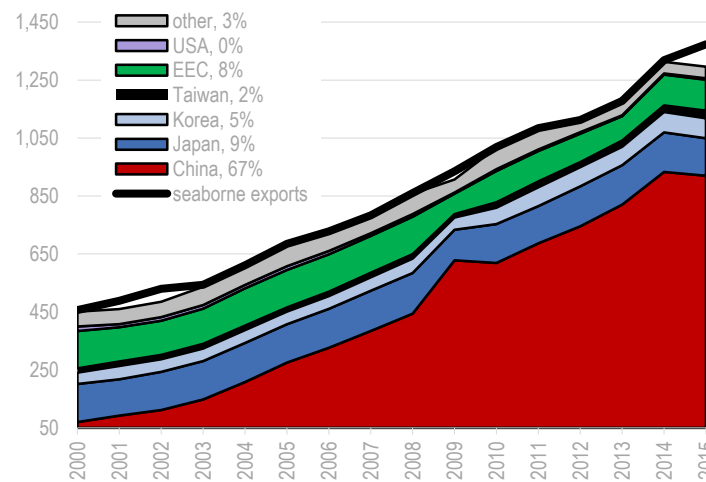
Cost curve flattens/widens a bit more

- Supply-side evolution continues:** High cost production capability has been exiting the market quickly at a price below US\$60/t cfr – including low-grade mines of Hebei province, northeast China; and small operations in Australia and Brazil. As of Dec-15, we estimate that over 127Mtpa of capacity has been cut (idled; reduced rate, closed; incl. Samarco's 30Mtpa for 2 years) in 2015, representing about 6.5% of estimated seaborne + China production capability in 2015. We observe that it takes 6-12 months of relatively low price levels before out-of-the-money capability cuts occur.
- FMG almost caught by the price:** At US\$40/t cfr + 72¢AUD, our analyst Brendan Fitzpatrick estimates that Fortescue Metals generates about US\$4/t post-C1 costs, shipping, royalty, interest, tax, overheads & sustaining capex. FMG's quoted break-even price is US\$39/t (excl. dividends + cash for debt repayment), but it has since cut C1 by US\$3/t (FMG assumes \$2/t for sust. capex; \$5/t freight). 1¢ AUD = US\$0.20/t C1; so had the AUD weakened in-line with the ore price, US\$2.5/t of cost offset would have been captured. Instead, the AUD has remained stable. That's a problem. For at US\$40/t, the US\$800Mpa FMG generates will fall short of accumulating the US\$6bn by 2019 to meet debt repayments.
- LT price:** Our long-term price is US\$52/t cfr 62% Fe fines, Nth China (real; revised 29-Sep-15).

Seaborne iron ore's major EXPORTERS (Mtpa)



Seaborne iron ore's major IMPORTERS (Mtpa)



Iron Ore

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e	2021e	2022e	2023e	2024e	2025e
Global crude steel production	Mt	1,348	1,343	1,239	1,433	1,538	1,560	1,650	1,670	1,631	1,653	1,684	1,712	1,735	1,748	1,760	1,772	1,784	1,797	1,811
YoY growth	%	7.8%	-0.3%	-7.8%	15.7%	7.3%	1.4%	5.8%	1.2%	-2.3%	1.3%	1.9%	1.6%	1.4%	0.7%	0.7%	0.7%	0.7%	0.7%	0.8%
China's crude steel production	Mt	489	500	574	627	684	730	815	823	793	777	785	793	799	794	788	782	777	771	765
YoY growth	%	16.8%	2.2%	14.7%	9.3%	9.1%	6.7%	11.6%	0.9%	-3.6%	-2.0%	1.0%	1.0%	0.8%	-0.6%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%
Global iron ore demand	Mt	1,654	1,668	1,552	1,786	1,881	1,960	2,064	2,118	1,974	1,941	1,959	1,981	2,004	2,008	2,015	2,022	2,031	2,040	2,051
Global iron ore supply	Mt	1,665	1,679	1,563	1,823	1,899	1,968	2,083	2,139	2,116	2,022	2,031	2,078	2,091	2,079	2,063	2,019	2,011	2,009	2,006
Global Balance	Mt	11.5	10.5	10.6	37.5	18.1	7.9	18.5	20.7	141.8	80.7	71.6	97.2	87.0	70.7	47.9	-3.1	-19.8	-31.7	-44.6
Total seaborne iron ore demand	Mt	783	858	907	1,017	1,078	1,110	1,174	1,313	1,296	1,334	1,371	1,390	1,410	1,407	1,401	1,393	1,386	1,379	1,372
YoY growth	%	7.9%	9.6%	5.7%	12.1%	6.0%	3.0%	5.7%	11.9%	-1.3%	2.9%	2.8%	1.4%	1.4%	-0.2%	-0.5%	-0.5%	-0.5%	-0.5%	-0.5%
China iron ore import requirements	Mt	384	444	628	619	687	745	820	933	920	959	994	1,009	1,026	1,022	1,013	1,003	993	983	974
China as % of seaborne market	%	49%	52%	69%	61%	64%	67%	70%	71%	71%	72%	72%	73%	73%	73%	72%	72%	72%	71%	71%
Total seaborne iron ore supply	Mt	783	860	935	1,019	1,084	1,112	1,178	1,319	1,356	1,380	1,405	1,458	1,471	1,464	1,445	1,401	1,390	1,384	1,378
YoY growth	%	7.6%	9.9%	8.7%	9.0%	6.4%	2.6%	5.9%	11.9%	2.8%	1.8%	1.9%	3.7%	0.9%	-0.5%	-1.3%	-3.1%	-0.8%	-0.4%	-0.4%
Seaborne Balance	Mt	0.5	2.4	27.9	2.2	6.7	1.8	4.6	5.7	59.5	45.8	34.1	68.2	61.6	56.9	44.6	8.1	3.9	5.2	6.9
price CY fines cfr	US\$/t (62%Fe)	155	185	95	146	168	128	135	97	56	46	45	48	53	54	56	58	59	60	61
price CY fines cfr	US\$/mtu	250	298	153	235	270	207	218	156	91	74	73	77	85	87	91	93	95	97	98
price CY lump cfr	US\$/t	89	137	98	167	189	137	147	108	66	51	53	58	64	67	70	71	71	72	74
lump/fine differential	US\$/t	-66.5	-47.9	2.8	21.1	21.5	8.6	12.3	10.5	9.3	5.1	7.9	11.0	12.0	12.9	13.3	12.0	12.2	12.4	12.7
YoY growth (fines)	%	77%	19%	-49%	54%	15%	-23%	5%	-28%	-42%	-19%	-2%	6%	11%	2%	5%	3%	2%	2%	2%
YoY growth (lump)	%	28%	54%	-29%	71%	13%	-27%	7%	-27%	-39%	-22%	4%	11%	10%	3%	4%	1%	2%	2%	2%
Imports																				
China	Mt	384	444	628	619	687	745	820	933	920	959	994	1,009	1,026	1,022	1,013	1,003	993	983	974
Japan	Mt	139	140	105	134	128	138	136	136	129	123	123	123	122	122	122	121	121	120	120
Europe	Mt	127	129	71	108	105	98	84	106	107	104	105	106	107	109	110	111	112	113	114
Exports																				
Rio Tinto	Mt	161	171	204	223	225	233	244	288	318	345	337	337	337	337	337	337	337	337	337
BHP Billiton	Mt	111	130	129	138	162	177	206	220	261	274	279	270	266	270	263	259	255	256	257
Fortescue	Mt	0	15	34	40	46	64	95	152	159	150	140	140	140	140	140	120	120	120	120
Vale	Mt	229	233	219	255	270	270	277	259	296	308	335	381	390	385	377	370	363	356	349
India	Mt	94	106	117	97	79	38	14	13	10	10	10	10	10	10	10	10	10	10	10

e = Morgan Stanley Research estimates.

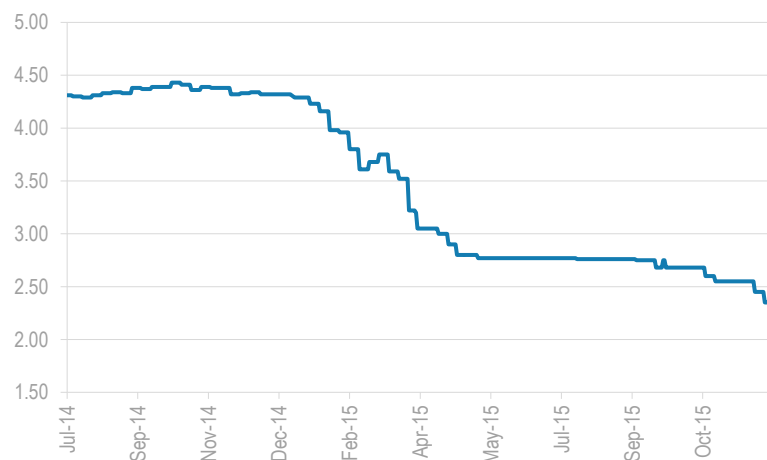
Source: Wood Mackenzie, United Nations Commission for Trade and Development, Tex Report, Steel Business Briefing, World Steel Association, Morgan Stanley Research

Manganese

Producers rebalancing

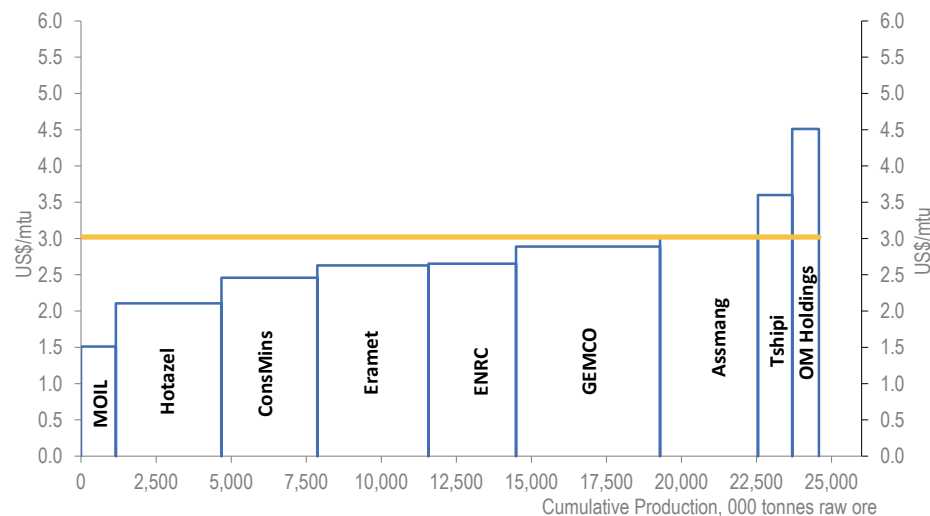
- Poor supply discipline:** A 45% decline in manganese ore prices (44% cif Tianjin) year-to-date has failed to prompt a meaningful supply-side response, with output from the Majors – Eramet, Assmang, GEMCO, Hotazel, Vale – actually up 6%yoy for Jan-Sep 2015. Miners' optimal strategy is to use debt funding and asset cross-subsidisation to reduce unit costs and boost market share. In addition to this expansion in seaborne supply, China's domestic production (27% of global output) has held up. As a result, the spot price of US\$2.35/mtu sits at the 55th centile of 2015 cost curve.
- Infrastructure access improving:** Contributing to the market's persistent surplus is improving infrastructure access, with latent capacity representing 20% of seaborne supply (6.3Mtpa). Cost of production is also declining, down by an estimated 25% in 2015, on lower oil prices, freight rates (directly linked to oil) and producer currencies.
- Price depends on China's steel output:** China's apparent consumption of seaborne manganese ore has fallen 2%ytd, tracking the fall in steel production rates. A recovery in the manganese ore price requires at least some stability in China's steel output rate. We forecast a 2-4%/yr decline in China's crude steel production in the next two years to just 777Mtpa in 2017. Similarly, *China Iron and Steel Industry Association* (CISA) forecasts a further 2%yoy decline in China's steel production rate in 2016 to 783Mt. Such views are obviously bearish for the manganese outlook too ([Metals & Mining: Insight: Manganese - Supply Exuberance, 23-Nov-15](#)).

Manganese ore (US\$/mtu)



Source: Bloomberg, Morgan Stanley Research

Manganese ore cost curve, 2015



Source: Company data, Morgan Stanley Research

Manganese

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e
World Crude Steel Production by Region													
European Union (27)	Mt	210	199	139	173	178	169	166	169	169	169	171	173
CIS/Russia	Mt	124	114	98	108	113	111	108	106	103	108	111	113
North America (USA, Mexico and Canada)	Mt	132	125	84	112	119	122	119	121	117	129	133	134
China	Mt	489	500	574	627	684	730	815	823	812	811	819	828
Japan	Mt	120	119	88	110	108	107	111	111	106	108	109	110
South Korea	Mt	52	54	49	59	69	69	66	72	73	74	74	75
India	Mt	53	58	64	69	73	78	79	82	88	95	105	113
ROW	Mt	165	162	140	161	173	169	170	173	177	183	188	194
Total World Steel Production	Mt	1,346	1,330	1,234	1,418	1,515	1,554	1,635	1,657	1,645	1,676	1,710	1,739
<i>World steel production growth</i>	%	7.9%	-1.2%	-7.3%	14.9%	6.9%	2.6%	5.2%	1.4%	-0.7%	1.9%	2.0%	1.7%
<i>China steel production growth</i>	%	16.8%	2.2%	14.7%	9.3%	9.1%	6.7%	11.6%	0.9%	-1.4%	-0.1%	1.0%	1.1%
<i>World ex-China production growth</i>	%	3.4%	-3.1%	-20.5%	19.9%	5.1%	-0.9%	-0.5%	1.8%	-0.1%	3.8%	2.9%	2.3%
Total Apparent Manganese Unit Consumption	Mt	13.5	13.8	11.9	15.1	17.2	17.4	18.3	18.5	18.3	18.6	19.0	19.3
<i>China as % of global demand</i>	%	36%	38%	46%	44%	45%	47%	50%	50%	49%	48%	48%	48%
Mn ore production (Contained Mn Units)													
Australia	Mt	2.2	2.2	1.8	2.9	3.0	3.4	3.3	3.3	3.4	3.4	3.4	3.4
Brazil	Mt	0.8	1.3	1.0	1.1	1.2	1.0	1.1	1.1	1.1	1.1	1.1	1.1
China	Mt	2.8	3.4	2.7	3.1	4.1	2.9	3.1	2.8	2.8	2.8	2.9	2.9
Gabon	Mt	1.6	1.6	1.0	1.5	1.9	1.6	2.0	1.9	2.1	2.1	2.1	2.1
India	Mt	0.7	0.8	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
South Africa	Mt	2.5	3.0	1.9	3.1	3.6	3.7	4.6	5.3	6.2	5.9	6.0	6.1
Ukraine	Mt	0.7	0.7	0.2	0.6	0.5	0.4	0.5	0.5	0.5	0.6	0.6	0.6
Kazakhstan	Mt	0.4	0.4	0.4	0.4	0.4	0.4	1.1	1.4	1.4	1.3	1.4	1.4
ROW	Mt	0.5	0.8	1.0	1.2	1.1	1.0	1.2	1.2	1.2	1.2	1.2	1.2
Global contained Mn produced	Mt	12.8	14.4	11.1	15.3	17.3	15.7	18.5	19.0	20.0	19.8	19.8	20.0
<i>% change Y-o-Y</i>	%	9%	13%	-23%	38%	13%	-9%	18%	3%	5%	-1%	0%	1%
<i>Average grade</i>	%	31%	30%	31%	31%	32%	32%	33%	33%	34%	33%	33%	33%
Global Supply/Demand Balance	Mt	-0.7	0.6	-0.8	0.2	0.1	-1.7	0.2	0.6	1.7	1.1	0.8	0.7
Price	US\$/mtu	3.5	14.1	5.4	7.7	6.0	4.6	5.4	4.5	3.1	2.9	3.0	3.1

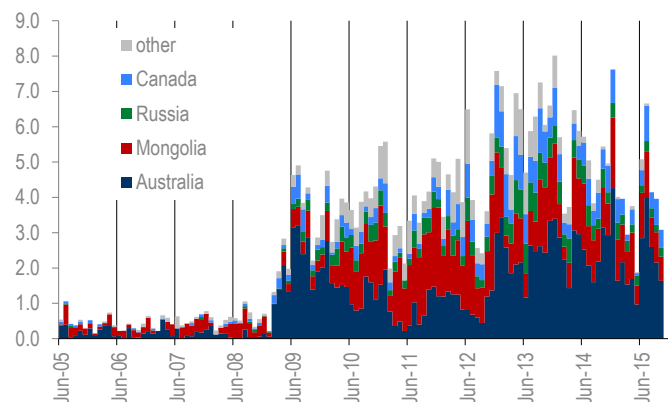
Source: Company data, e = Morgan Stanley Research estimates.

Met-Coal

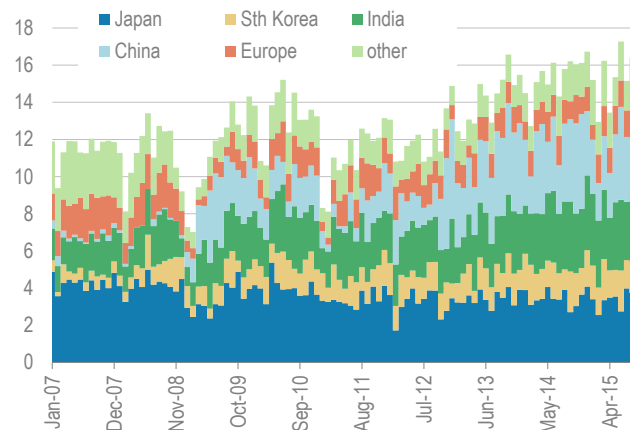
China + Japan withdrawal still dominates prices

- China's exit dents prices:** The ongoing withdrawal of China from the seaborne met-coal trade has been the primary factor undermining product prices in 2015. China's mixed met-coal imports peaked at 75Mt in 2013, down 17%yoy to 62Mt in 2014, on track for a 24%yoy decline in 2015 to 47Mt. What's going on? Steel production rate has peaked; a surplus in steel raw materials has formed; China is turning increasingly to its domestic coal resources, with less need for imports.
- Japan cuts too:** Elsewhere, Japan's long-standing steady-state +50Mtpa trade has taken a hit this year too. Mixed met-coal imports are now down 23% to an annualized 42Mtpa by Q3 – reflecting weakness in Asia's steel demand growth + rise of China's coke exports (+5%yoy to 9Mtpa, highest since 2008; equiv. to 13Mtpa met-coal).
- Price performance:** Met-coal's spot prices (HCC; LV-PCI; SSCC) have reported a 25-32% fall year to date; 8% fall quarter to date (PCI, flat). Much of 2015's price decline was reported in Jan-Apr, with all prices remaining at mid-year's lows throughout 2015H2, US\$60-90 for the 3 x met-coal types. Australia's dominance of the trade (183Mtpa in 2015; 60% of total) is underpinned by AUD weakness.
- Counting the cuts:** In 2014, production cuts were announced in North America and Australia, a response to the collapse in product prices, on weaker-than-expected trade with China – a total of 28Mtpa of capability. For 2015, we estimate an additional 14Mt. A total of 40Mtpa to date represents 11% of 2015e global trade. Of these 2014-15 cuts, 20Mtpa is North American; 10Mtpa is Australian.

China's monthly total met-coal imports (Mt/mth)



Australia's met-coal (HCC+PCI+SSCC) exports (Mt/mth)

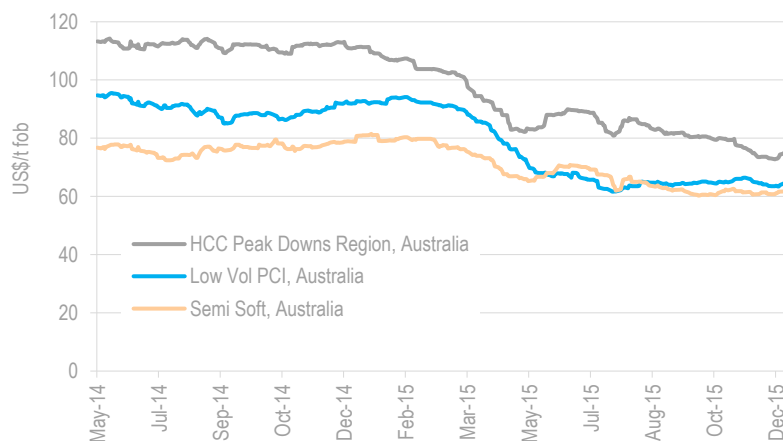


Met-Coal

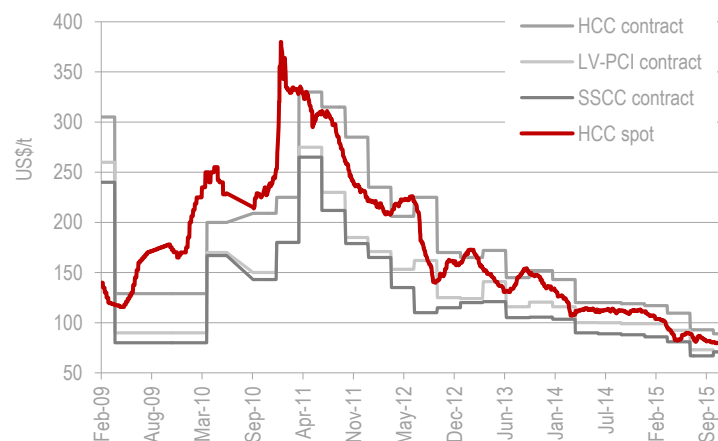
Price upside depends on BHP's supply growth strategy

- 2016Q1 HCC deal...** Negotiations are underway for 2016Q1 met-coal quarterly contracts. Key players include Anglo + Teck + JSMs. Principal guides include spot (US\$75/t fob for HCC, now rising) and the 2015Q4 deal (US\$89/t fob). The custom for the trade is a settlement at about 10% premium to prevailing spot: US\$83/t fob (MSe 2016Q1, \$85/t fob).
- ...& those for PCI & SSCC:** Key players for these are Peabody/Rio Tinto + JSMs; guided by HCC's 'benchmark' deal + spot (LV-PCI, \$65/t fob; SSCC, \$62/t fob) + 2015Q4's deals (\$71/t fob for *both* LV-PCI + semi-soft). Q4's deal was set at an 11% premium to LV-PCI's spot; 14% premium to SSCC's. Applying the same premia to spot gives LV-PCI, \$72/t fob; SSCC, \$70/t fob. PCI's upside is limited by the surplus that exists in China's market, undermining import demand.
- India-driver + supply-side consolidation:** Our US\$115/t fob real long-term HCC price (US\$89/t fob for PCI; \$77/t fob, SSCC) requires a substantial decline in higher-cost North American production, transferring greater pricing power to Australia's miners. In Australia, the biggest is BHP Billiton. Exporting at 75Mtpa, it delivers 25% of mixed met-coal products; almost 40% of HCC. Any reduction in output from its assets will be price-supportive (given size/quality of product). The trade's dominant demand driver is now India (not China), buying 50Mtpa of products from seaborne; demand has expanded at 18%/yr growth since 2010; we forecast 5%/yr to 2020.

Metallurgical coal's spot prices (US\$/t fob)



Met-coal contract price outlook vs. HCC spot (US\$/t fob)



Met-Coal

Global supply-demand outlook

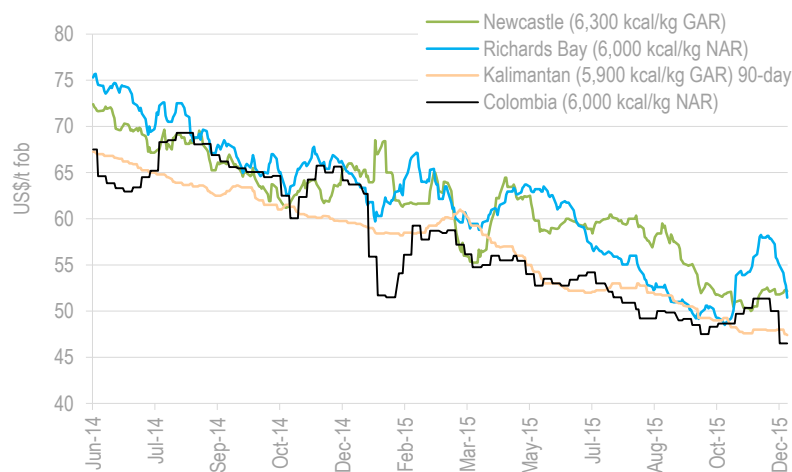
	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Global Crude Steel Production	Mt	1,348	1,343	1,239	1,433	1,538	1,560	1,650	1,670	1,629	1,651	1,682	1,710	1,733	1,745
Global Pig Iron Production	Mt	961	949	933	942	1,104	1,147	1,240	1,257	1,228	1,247	1,273	1,297	1,317	1,329
Metallurgical Coal usage in steel-making	Mt	901	889	879	899	1,037	1,070	1,154	1,160	1,138	1,155	1,170	1,191	1,212	1,224
Requirement for metallurgical coal for coke-making	Mt	805	794	784	795	925	955	1,030	1,033	1,010	1,025	1,038	1,057	1,076	1,087
Metallurgical Coal Exports															
Australia	Mt	137.7	134.5	134.5	158.5	132.3	144.4	169.2	184.3	183.4	181.8	184.6	188.3	190.1	192.0
Canada	Mt	26.7	26.6	22.1	27.0	27.6	30.7	35.3	31.1	28.4	28.4	28.4	28.4	28.4	28.4
United States	Mt	29.3	38.7	33.8	50.9	63.1	63.4	59.5	57.2	44.2	39.8	36.6	34.8	33.0	31.4
Colombia	Mt	2.3	2.1	2.0	1.8	2.1	1.6	2.8	2.8	2.8	2.8	2.9	2.9	2.9	2.9
Venezuela	Mt	2.1	2.1	2.2	1.1	2.5	2.6	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.5
China	Mt	2.5	3.5	0.6	1.1	3.6	1.3	1.1	0.8	0.9	1.0	1.1	1.2	1.3	1.5
Indonesia	Mt	5.1	5.0	4.9	4.1	3.8	2.2	3.8	5.2	5.9	5.9	6.0	6.0	6.0	6.0
Mongolia	Mt	3.1	3.6	4.0	15.0	20.0	19.1	15.4	14.8	12.0	12.2	12.4	12.7	12.9	13.2
Vietnam	Mt	1.1	1.1	1.1	1.2	1.2	0.9	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2
New Zealand	Mt	2.7	2.6	2.6	1.6	1.9	1.6	2.4	2.1	2.4	2.5	2.5	2.5	2.5	2.6
Russia	Mt	13.3	13.6	13.2	18.2	14.2	17.7	18.1	14.2	10.2	10.0	9.8	9.6	10.6	10.8
other	Mt	6.7	6.5	7.2	6.7	7.5	10.2	11.1	11.7	12.4	15.9	16.9	17.0	17.1	18.1
Total		233	240	228	287	280	296	323	329	307	305	306	308	310	312
Metallurgical Coal Imports (all coking + direct injection coals)															
Japan	Mt	61.2	61.5	50.2	60.9	56.1	53.3	56.6	54.4	42.0	45.0	50.8	51.0	50.8	50.5
China	Mt	6.2	6.9	34.5	47.3	44.7	53.6	75.4	62.4	47.4	45.0	42.8	40.6	38.6	36.7
South Korea	Mt	19.8	22.6	21.9	26.0	30.8	28.8	29.7	32.5	34.6	31.5	31.9	32.5	33.3	33.7
India	Mt	21.3	24.5	20.8	22.4	26.9	32.3	37.1	45.0	50.2	53.2	56.4	59.2	62.1	65.2
Brazil	Mt	15.3	15.7	11.3	14.3	16.1	14.8	14.0	20.7	21.3	21.7	22.2	22.6	23.1	23.5
EU-25*	Mt	74.7	75.6	55.6	69.6	65.3	68.5	66.7	70.9	69.7	70.8	71.8	72.9	74.1	75.2
other	Mt	34.3	33.4	33.8	47.2	40.2	44.3	44.3	42.3	39.4	41.4	41.9	42.3	42.7	43.2
Total		232.8	240.1	228.2	287.6	280.1	295.5	323.9	328.1	304.6	308.6	317.8	321.2	324.7	328.0
Traded Balance		0	0	0	0	0	0	-1	1	3	-4	-12	-13	-15	-16
Annual Average Prices (JFY set price, prior 2010; quarterly set price, post 2010)															
Hard Coking Coal (spot; premium)	US\$/t fob					292	191	148	115	88	78	81	97	102	110
Hard Coking Coal (contract; premium)	US\$/t fob	101	305	129	191	289	209	159	126	102	83	86	103	108	116
Low-vol PCI (contract)	US\$/t fob	64	235	80	136	218	153	125	104	84	69	72	85	86	91
Semi-soft coking coal (contract)	US\$/t fob	67	260	90	147	209	131	113	93	76	62	60	68	69	70
China's Metallurgical Coal Supply-Demand															
Domestic requirement	Mt	310	310	356	385	413	431	463	465	442	428	431	435	439	436
Imports	Mt	6	7	34	47	45	54	75	62	47	45	43	41	39	37
Implied domestic production	Mt	304	303	321	338	368	377	387	402	394	383	389	394	401	399

Thermal Coal

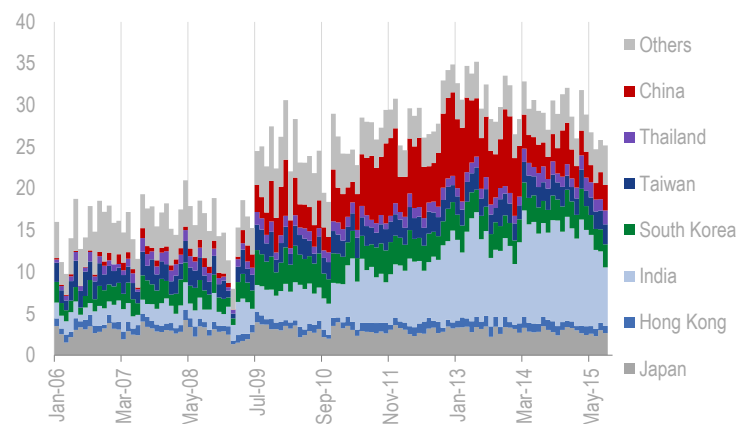
Weak floor forming, but still in downward trend

- Pre-winter restock offers some support:** Down 15-30% in 2015, extending the 15%/yr decline since 2011 – seaborne thermal coal prices have found a short-term floor late in the year, on pre-winter restocking. The biggest shift has been China's rapid withdrawal from the trade: imports are down by over 20% to just 180Mt, reflecting the decline in power consumption/industrial activity. The demand shortfall is being partly offset by 2-4%yoy lifts in the buying rate of traditional seaborne consumers: Japan, Korea and Taiwan. India's demand is proving to be stable in 2015. Indonesia is the source of coal that is taking the biggest hit on China's withdrawal: down 7%yoy to 380Mt (MSe 2015).
- Top-grade prices slide lower:** Top grade seaborne thermal coal prices (NEWC/RB) are holding at around the US\$50/t fob level in Q4. There's no trade evidence that substitution by more abundant Indonesian coals is occurring, or that Indonesia has been able to switch exports into other markets – China's spurned Indonesia coal is simply being cut from the trade. Australian and Richards Bay exports are underpinned by a weakening of producer exchange rates (AUD/ZAR), undermining US\$-prices.
- Rebalancing/restructuring continues:** As of Dec-15, we estimate that 40Mtpa of seaborne-linked mining capability has been cut (idled; reduced rate, closure) in 2015, representing about 4% of the seaborne trade. Most cuts relate directly to substantially lower prices (down 15-30%ytd for top-grade products) and deteriorating trading conditions.

Key thermal coal product prices (US\$/t fob)



Indonesia's thermal coal exports ...China's share has halved (Mt/mth)

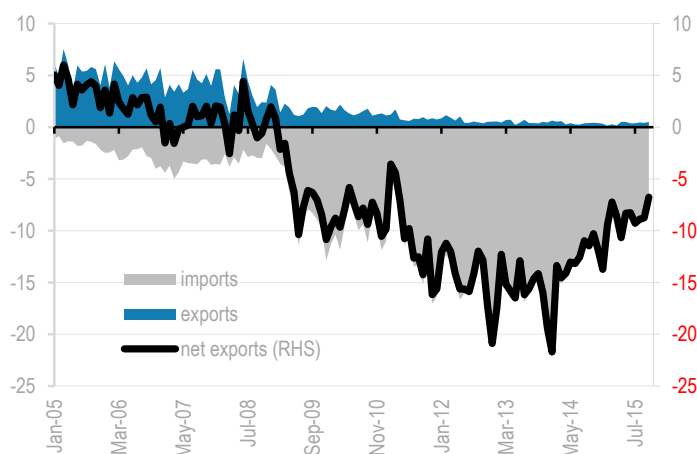


Thermal Coal

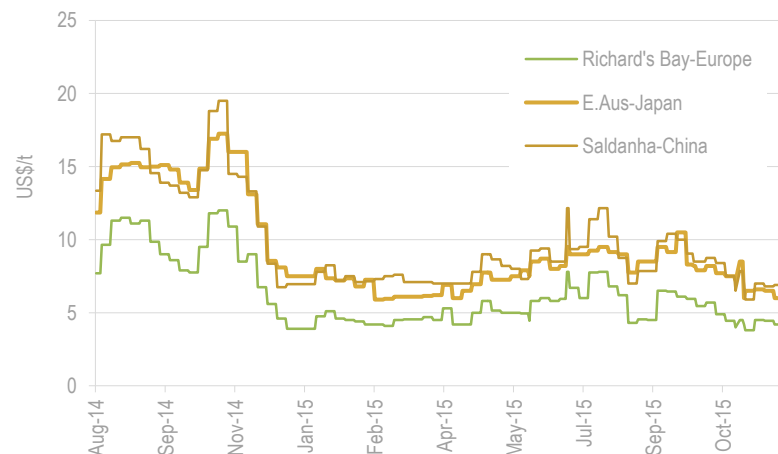
Universal impact of China's slowing growth

- Tough year for China's coal industry:** Declining industrial activity in China is the primary demand-side factor weighing on all coal prices (directly/substitution): China's coal mining industry average profits slumped 62%yoy to RMB36bn for Jan-Oct 2015; revenues down 15% to RMB2,062bn (NBS, 27-Nov). Implications? Weak demand for imports (meets <10% of total demand) simply reflects a broad deterioration in coal/power demand in China.
- China's latest coal cap target = bearish:** China's central government has highlighted a new 'clean drive' Dec-15: another plan to cap average coal consumption at existing plants; aiming for nationwide 2020 target of 310 grams/kilowatt-hour at existing plants + 300g/kWh at new plants; impact of policy on coal demand? Estimated at 100Mtpa = 2-3% of total.
- Excess coal-fired capacity:** China's National Energy Administration reported forecasts early this year that feature power demand growth of just 3.4%/yr for 2015-20, down from 2000-14's average of 7.9%. Apart from weak power demand growth, coal-fired power generation is also being undermined by a government policy to invest in alternative base load power options, including nuclear power and solar.
- Price outlook:** Our model reports a small deficit, reflecting the collapse in supply growth. This underpins our flat price outlook for all seaborne products (NEWC, LT price US\$63/t fob).

China's thermal coal trade (Mt/mth)



Coal freight rates – key routes (US\$/t)



Thermal Coal

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Supply															
Indonesia	Mt	195	200	234	298	353	384	424	408	380	365	358	350	343	336
Australia	Mt	112	126	128	141	148	171	188	201	200	200	202	204	208	212
Colombia	Mt	65	69	63	69	76	79	74	75	80	81	82	82	82	83
South Africa	Mt	64	65	66	68	66	74	73	76	75	75	76	77	78	78
United States	Mt	11	18	12	16	31	48	44	29	25	25	25	25	25	26
Canada	Mt	4	4	6	4	6	4	3	3	2	2	2	2	2	2
China	Mt	45	36	18	14	7	5	4	2	1	1	1	1	1	1
Poland	Mt	9	6	6	6	6	6	6	6	6	6	6	6	6	6
Russia	Mt	76	79	93	91	88	93	85	115	101	95	96	96	97	97
RoW	Mt	58	50	56	47	53	51	46	40	32	33	33	33	33	33
Total Supply	Mt	640	652	683	754	833	916	947	956	902	883	880	876	875	875
YoY %chg	%	4.9%	1.9%	4.7%	10.5%	10.4%	10.0%	3.4%	1.0%	-5.7%	-2.1%	-0.4%	-0.4%	-0.1%	-0.1%
Demand															
Japan	Mt	124	128	111	125	121	132	139	145	149	151	153	155	158	160
South Korea	Mt	66	74	78	88	98	97	97	98	102	103	104	105	106	107
Taiwan	Mt	54	53	49	53	55	43	46	45	47	48	49	50	51	52
China	Mt	46	37	105	141	177	235	252	229	177	142	121	103	87	74
India	Mt	29	36	60	75	92	101	112	137	137	144	151	159	166	175
Europe	Mt	189	193	163	150	168	192	185	180	170	173	176	180	183	187
North America	Mt	54	52	40	34	30	25	24	25	26	26	26	26	27	27
ROW	Mt	82	81	78	87	91	92	93	96	96	99	102	105	108	112
Total Imports	Mt	644	654	683	753	833	915	947	956	903	885	882	882	886	893
YoY %chg	%	5.2%	1.6%	4.4%	10.2%	10.7%	9.8%	3.4%	1.0%	-5.5%	-2.0%	-0.4%	0.1%	0.4%	0.8%
Atlantic Market	Mt	270	275	231	215	231	250	244	241	234	239	245	251	257	263
YoY %chg	%	-2.8%	1.6%	-15.7%	-7.2%	7.4%	8.3%	-2.4%	-1.3%	-2.9%	2.3%	2.3%	2.4%	2.4%	2.5%
Pacific Market	Mt	374	380	452	538	602	665	703	715	670	646	637	632	629	630
YoY %chg	%	11.9%	1.5%	18.9%	19.2%	12.0%	10.4%	5.6%	1.8%	-6.4%	-3.5%	-1.4%	-0.8%	-0.3%	0.1%
Trade Balance	Mt	-4.8	-2.4	-0.2	1.3	-0.5	0.5	0.0	0.0	-1.5	-2.2	-2.1	-5.8	-10.6	-18.2
Annual Asian Reference Price (US\$/t, JFY)															
Price (Newcastle spot, 6,322 kcal/kg, US\$/t fob)		\$55	\$125	\$70	\$98	\$130	\$115	\$95	\$82	\$68	\$58	\$60	\$62	\$64	\$66
		\$65	\$129	\$72	\$99	\$121	\$95	\$84	\$70	\$58	\$53	\$56	\$58	\$60	\$62
China's Thermal Coal Supply-Demand															
Domestic production (for power generation)	Mt	3,041	3,222	3,712	4,201	4,432	4,663	4,894	5,124	5,355	5,587	5,819	6,051	6,283	6,514
Imports	Mt	46	37	105	141	177	235	252	229	177	142	121	103	87	74
Total supply	Mt	2,994	3,185	3,607	4,061	4,255	4,428	4,642	4,895	5,178	5,445	5,698	5,948	6,195	6,440

Other

Uranium

Weakening demand + stable supply = rising inventory

- **Too much supply, for now:** The demand outlook for uranium oxide improved in 2015, with Japan re-firing two reactors + China again boosting capacity growth guidance. However, global supply growth rate is still adequate, demand subdued; so we have cut our short- to medium-term oxide price outlook. We now forecast US\$39/lb for spot, 2016 (+5%yoy; \$37/lb, 2015); US\$47/lb for the term price (+2%yoy; US\$46/lb, 2015).
- **Producers, utilities, traders hold sizable inventories:** Demand growth slippage has persisted since Fukushima, allowing for a prolonged build in global inventory. Beyond Japan's withdrawal from nuclear energy generation, a number of countries, including primary demand-driver China, slowed approvals for capacity growth – to review projects. Over the past two years, expanding surpluses have undermined prices and impaired the project pipeline. Also, China's expanding demand growth story is failing to report to the spot price, because they are engaging the mining projects directly.
- **2016 features mine supply growth:** Cigar Lake will continue its multi-year ramp-up, moving from 2.7ktU (7Mlbs) in 2015 to 4.6ktU (12Mlbs) in 2016; targeting 6.9ktU (18Mlbs) nameplate. China-owned Husab, Namibia, is scheduled to begin commercial production with an estimated 1.2ktU (3Mlbs) coming to market in 2016; 3.8KtU (10Mlbs) nameplate. With little other new supply on the horizon, and the dominance of mine supply vs. flows from global inventories, operational success of these projects is important for price stability.

Uranium spot price (US\$/lb)



Uranium spot market statistics

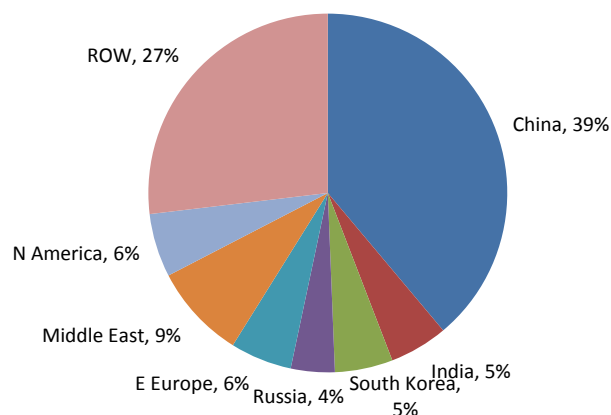
Year	Avg price US\$/lb	Volume (M lbs)	Average leadtime (mths)	No of transactions	Spot as % of total supply
2005	\$28.52	35.7	4.3	110	22%
2006	\$49.27	29.1	3.3	114	19%
2007	\$99.33	19.1	2.9	101	13%
2008	\$61.75	43.3	2.0	209	26%
2009	\$46.27	50.8	2.4	222	28%
2010	\$46.96	49.6	2.3	264	26%
2011	\$56.75	52.4	1.5	357	28%
2012	\$48.52	42.6	2.7	245	21%
2013	\$38.24	50.4	3.0	318	24%
2014	\$33.25	42.9	3.2	299	23%
2015*	\$37.05	50.1	2.8	305	27%

Uranium

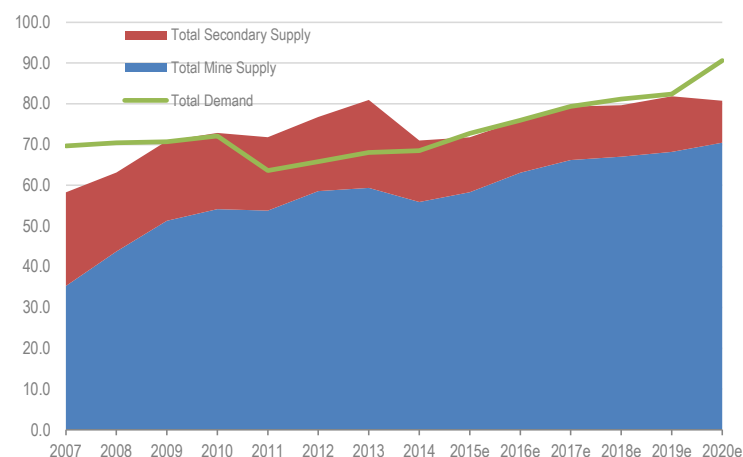
Climate concerns push nuclear back into focus

- The **Paris COP21 climate talks** prompted debate on non-fossil fuel energy generation, confirming that nuclear remains an important option for the mix. A number of emerging economies have already committed to new and/or more nuclear. South Korea is a major user that has expanded its commitment to nuclear: the government has replaced plans for four coal-fired plants with a schedule of 13 nuclear reactors, activated by 2029.
- **China moving further away from coal:** By Dec-15, there are 27 nuclear reactors in operation, delivering 2.5% total electricity generation; 24 more are under construction. The central government has signaled that the 13th five-year plan will call for 88GWe of nuclear power capacity by the end of 2020, and in the longer term, for 110 nuclear reactors by 2030 to meet the goal of 10% nuclear power in the energy mix. We think these targets should be taken very seriously given the recent smog events unsettling the nation/world
- **Japan re-fired:** The Sep-15 restart of the two Sendai reactors in Kyushu marked Japan's broader re-firing of its nuclear power capacity – dormant since the Fukushima disaster of 2011. Re-activation of the remaining capacity will be a very slow process. The government has a long-term strategy of lifting nuclear power's share of electricity supply to 20-22% by 2030. There are 41 other operable reactors totaling about 38GWe of capacity. Of those, 23 have restart applications under review with the Nuclear Regulation Authority.

Regional share of new nuclear power demand through 2020



Uranium supply-demand balance (ktU)



Uranium

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Existing mine supply	ktU	35.3	43.7	51.3	54.1	53.8	58.6	59.3	55.9	55.7	59.4	63.2	65.4	67.6	69.2
	Mlbs	92	114	133	141	140	152	154	145	145	155	164	170	176	180
New mines / Ramp-ups	ktU								0.0	3.0	3.6	3.0	1.9	1.1	1.2
New mines / Ramp-ups	Mlbs								0	8	9	8	5	3	3
Total Mine Supply	ktU	35.3	43.7	51.3	54.1	53.8	58.6	59.3	55.9	58.7	63.1	66.2	67.3	68.7	70.5
Total Mine Supply	Mlbs	91.7	113.7	133.3	140.7	139.8	152.3	154.3	145.3	152.6	164.0	172.0	175.1	178.6	183.2
YoY change	%		24.0%	17.2%	5.6%	-0.7%	8.9%	1.3%	-5.8%	5.0%	7.5%	4.9%	1.8%	2.0%	2.6%
Megatons-to-Megawatts	ktU	6.9	7.3	4.6	4.6	4.6	4.6	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Enricher Sales + DOE	ktU	1.9	2.6	2.8	3.1	4.3	4.4	5.3	4.9	5.0	4.3	4.3	4.8	5.2	2.3
FSU Supplies	ktU	11.5	6.9	9.2	8.1	6.5	6.5	8.8	7.3	5.5	5.9	6.4	5.5	6.2	5.7
Mox + reprocessed U	ktU	2.6	2.5	2.9	2.9	2.6	2.7	2.9	2.9	3.0	2.7	2.4	2.4	2.2	2.1
Total Secondary Supply	ktU	23.0	19.4	19.6	18.7	18.0	18.2	21.6	15.1	13.5	12.9	13.1	12.6	13.6	10.0
Secondary Supply	Mlbs	59.7	50.4	50.9	48.6	46.8	47.3	56.1	39.2	35.1	33.5	34.1	32.8	35.5	26.1
YoY change	%	39%	31%	28%	26%	25%	24%	27%	21%	19%	17%	17%	16%	17%	12%
Total Supply	ktU	58.3	63.1	70.9	72.8	71.8	76.8	80.9	71.0	72.2	76.0	79.3	80.0	82.4	80.5
Total Supply	Mlbs	151.5	164.1	184.2	189.4	186.6	199.6	210.4	184.5	187.7	197.5	206.1	207.9	214.1	209.3
YoY change	%	-2.6%	8.3%	12.3%	2.8%	-1.4%	6.9%	5.4%	-12.3%	1.7%	5.2%	4.4%	0.8%	3.0%	-2.2%
Global operating reactors				435	436	386	387	395	396	411	434	450	466	472	500
Global nuclear generating capacity	GWe	372	373	371	372	325	327	333	336	351	377	393	409	419	451
Reactor oxide requirements	ktU	64	65	65	67	58	60	61	62	66	70	74	76	77	85
Stockpiling	ktU	4.5	4.5	4.6	4.7	5.2	5.4	6.1	6.2	6.6	7.0	7.4	7.6	7.7	8.5
Investment demand	ktU	0.8	1.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9
Generating Capacity Breakdown															
China	GWe			9	9	11	13	17	18	25	42	45	51	54	65
YoY change	%				4%	30%	14%	31%	6%	43%	65%	8%	12%	7%	21%
Japan	GWe			46	46	0	0	0	0	2	8	13	18	18	20
Total Demand	ktU	69.7	70.4	70.7	72.1	63.6	65.8	68.0	68.5	72.7	76.1	79.6	81.5	82.7	91.0
Total Demand	Mlbs	181.1	183.0	183.8	187.4	165.5	171.0	176.9	178.1	189.1	197.8	206.9	211.8	215.0	236.5
YoY change	%	0.1%	1.1%	0.4%	2.0%	-11.7%	3.4%	3.4%	0.7%	6.2%	4.6%	4.6%	2.4%	1.5%	10.0%
Market Balance	ktU	-11.4	-7.3	0.2	0.8	8.1	11.0	12.9	2.5	-0.6	-0.1	-0.3	-1.5	-0.3	-10.5
Market Balance	Mlbs	-29.6	-18.9	0.5	2.0	21.2	28.6	33.5	6.4	-1.5	-0.3	-0.7	-3.9	-0.9	-27.2
Price (U3O8; spot)	US\$/lb	98.77	62.82	46.52	43.36	57.88	48.85	38.84	33.62	38.36	49.00	58.00	60.00	65.00	65.00
Price (U3O8; term)	US\$/lb	90.83	82.50	67.83	61.00	67.75	60.79	52.08	46.67	50.25	62.00	66.00	70.00	70.00	70.00

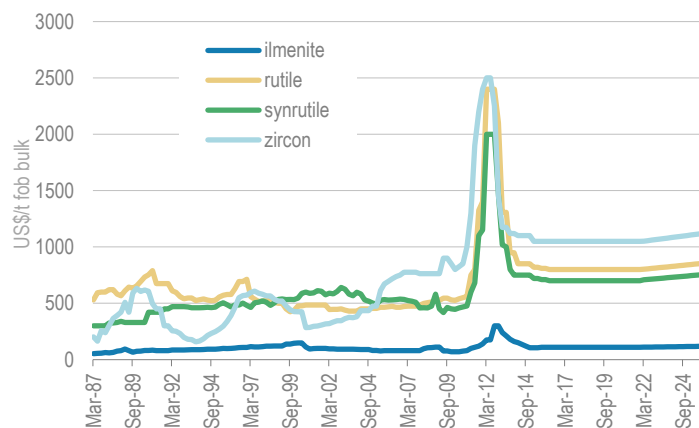
Source: UxC, World Nuclear Association, company data, Morgan Stanley Research; e = Morgan Stanley Research estimates.

Mineral Sands

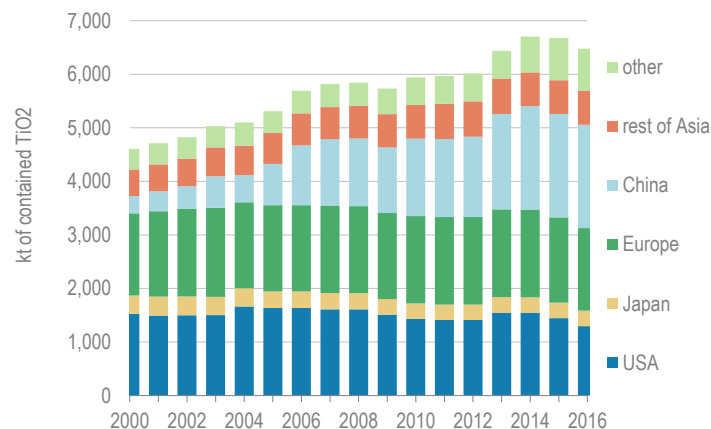
Excess production capacity, across all supply chains

- Titanium feedstock/pigment's demand shock:** Widely-held industry expectations of persistent deficits in the titanium feedstock and pigment markets for 2014-16 required a slowing in supply/capacity growth, and that demand growth for both would be stable. However, demand growth has weakened in two key economies: China and Europe. Furthermore, it has prompted pigment producers there to export surpluses, weighing further on global prices. For titanium feedstock, demand in pigment's key paint application is the primary downstream driver (property, appliances, machinery, vehicles).
- Flat price outlook needs production cuts:** We estimate a 1%yoy fall in feedstock demand in 2015, to 7.03Mt (85% to pigment), recovering 2%yoy in 2016 (based on GDP growth forecasts). We forecast a balanced contained-TiO₂ market over the long-term, underpinning our flat price forecasts for all products – rutile-synrutile-ilmenite. The view depends on high cost production being cut from the industry, a response to a 25% decline in product prices since 2013.
- Similar grief in zircon:** Subdued activity in residential and commercial property markets of Europe and China have also hit demand growth for zircon. The market is still absorbing inventories built during a period of weak demand 2012-14, and the stimulation of by-product supply when Iluka briefly supported the price by withholding supply (strategy failed; price has fallen 15% in 2 years). Our flat price outlook of US\$1,050/ t (fob Aust.) requires low growth from Iluka.

Mineral sands prices, historical & forecast, quarterlies



Source: TZMI, Morgan Stanley Research

Global TiO₂ pigment capacity, by country/region

Source: TZMI, Morgan Stanley Research

Mineral Sands

Global supply-demand outlook

	unit	2007	2008	2009	2010	2011	2012	2013	2014	2015e	2016e	2017e	2018e	2019e	2020e
Titanium FEEDSTOCK Supply & Demand															
Total Ti - feedstock Demand	kt TiO ₂	5,962	6,224	5,808	6,708	6,770	6,886	6,889	7,095	7,031	7,147	7,261	7,378	7,517	7,660
YoY change	%	4%	4%	-7%	15%	1%	2%	0%	3%	-1%	2%	2%	2%	2%	2%
Total Ti - feedstock Supply	kt TiO ₂	5,986	6,179	5,815	6,713	6,747	7,000	6,758	7,328	7,201	7,164	7,265	7,382	7,532	7,708
YoY change	%	4%	3%	-6%	15%	1%	4%	-3%	8%	-2%	-1%	1%	2%	2%	2%
Balance	kt TiO ₂	24.6	-44.7	7.3	5.3	-23.6	113.2	-131.6	233.0	170.1	17.3	3.5	4.4	15.1	48.0
Implied titanium inventory	kt	155	110	118	123	99	212	81	314	484	501	505	509	524	572

Titanium PIGMENT Supply & Demand

World demand for TiO ₂	kt TiO ₂	5135	4876	4688	5311	5517	4800	5280	5470	5667	5871	6082	6301	6528	6763
YoY change	%	8%	-5%	-4%	13%	4%	-13%	10%	4%	4%	4%	4%	4%	4%	4%
TiO ₂ pigment production	kt	5148	4974	4370	5332	5132	4269	5021	5364	5677	5507	5507	5566	5634	5634
YoY change	%	5%	-3%	-12%	22%	-4%	-17%	18%	7%	6%	-3%	0%	1%	1%	0%
TiO ₂ pigment production capacity	kt	5,816	5,843	5,733	5,943	5,968	6,013	6,438	6,705	6,678	6,478	6,478	6,548	6,628	6,628
Pigment production capacity utilisation rate	%	89%	85%	76%	90%	86%	71%	78%	80%	85%	85%	85%	85%	85%	85%
Balance	kt TiO ₂	13	98	-318	21	-385	-531	-258	-106	10	-364	-576	-735	-894	-1,129
% of demand	%	0%	2%	-7%	0%	-7%	-11%	-5%	-2%	0%	-6%	-9%	-12%	-14%	-17%

ZIRCON Supply & Demand

Total Demand	kt ZrSiO ₄	1243	1161	987	1317	1367	942	1110	1199	1219	1239	1259	1280	1301	1323
YoY change	%	3%	-7%	-15%	33%	4%	-31%	18%	8%	2%	2%	2%	2%	2%	2%
Total Supply	kt ZrSiO ₄	1243	1162	993	1285	1400	1145	778	1179	1277	1412	1439	1479	1408	1442
YoY change	%	3%	-7%	-15%	29%	9%	-18%	-32%	52%	8%	11%	2%	3%	-5%	2%
Balance	kt ZrSiO ₄	0.0	1.0	6.3	-31.7	33.2	202.6	-332.5	-19.8	58.4	173.7	180.3	199.5	107.3	119.6

PRICES

Ilmenite	US\$/t bulk	80	105	84	74	118	238	198	128	108	110	110	110	110	110
Rutile	US\$/t bulk	477	510	536	544	1,069	2,325	1,128	850	815	800	800	800	800	800
Synrutile	US\$/t bulk	502	494	445	462	883	1,866	892	750	715	700	700	700	700	700
Zircon	US\$/t bulk	772	763	853	869	1,950	2,175	1,146	1,100	1,050	1,050	1,050	1,050	1,050	1,050

Recent Relevant Research

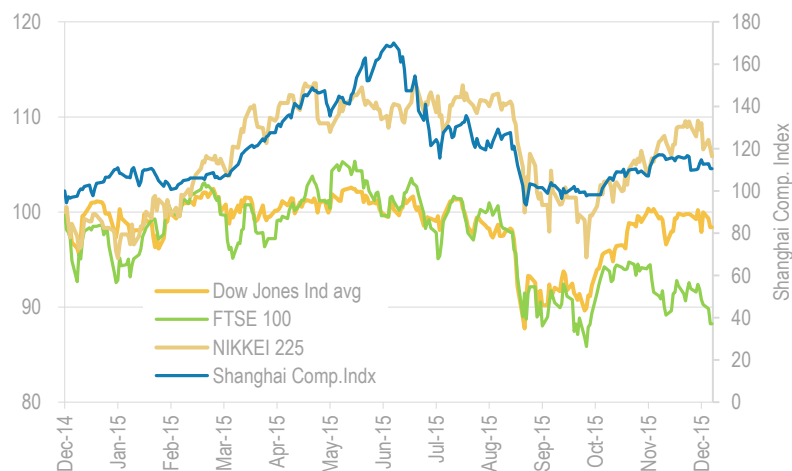
Date	Research	Summary
2-Dec-15	<u>Commodity Matters: Why China's solidarity won't work</u>	China's metals processors have responded to collapsing prices by announcing joint production cuts. We discuss why we believe this strategy only offers fleeting price support.
29-Nov-15	<u>commodity fruitCAKE – Iron ore price's new low</u>	Brief note on iron ore prices + premia, steel consumption, nickel production...and asteroids.
26-Nov-15	<u>commodity fruitCAKE – Mixed items from Metals World</u>	Update on developments in base metals as prices track lower.
23-Nov-15	<u>Metals & Mining Insight: Manganese – Supply Exuberance</u>	Excess industry supply and infrastructure capacity make manganese fundamentals more challenging than for other metals.
19-Nov-15	<u>commodity fruitCAKE – Price performance, revisited</u>	Examining the drivers behind 2015's price performance and the impact of production cuts on the cost curve.
17-Nov-15	<u>China field trip – more stimulus needed for cyclical boost in metal demand</u>	Our field trip to China found stabilising demand growth, but concluded that further stimulus is needed to boost commodities demand.
09-Nov-15	<u>commodity fruitCAKE – Samarco quantified</u>	Assessing the impact of the tragic Samarco tailings dam rupture in Brazil.
05-Nov-15	<u>Metals & Mining Tracker: Lump's failure to fire</u>	We explain the unusual seasonality that has emerged in iron ore's lump premium, and why it's not working now.
6-Oct-15	<u>Commodity Matters: Production cuts, stacking up</u>	Adding up the supply cuts that have taken place across the industry in 2015.

Commodity price vs. index performance – a history

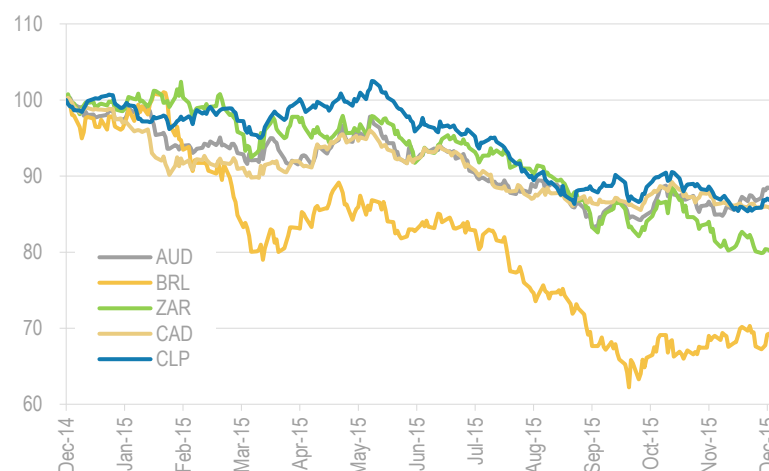
Resource sector indices (12-mth rolling)



General market indices (12-mth rolling)

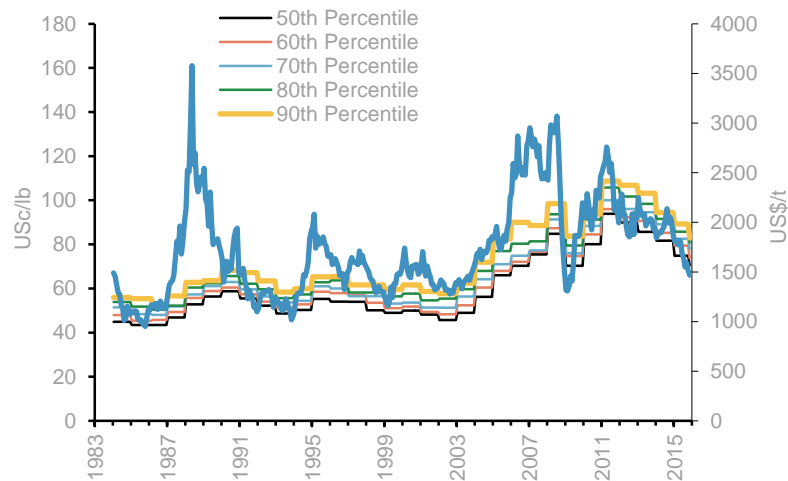


Selection of producer currencies (12-mth rolling)

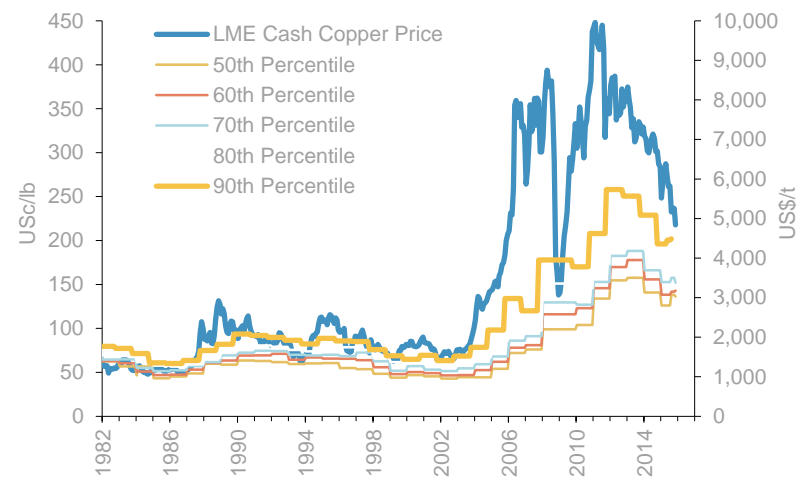


Price vs. marginal costs of production

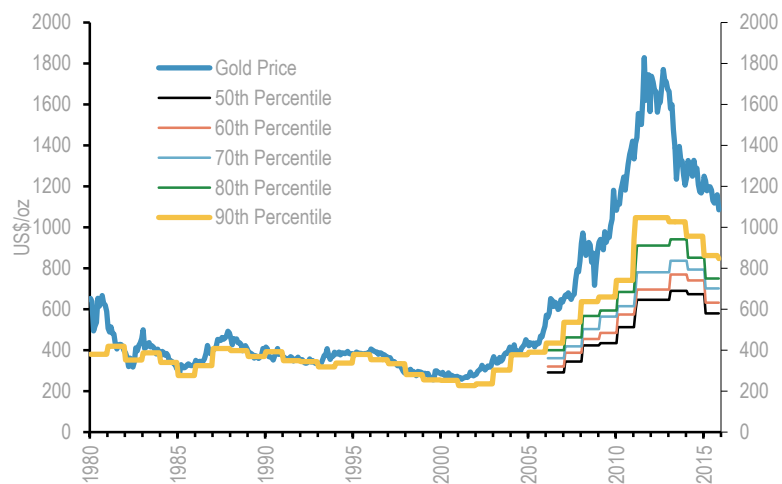
Aluminium



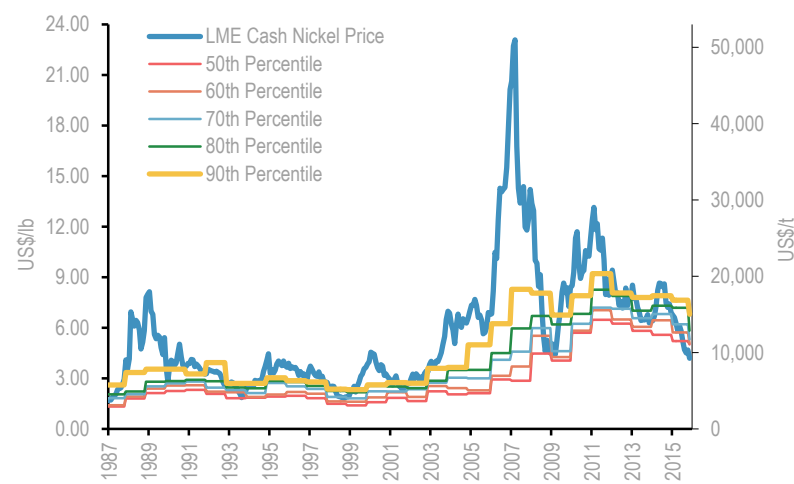
Copper



Gold

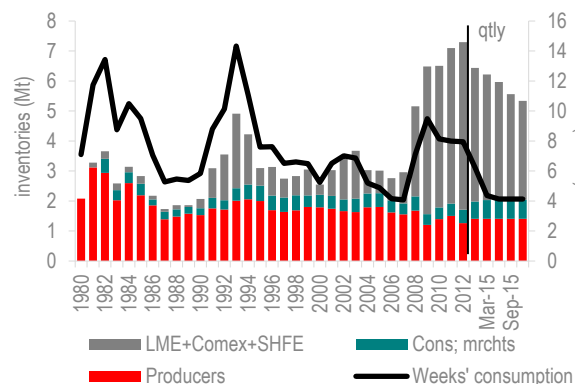


Nickel

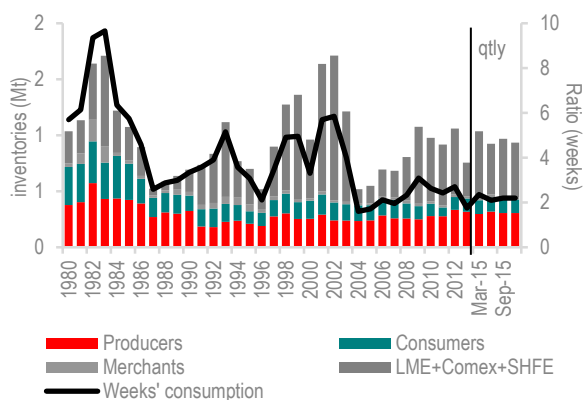


Inventories vs. weeks' consumption ratios – LME base metals

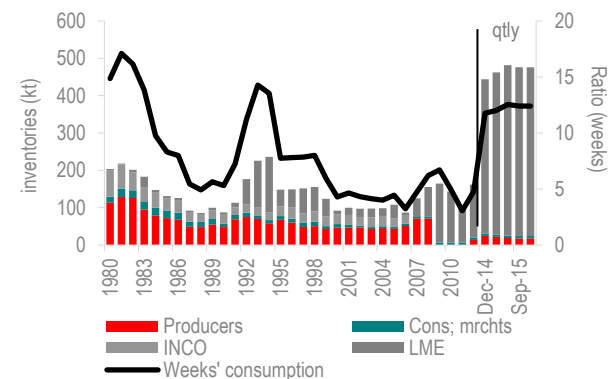
Aluminium



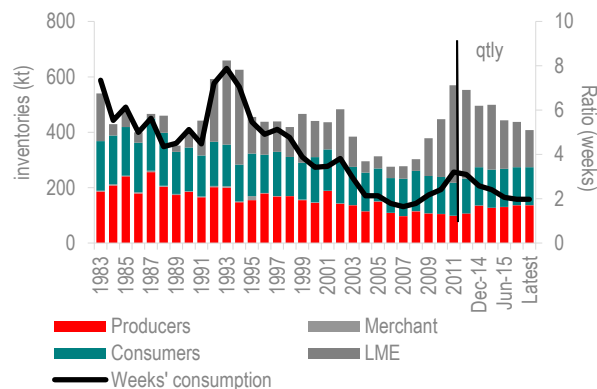
Copper



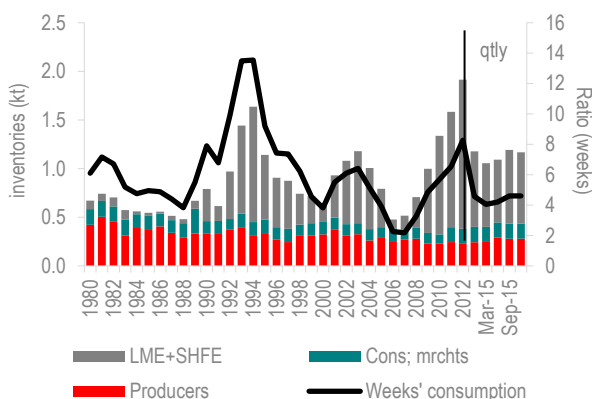
Nickel



Lead

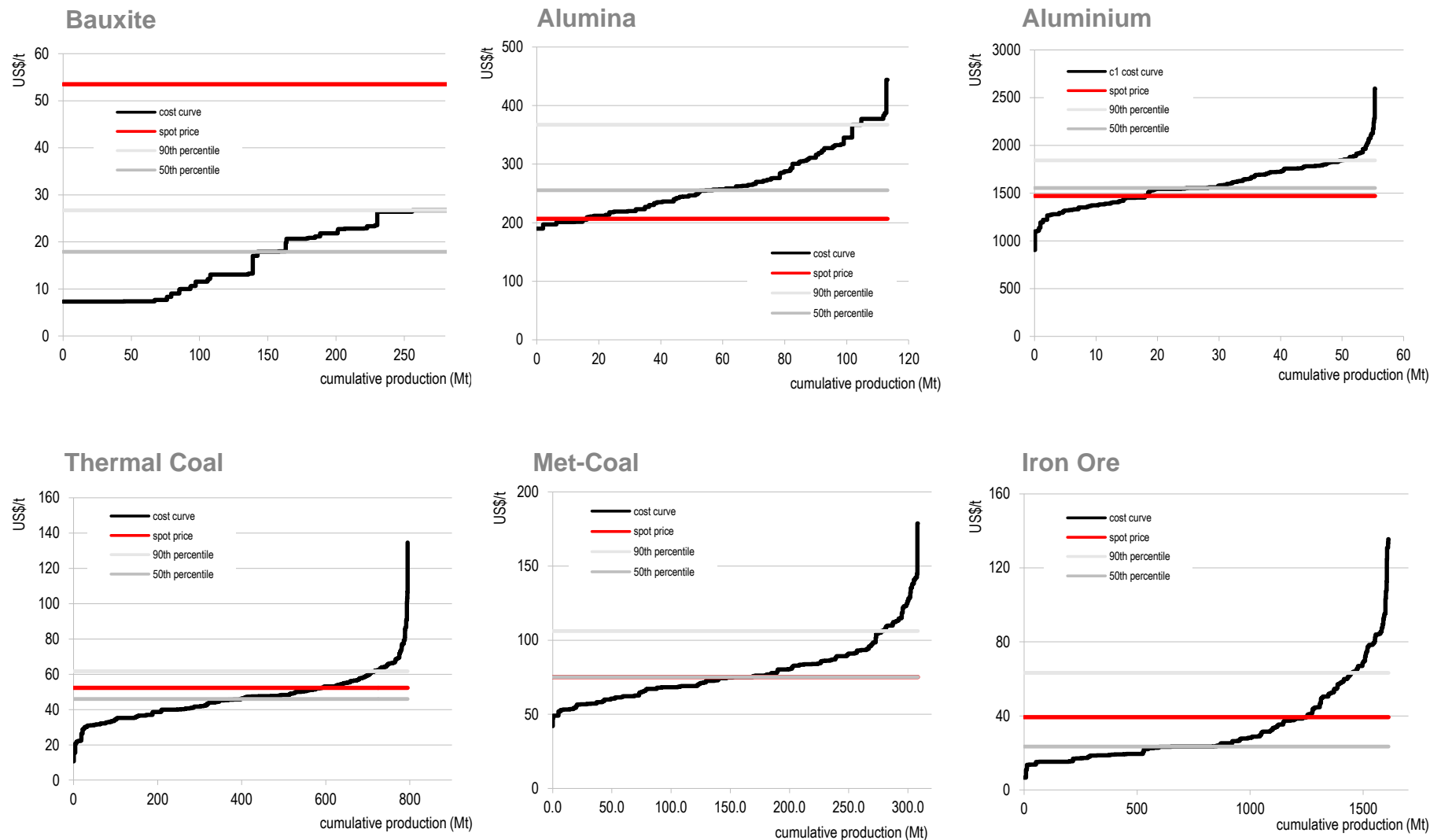


Zinc

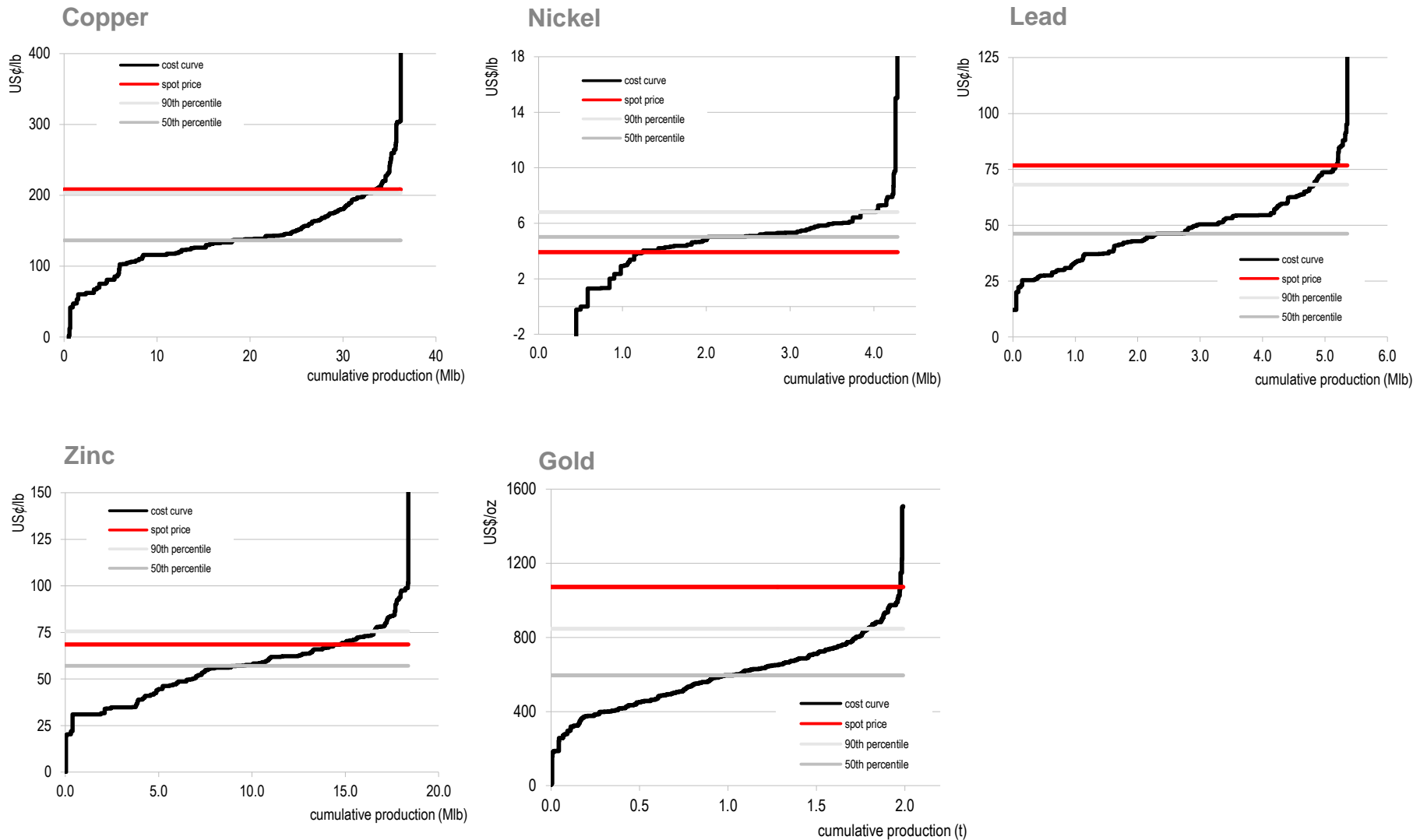



Source: World Bureau of Metals Statistics, International Copper Study Group, International Lead Zinc Study Group, International Nickel Study Group, Bloomberg, Morgan Stanley Research

Commodity cost curves



Commodity cost curves



	<p>Morgan Stanley ModelWare is a proprietary analytic framework that helps clients uncover value, adjusting for distortions and ambiguities created by local accounting regulations. For example, ModelWare EPS adjusts for one-time events, capitalizes operating leases (where their use is significant), and converts inventory from LIFO costing to a FIFO basis. ModelWare also emphasizes the separation of operating performance of a company from its financing for a more complete view of how a company generates earnings.</p>
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Distribution

(as of August 31, 2015)

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Stock Rating Category	Coverage Universe		Investment Banking Clients (IBC)		
	Count	% of Total	Count	% of Total IBC	% of Rating Category
Overweight/Buy	1206	36%	356	44%	30%
Equal-weight/Hold	1446	43%	352	44%	24%
Not-Rated/Hold	94	3%	11	1%	12%
Underweight/Sell	601	18%	83	10%	14%
Total	3,347		802		

Data include common stock and ADRs currently assigned ratings. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months.

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

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