Commodities Comment

The 2017 battery metal story might well be cobalt

Feature article

- If last year was lithium’s time, for 2017 its battery peer cobalt may be the one receiving more attention. Prices have accelerated to levels last seen in 2011, and with demand from the core portable electronics sector recovering and supply growth relatively stagnant, this can be fundamentally justified. China has next to no domestic mine supply, and is highly reliant on the Democratic Republic of Congo (DRC) for its cobalt units. Moreover, the prioritisation of higher quality battery development by the Chinese government may even open up the coveted new energy vehicle market to greater cobalt penetration.

- Risks remain – technological on the demand side and geopolitical on the supply side – but for now the perennial underperformer in metals markets looks well placed to shine.

Latest news

- LME tin 3-month continued its slide today, falling 1.5% to <$19,000/t as the forward curve softened at the front. Cash-3s are now out to ~$46/t contango – an extraordinary move given the spread was in a backwardation of $2/t just over two months ago. Stocks have barely changed since the latest price downside, however, remaining flat at ~$5.8kt since 27 January.

- A recent article written by Chinese Premier Li confirmed that China has closed more than 65mtpa of outdated steel-making capacity and 290mtpa of coal-mining capacity in 2016, both higher than the original target of 45mtpa steel-making and 250mtpa coal-mining capacity cut set for 2016. 700,000 workers from the above industries were relocated in the same year. Over the next 3-5 years the Premier said China would continue cutting to make total cuts of 140mtpa of steel-making capacity and 800mtpa coal-mining capacity. We see the target of the steel capacity cut at the higher end of the originally planned range of 100~150mtpa for 2016~2020, and the target of coal-mining capacity cut is in line with the latest 13th five year plan for coal industry (note). Official target for 2017 capacity cuts have not yet been released, but consensus expects the number to be higher than the original 2016 target for steel and coal, and it is possible that more industries may be included into “supply side reform”. Signals from the government suggest that for “over-supplied” industries in China the first three years of 2016~2020 will focus on outdated capacity cut, and the last two years will focus on industry consolidation.

- The European steel industry is “on the cusp of consolidation” according to a new report from our European mining equity analyst, Patrick Morton. He believes Thyssenkrupp is the most likely beneficiary, with press reports citing potential JVs with counterparties including Salzgitter, Tata Steel Europe and Tata Steel UK. A combined entity with any of these European names would solidify the company as the #2 European steel producer, giving it output of >20Mtpa.

- The Chinese central bank purchased no gold in January, according to reserves data released on Tuesday. This was the third consecutive month it has not bought any, a worrying trend.
The 2017 battery metal story might well be cobalt

- If last year was lithium’s time, for 2017 its battery peer cobalt may be the one receiving more attention. Prices have accelerated to levels last seen in 2011, and with demand from the core portable electronics sector recovering and supply growth relatively stagnant, this can be fundamentally justified. China has next to no domestic mine supply, and is highly reliant on the Democratic Republic of Congo (DRC) for its cobalt units. Moreover, the prioritisation of higher quality battery development by the Chinese government may even open up the coveted new energy vehicle market to greater cobalt penetration. Risks remain – technological on the demand side and geopolitical on the supply side – but for now the perennial underperformer in metals markets looks well placed to shine.

- There has been a long wait for cobalt prices to start moving upwards in a conspicuous fashion. From a peak at ~$50/lb in 2007, to ~$25/lb coming out the GFC, prices steadily ground lower through 2010 (even as peers were rising), 2011 and 2012 before finding some stability. After dropping to ~$10/lb in late 2015, from July 2016 onwards we have seen recovery, and one accelerating into 2016. Latest spot metal prices are above $17/lb, a level we only expected over the medium term.

- This move has been matched and even slightly exceeded by moves in cobalt chemical prices, the raw material crucial for the global rechargeable battery industry. Cobalt tetroxide prices in China have roughly doubled in RMB terms since mid-2016, suggesting battery demand has been improving over this period.

- Much of this improvement has to do with the wider industrial recovery. Cobalt has always tended to benefit from the maturing period of such recoveries, where the industrial consumer is feeling more confident. And, as we noted recently, into year-end 2016 the pace of IP growth is clearly accelerating, reaching 2.8% YoY in November, its fastest since December 2014. The main improvement has been in the developed markets, which are seeing synchronised growth for the first time in years. PMI data, which we think gives a heads up to the output data over the next few months, suggests that recovery continued into January.

- Cobalt is distinct among peer metals through roughly half of current consumption being in battery manufacture. While lithium is often thought of as the battery metal, this sector currently only accounts for around a third of total demand, and may only reach cobalt’s current levels on a 5-10 year view. The past decade has seen almost 10% CAGR growth for cobalt in this area, however the pace of growth both in absolute and percentage terms has been weakening in recent years, even with lower cobalt pricing.
As the global industrial recovery matures…

…we see an acceleration in battery demand

Fig 3  As the global industrial recovery matures…

Fig 4  …we see an acceleration in battery demand

Source: National Statistics, Macquarie Research, February 2017

Source: CDI, CRU, Macquarie Research, February 2017

- Much of this growth slowdown is related to the portable electronics sector. Lithium-cobalt (LCO) batteries are the staple of consumer electronics, and have suffered as core areas have declined – both laptop and tablet shipments dropped over 10% YoY in 2016. However, smartphones (whose batteries are smaller but sales significantly higher) did pick-up strongly in H2 2016 after a stagnant Q1. Indeed, Q4 shipments were up 7.3% YoY according to industry statistics. This is highly beneficial for cobalt, while LCO batteries also continue to gain penetration in other areas, notably power tools. Thus for 2017 we see an acceleration in cobalt demand for batteries to 10% YoY.

Fig 5  LCO batteries are most important for cobalt demand, and dominate portable electronics…

Fig 6  …where smartphone shipment growth is accelerating once more, after a poor H1 2016

Source: Avicenne, Macquarie Research, February 2017

Source: IDC, Macquarie Research, February 2017

- This improving demand perspective is clearly pressuring Chinese battery manufacturers to seek more cobalt. After strong imports in 2015, 2016 was a year where cobalt ore and intermediate stocks were run down – the raw material overhang which depressed prices in early 2016 is gone.

- Of the ~54kt of recoverable cobalt units imported into China last year, 48kt came from the DRC, making this China’s most concentrated supply risk in an individual commodity. This is helped by the distinct lack of Chinese domestic resource, which supplies less than 3% of Chinese cobalt units. We reiterate our view that the ongoing Chinese purchases of DRC assets (most notably Tenke Fungurume) are with one eye on securing supply of cobalt.
Just as with many other markets, cobalt has limited new supply projects coming through. Meanwhile, refined output in key supply countries such as Australia, Russia and Zambia are well down on levels seen a decade ago. As a result, the global cobalt market is becoming ever more dependent on supply from the DRC, a country where geopolitical risk is once again rising after a period of relative stability, with a transfer of presidential power due next year, a process which has not gone smoothly over history. Moreover, it is also a country under increasing pressure domestically to add more value to mined products in the country, and under increasing pressure internationally to clamp down on artisanal mining – with cobalt extraction the poster child for this.

Much of DRC cobalt supply comes as a co-product with copper, hence the copper price (and therefore copper projects) are crucial. Given the steady downtrend in copper pricing until October last year, investment in the DRC has been limited while certain existing assets (most notably Glencore’s operations) have seen a supply decline. Indeed, DRC copper output has been stagnant for the past three years, with 2017 expected to continue this trend. We do however expect some growth in 2018-19. We see cobalt supply growing 2.9% this year, the lowest rate since 2012, with the swing up and down from this number highly dependent on the performance of small-scale DRC supply. The fundamental outlook does look to be improving for 2017, and on our modelling we see a sustained deficit and stock draw through the end of the decade.

So where are the risks to this view? First, let’s consider the upside risk. Currently we are assuming little cobalt penetration into the rapidly growing electric vehicle and new energy vehicle market. China, most notably BYD, has been progressing down the LFP (zero cobalt content) battery route for the bus sector while LCO batteries are not deemed practical for the larger scale needed for NEVs. However, here technology could be shifting in cobalt’s favour.

On December 30th 2016, China announced a revised E-bus subsidy policy – please see this note by our China autos analyst Allen Yuan for further details. While overall subsidies were lowered, the policy introduced more technology metrics, such as energy density and battery weight/total vehicle weight ratio. It also lifted the minimum travel range to 200km, and lowered the maximum E-kg requirement to 0.24Wh/km.kg. Essentially, this is prioritising the higher battery quality technologies, which should see a decline in use of LFP batteries and potential replacement with NMC (19% cobalt by weight in cathode) and NMA (9% cobalt), which means our demand forecast risk is skewed to the upside. While our team expects a 24% YoY decline in China E-bus sales over 2017 given the subsidy removal, this is still seen as a sector targeted for growth by the government to alleviate environmental concerns. We forecast a 8.2% CAGR over the coming years.
However, a rising cobalt price may also slow the relatively rapid decline we have seen in battery manufacturing costs over recent years. For LCO batteries, cobalt is significantly more important than lithium in terms of pricing, and with both now well up YoY there is a risk that companies look at alternative technologies to the detriment of cobalt. Moreover, while the DRC-China link clearly brings supply side risk, it also creates potential problems on the demand side. Material buyers rarely feel comfortable being beholden to such concentrated supply, and when coupled with concerns over the social and environmental impact of DRC mining, there is certainly potential that cobalt is thriftyed or engineered out of battery technology over the longer term horizon.

Lastly, the battery demand story has attracted a new source of cobalt demand in recent times – investors. With strong expectations of growth in rechargeable batteries and energy storage, and cobalt having lagged lithium pricing significantly, it is viewed as the catch-up trade. And with limited equity exposure options, this has often resulted in taking physical metal positions. This of course can accentuate upside moves, but can also pose risk of a correction should cycles turn.
## Fig 11 Cobalt supply-demand balance

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Source: CDI, CRU, Macquarie Research, February 2017
## Tuesday 07 February 2017

### Prices

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* LME 2nd ring price - 1700 hrs London time. Year-to-date averages calculated from official fixes.

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<td>253,725</td>
<td>-275</td>
<td>-0.1%</td>
<td>108,525</td>
<td>311,825</td>
<td>-58,375</td>
</tr>
<tr>
<td>Comex Copper</td>
<td>95,879</td>
<td>95,065</td>
<td>814</td>
<td>0.9%</td>
<td>-</td>
<td>80,112</td>
<td>15,767</td>
</tr>
<tr>
<td>Shanghai Copper</td>
<td>223,853</td>
<td>223,853</td>
<td>0</td>
<td>0.0%</td>
<td>-</td>
<td>146,598</td>
<td>77,255</td>
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<tr>
<td>Total Copper</td>
<td>573,182</td>
<td>572,643</td>
<td>539</td>
<td>0.1%</td>
<td>108,525</td>
<td>538,535</td>
<td>34,647</td>
</tr>
<tr>
<td>LME Zinc</td>
<td>386,675</td>
<td>389,475</td>
<td>-2,800</td>
<td>-0.7%</td>
<td>113,600</td>
<td>427,850</td>
<td>-41,175</td>
</tr>
<tr>
<td>Shanghai Zinc</td>
<td>162,063</td>
<td>162,063</td>
<td>0</td>
<td>0.0%</td>
<td>-</td>
<td>152,824</td>
<td>9,239</td>
</tr>
<tr>
<td>Total Zinc</td>
<td>548,738</td>
<td>551,538</td>
<td>-2,800</td>
<td>-0.5%</td>
<td>113,600</td>
<td>580,674</td>
<td>-31,936</td>
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<tr>
<td>LME Lead</td>
<td>189,325</td>
<td>189,325</td>
<td>0</td>
<td>0.0%</td>
<td>66,975</td>
<td>194,900</td>
<td>-5,575</td>
</tr>
<tr>
<td>Shanghai Lead</td>
<td>46,918</td>
<td>46,918</td>
<td>0</td>
<td>0.0%</td>
<td>-</td>
<td>28,726</td>
<td>18,192</td>
</tr>
<tr>
<td>Total Lead</td>
<td>236,243</td>
<td>236,243</td>
<td>0</td>
<td>0.0%</td>
<td>66,975</td>
<td>223,626</td>
<td>12,617</td>
</tr>
</tbody>
</table>

Source: CME, LBMA, LME, Reuters, SHFE, Macquarie Research
Macquarie Research

Important disclosures:

Macquarie Research

Volatility index definition*
This is calculated from the volatility of historical price movements.

Very high–highest risk – Stock should be expected to move up or down 60–100% in a year – investors should be aware this stock is highly speculative.

High – stock should be expected to move up or down at least 25–30% in a year.

Medium – stock should be expected to move up or down at least 15–25% in a year.

Low – stock should be expected to move up or down at least 5–10% in a year.

Recommendations – 12 months
Note: Quant recommendations may differ from Fundamental Analyst recommendations.

Financial definitions
All “Adjusted” data items have had the following adjustments made:
- Adjust back: goodwill amortisation, provision for catastrophe reserves, IFRS derivatives & hedging. IFRS impairments & IFRS interest expense
- Excluded: non recurring items, asset revals, property revals, appraisal value uplift, preference dividends & minority interests

EPS – adjusted net profit / diluted earnings
ROA – adjusted ebit / average total assets
ROA Banks/Insurance = adjusted net profit /average total assets
ROE = adjusted net profit / average shareholders funds

Gross cashflow = adjusted net profit + depreciation
*equivalent fully paid ordinary weighted average number of shares

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Recommendation definitions
Macquarie - Australia/New Zealand
Outperform – return >3% in excess of benchmark return
Neutral – return within 3% of benchmark return
Underperform – return <3% below benchmark return

Benchmark return is determined by long term nominal GDP growth plus 12 month forward market dividend yield

Macquarie – Asia/Europe
Outperform – expected return >+10% Neutral – expected return from -10% to +10% Underperform – expected return <–10%

Macquarie – South Africa
Outperform – expected return >+10% Neutral – expected return from -10% to +10% Underperform – expected return <–10%

Macquarie - Canada
Outperform – return >5% in excess of benchmark return Neutral – return within 5% of benchmark return Underperform – return <5% below benchmark return

Macquarie - USA
Outperform (Buy) – return >5% in excess of Russell 3000 index return Neutral (Hold) – return within 5% of Russell 3000 index return Underperform (Sell) – return <5% below Russell 3000 index return

Recommendation proportions – For quarter ending 31 December 2016

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>AU/NZ</th>
<th>Asia</th>
<th>RSA</th>
<th>USA</th>
<th>CA</th>
<th>EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outperform</td>
<td>57.53%</td>
<td>50.72%</td>
<td>45.57%</td>
<td>42.28%</td>
<td>60.58%</td>
<td>52.79%</td>
</tr>
<tr>
<td>Neutral</td>
<td>33.90%</td>
<td>33.97%</td>
<td>43.04%</td>
<td>50.11%</td>
<td>37.23%</td>
<td>35.62%</td>
</tr>
<tr>
<td>Underperform</td>
<td>8.56%</td>
<td>15.30%</td>
<td>11.39%</td>
<td>7.61%</td>
<td>2.19%</td>
<td>11.59%</td>
</tr>
</tbody>
</table>

(For global coverage by Macquarie, 8.71% of stocks followed are investment banking clients)
(For global coverage by Macquarie, 8.05% of stocks followed are investment banking clients)
(For global coverage by Macquarie, 4.63% of stocks followed are investment banking clients)
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