FIRST AVENUE
INVESTMENT MANAGEMENT

THE INVESTMENT VALUE OF
RESOURCE EQUITIES
Commodity equities are difficult to invest in due to the cyclicality of commodity prices, a significant value driver. Over the years, macroeconomic factors impacting security of supply and consistency of demand caused cyclicality in commodity prices - the larger the shock to supply or demand, the wilder the swing in price. As a result of this, commodity producers used the futures market to secure selling prices relative to their cost while industrial fabricators took the other side of the trade to secure critical raw materials. In the first half of the last decade, yet another factor is increasingly impacting commodity prices; monetary policy. Financial investors reached for capital appreciation through the futures market. Exacerbating the direction and amplitude of commodity prices, financial investors have left us wondering what the correct commodity prices really are, where price discovery on the futures market between producers and fabricators stops, and that by financial investors starts. Our bedrock thesis is that production costs drive commodity prices in the long run. In the short run, the gap between marginal costs and spot commodity prices is heavily influenced by financial investors speculating on monetary policy, though we will never know the extent.
Investment decisions on the commodity complex listed on the Johannesburg Stock Exchange (JSE) have significant implications on portfolio performance. Resource equities (shares) have contributed immensely to the returns generated by the All Share Index (ALSI) of the JSE. However, unbearably high volatility has accompanied these returns, making it critical to be on the right side of the sector relative to the ALSI.

**Fig 1: Resource Index versus All Share Index**

Commodity prices contribute 79% to fundamental value created by commodity producers, compared to volume (12%). This is for good reason. Commodity production is a tussle at two levels, namely, nature and geology. Put simply, mining or the act of extracting ore from the ground requires man to triumph over geology. The extraction of ore from various rock formations as they occur at different depths is not as consistent as the manufacture of widgets in a production line. Not only are volumes produced erratic, but fatalities often result. Mining techniques used (mechanized versus manual) are informed not only by the geology of the earth but also by the tussle between the costs of machinery versus the cost of labor.

The second level of conquer is one of technology – smelting and refining. This is the next stage after extraction. Most metals result from purifying the extracted ore through heat, chemicals and electricity. While this step is generic for all precious and base metals, the reliability of technology at this stage is far from a given. In South Africa, mining of precious metals is most accompanied by mining problems that lead to fatalities, refining and smelting technology failures, and environmental disasters such as un-rehabilitated mines. Because all miners face these challenges to varying degrees, the fortunes of a commodity producer are overwhelmingly driven by price rather than volume.

As intrinsic value investors, we prize stability and consistency of the value drivers of companies on which we perform fundamental analysis. Given that 100% of what’s known about a company is in the past, but yet 100% of its value is determined by its future, the importance of consistency of value drivers allows one to import a large part of a company’s past into how to think about its future. Resource shares do not fall into this category. The operating fortunes of resource companies gyrate with enormous inconsistency because (i) each cycle is different in its causes, and amplitude, (ii) the composition of metals in their portfolios changes over time, and (iii) their geographic exposure tends to differ from one cycle to the next. These nuances make valuing resource companies very difficult – the variability within them (caused by commodity price fluctuations) cannot be as reliably bounded in one cycle on account of lessons learnt in previous cycle(s).

If information contained in previous cycles is of little help to us in bounding our view of the future fortunes of resource companies, then we have to look for other “ports to anchor” commodity prices in. In essence, we have to identify our bedrock thesis for the evolution of commodity prices.
Commodity prices are the overwhelming value driver of resource equities. As a result, the most common way of estimating commodity prices is by reflecting commodity supply and demand dynamics through the futures market. While the futures market offers price discovery for commodity prices, it does not drive commodity prices. The futures market is a data rich environment that has come to permit primarily three totally unrelated parties – resource producers, industrial metal fabricators and financial investors – to simultaneously participate in it. So we have two choices: we can either take futures prices as efficient and use them for our fundamental analysis of mining companies or understand the driver of commodity prices separate from the market they are quoted in, the futures market. As such, our focus will fall squarely on understanding what drives commodity prices rather than the price discovery mechanism itself.

DEMAND AND SUPPLY

The role of metallurgy in the development of society is indisputable. We have remarked in our past papers (Is Gold’s Safe Haven Status Justified) at the developmental stages man went through to get to where he is today. That various periods in human existence are named after metals (Bronze Age, Iron Age) signifies the importance of their discovery and subsequent use. For man to have discovered that many years ago that increasing levels of heat aid the manipulation of metals from the most malleable, gold, to the least malleable, iron, is stunning! Nonetheless, history teaches us over and over again that there was a time in human development when scientific discovery was one and the same thing as the development of techniques. Man produced metals to manipulate them into tools for purposes ranging from farming, hunting, and fighting.

Fig 2: Timeline of Metal Discovery

The role of metals in man’s life has only intensified over time to the point that we now associate developed nations with a higher rate of use per person and developing nations with a lower but exponentially increasing rate of use per person. Depictions of metal intensity per capita are well known to those seeking to come to grips with what appears to be record breaking consumption in China!
This is no place to debate if China is for real. However, we simply should not lose sight of the fact that commodity prices will continue to be wildly cyclical, despite elevated levels of demand from industrializing nations, as they were during the industrialization of currently developed nations. A vast range of factors, including supply and demand imbalances, have historically impacted commodity prices.

Fig 4: Copper Price Cycles (LME cash, real 2010 SUS/ton)

Source: CRU and First Avenue Investment Management
While exogenous factors such as war and banking crises eventually impact commodity pricing by causing mismatches in supply and demand, it is important to know that these are unpredictable. We want to confine our analysis to factors observable in every day interactions between producers (mining companies) and consumers (industrial fabricators) of metal. One such driver of commodity prices is inventory. The logic is simple. Rising supply (inventories) reduces price and vice versa. The futures market developed over time, allowing producers and fabricators to soften the impact of inventory swings on their profitability by yielding some price certainty into the future.

**Fig 5: Inventory-Commodity Price Relationship**

The comfortable relationship broke in 2003/4 when the “China bull market” took off in earnest. Even the worst (2008/2009) recession since 1929 did not increase inventories to anywhere near the 2001 recession. Does it mean industry has moved demand up by orders of magnitude to the point that supply can’t keep up in perpetuity?

For certain, demand is strong. For another, it is not only industry driving this demand. Financial investors (including portfolio managers) are also “playing” Chinese industrial demand through exotic instruments such as exchange traded notes, swaps, and medium term notes. Their entrance into derivative markets previously reserved for industrial buyers has dramatically altered the dynamics of price discovery.
Certainly 2003 and 2004 were multiples of the previous three years (2000, 2001, and 2002). Even when industrial demand fell apart during the recent economic recession, investment flows into commodities buoyed the commodity market (hence lower stock days than in 2001). The following charts show the mindset of commodity investors polled by Barclays Capital at a metals conference in London early in 2011.

**Fig 6: Trend of Financial Investment in Commodities**

![Chart showing trend of financial investment in commodities](chart)

Source: Barclays Capital

**Fig 7: Proportion Answers (%) to Survey Questions**

![Bar chart showing proportion of answers to survey questions](chart)

Source: Barclays Capital

**Fig 8: Proportion Answers (%) to Survey Questions**

![Bar chart showing greatest downside price risk to commodities in 2011](chart)

Source: Barclays Capital
The bet on elevated Chinese growth coupled with a search for capital appreciation in elite metals characterized by tightness (copper, iron ore, coking coal) or speculation on a positive (roll) yield in the futures market relative to the artificially low rates in the United States has resulted in truly remarkable flows in the last two years. The obvious question is “What will the normalization of interest rates in the US do to these flows and finally commodity prices?” Another way to ask the same question: “How much metal will shift from backing speculative activity to being available for consumption, and what would our copper stock-days versus price chart above look like when consumption slows relative to available metal?” Last question: “What would a cyclical downturn in Chinese growth do to consumable inventories and commodity prices?”

While most analysts have obsessed over the amount of smaller amount of speculative activity in base metals relative to precious metals (gold and platinum), we focus on the fact that financial speculators cause price volatility as they bring liquidity to the market. Their willingness to act (buy on optimism and sell on pessimism) within a wide price range on the margins of price structure is what’s responsible for the significant volatility in commodity prices.

At current levels, commodity prices don’t seem to be bothered by these questions!

What then do we anchor commodity prices on if not inventories?

**COST PUSH**

We think costs and commodity prices are autocatalytic. That is, production cost pressures lead to higher prices, and higher commodity prices lead to higher costs (e.g. labor’s share in profits). We have found though that there is one significant limitation to the rate at which autocatalysis can occur between costs and prices.

To introduce the cost push/incentive price concept, let’s go back to basics.

The objective of any business is to arbitrage factors of production for profitability. By profitability, we mean economic and not accounting profits (profits above the cost of capital). In other words, if producers didn’t estimate that they could procure finance, equipment, labor, energy, and materials and convert them into product that can be parcelled out to the market for more, they either would not go into business, or last very long if their estimations were wrong. Demand will chew through supply from the cheapest to the most expensive producing mine. So the highest price paid should incentivize supply for the last unit of demand. This price is known as the marginal cost of production.

Given the above, you can imagine that the last thing producers’ want is for demand to be filled at a cost of production lower than theirs. The only problem is you never knew for sure what cost the competition is producing at. If you produce and demand doesn’t chew up your supply, the market goes into oversupply, forming inventory to be moved at some point, quite possibly at a discounted rate. This is frequently the case when demand mostly consists of fabricators, who face cyclical demand themselves. What is the moral of this lesson – customers never buy your costs, they buy your price. In other words, you must price your product to move it. If your costs allow you to produce profitably at that price, then great! If your costs are too high, you close a particular mine or go out of business. Marginal producers are always under the threat of price falling below their costs of production – the last unit of demand filling before getting to them.

The impact of financial investors (ETF, Index Swaps, and Medium Term Notes) who invest in commodities—for purposes of portfolio diversification, absolute returns, inflation hedging, emerging market growth, fears of currency debasement—on demand has radically altered these price dynamics.

Let’s illustrate this phenomenon by juxtaposing the copper price with the various costs of production.
**Fig 9:** Cu per Ton (US$) Versus the Lowest Cost of Production (Q1): 2004 – 2010

Source: CRU, First Avenue Investment Management

These are the folks who do the best at arbitraging factors of production for profitability.

**Fig 10:** Cu per ton (US$) versus the 2nd Lowest Cost of Production (Q2): 2004 – 2010

Source: CRU, First Avenue Investment Management

These are the next best folks at arbitraging factors of production for profitability.
These are the second to last folks at arbitraging factors of production for profitability.

Today, the demand for the last unit of supply is not only incentivizing the marginal cost producer (least cost competitive), it is also conferring respectable profitability to him! Given this uneconomic phenomena, one of two things would need to happen for this price to be sustainable:

• Demand from investment flows needs to stay strong, or
• Industrial fabricators should be able to pass on higher metal prices to consumers without triggering inflation (e.g. manufacturing higher value added products). Failure to do so would mean they either pull back from procuring metal expensively or suffer margin squeeze.

While we have recently witnessed higher commodity prices trigger inflation, we have not seen a widespread retreat of investment flows.

We have enough so far to answer the question, “What drives commodity prices?” Let’s bring it together neatly. Commodity prices comprise:
**Structural component**

Structural costs incurred by producers to meet the last needed unit of (current and future) demand. The marginal cost represents this cost. So, the long-term price we use in valuing mining companies is the marginal cost (at which supply meets future demand). Another way to look at this component of commodity prices is that it is the element of supply that industrial buyers are willing to pay to incentivize production – perhaps not on contract but on the spot market (swing producers or convenience stores in layman parlance).

**Cyclical component**

This is the portion of commodity prices we see driven by investment flows. It is cyclical because it is taking an investment view on (i) growth opportunities in emerging markets (China to be precise) (ii) enhancements of portfolio returns, and (iii) arbitraging monetary policy for an investment gain (price appreciation in commodity prices) or speculative gain (futures contract rolling up to the spot price). Consequently, money coming in and out of commodities (due to changes in expectations) lead to ebbs and flows in commodity prices as we saw in an earlier chart. As the expectations embedded in this portion of commodity prices can change in a flicker after a long run, we do not feel it appropriate to invest in resource equities when they’re pricing in a continuation of these expectations.

How high can these expectations be? The margin of profitability conferred onto the industry by cyclically high prices is simply astounding!

**Fig 13: Copper Profit Margins at Various Cost Structures (2004 – 2010)**

![Copper Margins](source: CRU, First Avenue Investment Management)
Fig 14: Iron Ore Fines Profit Margins at Various Cost Structures (2004 – 2010)

Source: CRU, First Avenue Investment Management

Fig 15: Iron Ore Lumps Profit Margins at Various Cost Structures (2004 – 2010)

Source: CRU, First Avenue Investment Management
A few thoughts come to mind when analyzing these charts (despite their short measurement period):

- There is a clear pattern of variability in the profit margins due to the release of “hot air” (deflating of the cyclical component of commodity prices)
- Not all metals are equal – copper and iron ore have far higher profitability than aluminum. We will witness “metal elitism” again a little later on.
- The most cost competitive producers (Q1 and Q2) dominate the profit pool of their respective industries
- Marginal producers struggle for profitability in most of the years, and in most metals. However, in this year, 2011, they are highly profitable.
ECONOMIC MOAT ANALYSIS

Our investment philosophy is centered on (i) identifying the factor that drives profitability in mining companies, (ii) determining its durability, and (ii) quantifying the contribution and longevity of that factor to the value of the business. In short, what quality is intrinsic to these businesses and how much is it worth. See our Investment Guide for edification.

The answers to these questions are sprinkled in various parts of the document hitherto. Let’s pull them out for you as follows:

It is the cost structure (Q1 and Q2) that confers the lion’s share of the industry’s profit pool to mining companies. As such, cost competitiveness is the source of intrinsic value. More finely, while the super profits resource producers enjoy are cyclically affected, their structural profits are not damaged by commodity prices falling to or temporarily below the marginal cost (long term price). In fact, it is at this time that they enjoy the choice to (i) elbow out companies at the next level below the marginal cost (Q3) by expanding production (thus pushing price further lower) or (ii) retain current production and enjoy structural profit margins. In our experience, companies have chosen the latter in order not to exacerbate the psychological effects that come with price deflation – erosion of business confidence being a key one.

This conversation requires that we next introduce specificity in two areas of analysis. The first is the names of mining companies in various metal industries and second, attach to them their share of cumulative metal production at various cost structures on the curve. We continue to concern ourselves with base and bulk metals. BHP Billiton (BIL) and Anglo American Corporation (AGL) are leading producers in these industries listed here in South Africa.

First up is copper. Figure 17 shows:

• The cost at which BIL and AGL mines (burgundy and light grey bars respectively) produce. The bars are arranged in ascending order–lowest to highest costs of production, read chart from left to right—and show a head to head of the copper mines of these two mining giants.
• The corresponding cost scale in US$ is on the left. The blue diamond shaped dots represent the mine’s production as a percentage of total industry production as seen on the right scale.
• Last, the blue straight line hovering above the chart is the average copper price for 2010. Bear in mind that already this year, the copper price is averaging US$9,700.

Fig 17: Individual Copper Mines, Production and Cost Curve Relative to 2010 Average Price (US$/ton)

Source: CRU, First Avenue Investment Management
It is clear that while both companies deliver most of their production from low cost mines, BIL not only controls most of the low cost mines but most its production is from these mines. An additional piece of information that is not shown in the chart is that the low cost, high production mines of both companies are long life mines - with BIL mines in the lead. We would conclude then that both companies have a competitive advantage in copper mining.

Next up is coking coal. The same instructions apply to Fig 18.

**Fig 18:** Individual Coking Coal Mines, Production and Cost Curve Relative to 2010 Average price (US$/ton)

![Cost Model: Coking Coal Mining 2010](image)

Source: CRU, First Avenue Investment Management

BIL has an even bigger lead over AGL on both (i) low cost of mines and high production from those mines. Further, both companies’ mines are long life. We would conclude then that both companies have a competitive advantage in coking coal, with BIL clearly in the lead.

We next look at iron ore (fine and lumpy) in Figures 19 & 20. The same instructions apply.

**Fig 19:** Individual Iron Ore Fines Mines, Production and Cost Curve Relative to 2010 Average Price (US$/ton)

![Cost Model: Iron Ore Fines Mining 2010](image)

Source: CRU, First Avenue Investment Management
BIL simply rules this roost here in the measures we want – cost efficiency, production, and life of mine – in both fine and lumpy iron ore. Kumba Iron Ore (AGL subsidiary) is no slouch either - it ranks right up there with the best mines in the world. Of course, we left out other quality producers such as Rio Tinto and CVRD as they are not listed in SA.

Last, we turn our attention to aluminum and nickel in Figures 21 & 22.
At the risk of sounding repetitive, allow us to say once again that BIL’s nickel and aluminum mines meet our criteria for being structurally advantaged.

Last, we were also interested in seeing how well costs are managed at various break points. In other words, how well does management perform with the only thing in its control – costs.

**Fig 23: Volatility of Annual Cost Growth per Quartile (%, 2004 – 2010)**

<table>
<thead>
<tr>
<th>Quartile</th>
<th>Copper</th>
<th>Aluminum</th>
<th>Iron (Fines)</th>
<th>Ore (Fines)</th>
<th>Iron (Lumps)</th>
<th>Ore (Lumps)</th>
<th>Coking Coal</th>
<th>Nickel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>18</td>
<td>15</td>
<td>14</td>
<td>42</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>19</td>
<td>12</td>
<td>20</td>
<td>35</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>19</td>
<td>5</td>
<td>25</td>
<td>27</td>
<td>22</td>
<td></td>
<td></td>
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<td>4</td>
<td>25</td>
<td>15</td>
<td>25</td>
<td>75</td>
<td>30</td>
<td>76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: CRU, First Avenue Investment Management

The data reveals two things:
- There is generally less variability in annual cost growth of Q1 and Q2 mines
- Some metals really are elite – copper and iron ore (fine and lumpy) register more stable cost growth across quartiles. Although cost growth in coking coal is more erratic than that of aluminum, its profitability is just way more spectacular.

Billiton’s Q1 assets stand it in good stead on both counts. How have tier 1 assets in a portfolio of elite metals with less volatility translated into superior fundamentals for BHP? The track record is stunning.
Let’s not forget, though, the global materials sector wasn’t creating value when commodity prices weren’t benefiting from Chinese and EM growth (prior to 1998). This validates our pursuit of properly calibrating commodity prices (see Fig 26).

**Fig 25: Global Materials Sector: Value Creation**

Source: CROCI, First Avenue Investment Management
Fig 26a: Evolution of Value Creation – Anglo American Corp (1996 – 2010)

Source: CROCI, First Avenue Investment Management

Fig 26b: Evolution of Value Creation – BHP Billiton (1996 – 2010)

Source: CROCI, First Avenue Investment Management
While both Anglo American and Billiton create value through the cycle, the latter has found a way to do so both incrementally and with additional stability:

**Economic Moat:**
- Billiton: Narrow Stable
- Anglo American: Narrow Stable

**Cash Flow Uncertainty:**
- Billiton: Medium
- Anglo American: High

Economic moat refers to a structural factor that allows a company to arbitrage factors of production for incidence of profit above the cost of capital for an extended period. As we discovered early on, that structural factor is the cost advantage of owning long life reserves containing high grades of ore. Billiton proves its management metal by generating cash flows in a more stable fashion, hence, its uncertainty rating.

Let’s now wrap up our discussion of marginal costs as the structural component of commodity prices. For this, we got a little help from experts in this field, CRU, to build an index of mining costs. The index is representative of costs incurred in mining projects without prejudice to both metal and geography.

We take that mine cost index and superimpose it on both inflation and commodity prices in order to test:
- Whether mine costs (by extension, the structural component of commodity prices) are inflationary, and
- The risk high cost operators run from commodity price volatility

**Fig 27: Mine Index Versus US CPI (1970–2010)**

In examining the inflationary quality of mine costs, we couldn’t help but notice that until 2003/4, mine costs were closely correlated to US CPI (the US has the highest consumption per capita of metal). As we mentioned earlier, the growth effect of China on commodities took off in earnest from 2004. China is now a primary consumer of metal while back then it was said to present marginal demand for metals. So while mine costs have ratcheted upwards, they haven’t fed through to US CPI. Of course we know now that inflation in China and other emerging markets are now more responsive to capital cost inflation and commodity prices.
Fig 28: Mine Cost Versus Commodity Prices: Year-on-Year Changes

Next, we are struck by how:

1. Commodity prices could grow slower than capital cost inflation, causing high (marginal) cost operators to suffer losses for approximately 3 year stretches
2. Volatility in commodity prices took on epic proportions from 2006 reflecting the increased participation by financial investors in commodity markets. In essence, while current commodity prices serve as an umbrella of profitability for the entire industry, they also hang like a guillotine waiting for financial investors to flip the switch. The impact of this volatility on resource equities can be a binary outcome between making and losing a lot of money.

We then tabulated current commodity prices relative to our long term price forecasts (equal to the structural component of spot commodity prices) to substantiate why we think resource equities are at peak earnings, peak EVA, and commodities futures markets are at peak roll yields.

Fig 29: Commodity Prices versus Marginal Cost/Long Term Price Forecast: Q1 2011

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Metric</th>
<th>Q1 2011 Price</th>
<th>Marginal Cost or L/T Price Estimate</th>
<th>Differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Ore Fines</td>
<td>c/dmtu</td>
<td>262</td>
<td>184</td>
<td>42%</td>
</tr>
<tr>
<td>Iron Ore Lumps</td>
<td>c/dmtu</td>
<td>283</td>
<td>160</td>
<td>76%</td>
</tr>
<tr>
<td>Iron Ore Pellets</td>
<td>c/dmtu</td>
<td>310</td>
<td>185</td>
<td>68%</td>
</tr>
<tr>
<td>Coking Coal</td>
<td>$/tonne</td>
<td>330</td>
<td>167</td>
<td>98%</td>
</tr>
<tr>
<td>Aluminium</td>
<td>$/tonne</td>
<td>2,527</td>
<td>2,612</td>
<td>-3%</td>
</tr>
<tr>
<td>Copper</td>
<td>$/tonne</td>
<td>9,640</td>
<td>6,756</td>
<td>43%</td>
</tr>
<tr>
<td>Nickel</td>
<td>$/tonne</td>
<td>26,731</td>
<td>23,988</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: CRU, First Avenue Investment Management
Fig 30: Peak Earnings for Base and Bulk Metal Producers

Earnings per share at fiscal year end

Source: First Avenue Investment Management, FactSet Research Systems
CONCLUSION: INVESTMENT ACTION

We remain underweight the sector. By avoiding bringing futures prices into our valuations, we are avoiding bringing circular logic into our investment decision-making processes. In other words, it is the very same financial investors in futures whose actions will lead to commodity prices trading cyclically lower than our long term prices - our preferred scenario to overweight the sector (see Fig 34).

**Fig 31: Our Preferred Scenario to Overweight or Underweight the Sector**

Recall that our long-term prices are driven by marginal costs, which act as the structural component of spot commodity prices. We want to avoid growth in commodity prices that is not related to supplying the last unit of demand. It is this structural component that induces new supply (often from low cost producers in new world-scale mines). We are thus encouraged to own resource equities when commodity prices fall below the marginal cost of production.
APPENDIX: STRUCTURE OF THE COST CURVE

The structure of the cost curve leads to intriguing nuances that are worth highlighting.

The cost curve represents the cost at which cumulative production occurs. Given that the objective of commercial enterprise is to arbitrage factors of production for revenue, the laws of economics require that production amounts fall with rising costs. In essence, a mining company would start mining the shallower part of the ore body and then go deeper if the economics (commodity price) allows. It also depends on the distribution of grades through the ore. Good grades (quality of ore) allow the mining company to obtain more metal content per ton of ore mined, translating into lower operating costs. Going deeper in an underground mine will raise operating costs so grade is all important. Conversely, because of lesser metal content resident in lower quality ore (lower grades) mining companies incur higher costs en route acquiring a ton of ore.

A great recipe for being a low cost producer is a shallow mine with great grades. To illustrate, while copper sells for around US$9,700 per ton currently, one would be surprised to learn that it sold for an average of US$2,000 from 1970 to 2004. Only on three occasions did it reach a stratospheric US$3,000 per ton (end of first oil crisis in 1974, end of second oil boom in 1980, and global recovery of 1989). In all this period, there was no room for deep and low grade copper production. Indeed this rally has outshone all others, and encouraged production of all sorts of grades from mines of all sorts of depths in order to meet Chinese and investor demand!

Fig 1: LME Copper Cash Price, Monthly, 1970 - 2010

Source: CRU

Let’s see how this “all-hands-on-deck” usually comes about beyond accessing and then exploiting ore bodies closer to the surface (shallow mines with good grades). There may be other ore bodies that are deeper in the same reserve. Again, consider today’s very favourable pricing environment, companies feel more justified in incurring capital costs of installing infrastructure such as shafts, refineries, concentrators, smelters, and so on. However, you can only imagine what happens to the shape of the cost curve. It rises. The cost of extracting a ton of ore increases because the revenue or price you get for that ton of ore has to be split between increased capital installations, and increased operational costs (materials/consumables, energy, and labor) expended going deeper. This is when economies of scale come to the rescue. With the fixed investment made and in place, all that’s required is to mine more so the revenue earned is increasingly covers and exceeds fixed costs. This is really how a mine with average grades can move from a bad cost structure (Q4) to acceptable (Q3). However, it is virtually impossible to cross the “Sahara” and go from bad (Q4) to good (Q2) or great (Q1). For that, you will need good grades that also lie shallow. So by definition, as you move from a shallow mine that has fantastic grades to a deeper mine with average grades, you move from Q1 to Q2. Likewise, it is difficult to confront such bad grades that you fall from grace (Q1 to Q4).
So why is the copper price so high today? We think, as we mentioned earlier in the document, that part of it is a cost-push driven by producing lower grade metals at deeper mines (marginal production). This kicked in because investment to start new mines or expand efficient mines was low. Recall that the pitch on the copper price wasn’t as elevated as it is today for about 34 years prior to 2004 when it really took off! Industrial demand though was always there.

Looking back over time it is clear that consumption growth on balance has outweighed production growth over the last eight decades. Consumption growth was higher in 1930-1940, 1940-1950, 1960-1970, 1970-1980 and 2000-2010 (i.e. in 5 out of the 8 decades consumption growth has outweighed production growth.) Only in 1950-1960, 1980-1990 and 1990-2000 did mine production growth outstrip that of refined consumption. These time frames reflect the start up and ramp-up of production at Escondida (1990), Collahuasi (1999) and Los Pelambres (2000) as reflected in Fig. 1. There was a dearth of new projects coming on stream over the 2000 to 2008 period, hence the appearance of marginal producers to fill the last increment of demand. As we discussed earlier, prices must be high in order to incentivise the development of projects/mines on stream as outlined earlier in document.

The cost curve gets exacerbated by a very particular operational nuance in mining. Low cost operators often use an environment of high prices to mine lower grades, artificially increasing their production cost (per ton). This typically only moves them from the best part of Q1 to the middle portion of Q1. Should commodity prices fall back, they revert to mining quality grades to lower production costs, restoring cost competitiveness to its most natural state. The above tactic, in our opinion, artificially inflates commodity prices. Think about what a low cost producer could do instead – produce more of the good stuff to snuff out the bad stuff (marginal production).

While this nuance is yet another reason for us to be cautious about the difference between the copper price (in particular) and its marginal cost of production, it is also clear that the copper market will remain in structural deficit for quite some time due to a historical lack of investment. As a result, our near-term signal of investing back into copper equities will most likely be a small premium (15% or so) of the copper price over the marginal cost and not a discount.

Footnotes
1. EVA II: Nothing Lasts for EVA, Page 6, Citi Investment Research.
2. Bill Miller, (WSJ, January 6, 2006)
DISCLAIMER

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