Deutsche Bank
Markets Research

F.I.T.T.

Industry
UK Metals & Mining

Date
17 June 2015

Europe
United Kingdom
Metals & Mining

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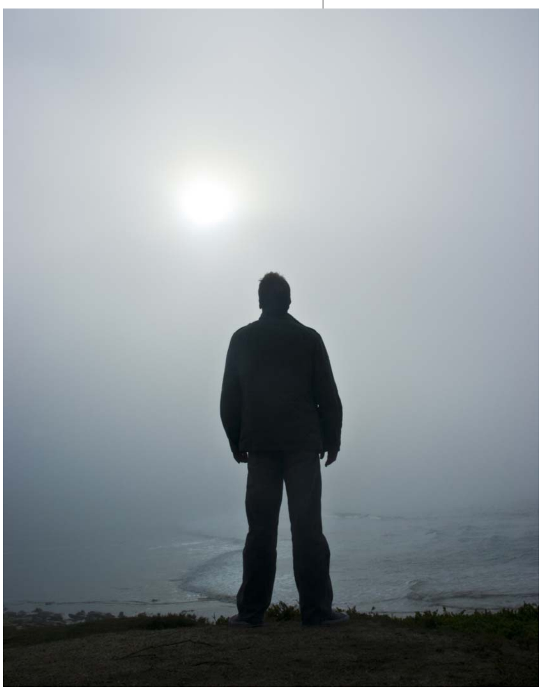

F.I.T.T. for investors

Piercing the gloom

High dividend yield is covered and value to be had at through the cycle levels

The mining stocks have become directionless as China matures and commodity demand has eased. Without the clarion call of ramping prices, fear of the future has left the miners trading at 0.7x est. fair value, high yields (BHP 5.9%, RIO 5.4%, AAL 5.4% and GLEN 4.2%) and inexpensive CROCI valuations. We have analysed extensive history by commodity and asset and modelled each at normalised margins and commodity prices. While prices have varied, asset margins are much less volatile. The bottom line is that miners' dividends are covered at normalized commodity levels, from just the existing asset base and the through the cycle value holds for Rio Tinto and Anglo.

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The miners can afford their dividends on normalised prices

We have constructed 'normalized' prices based on up to 100 yrs historic price series from numerous sources including government and company data. The normalised prices used are almost all below current commodity prices, (you will have to read further to get all the numbers). At these levels, all four miners can afford their dividends, maintenance capex and interest payments for at least a decade before the current reserves cannot support the dividend. BHP's reserves run out first at 12 years and Glencore's last at 31 years – When we then incorporate the remaining large resources, all companies will cover their dividends into the foreseeable future at normalised prices.

Anglo looks the most undervalued and Glencore the most overvalued on normalised prices.

Anglo is the only company to trade within its reserve valuation alone (its existing assets at current levels without bringing in any additional resources, justify the value – resource upside is free.). But Anglo also has the fastest reserve decline and will need to inject cash more quickly into its assets than the other companies to maintain production levels. Consequently, Rio remains our top pick with valuation only just over its existing asset reserve base (no growth included), space to grow its dividend and the slowest depletion in its normalised cash flows. At the other end of the scale, both Glencore and BHP trade in line with the normalised measured and indicated resource base (so you need their existing assets to work well and to assume conversion of most of their resources to justify the current price for their existing assets on normalised cash flows).

Don't get dragged into the gloom.

China is decelerating – (a fairly consensual view) and this is coinciding with additional production ramp-up as projects started years ago come to fruition. The net outcome is over supply (again, a consensual view) and prices should fall (as they have done). A risk is to use pre China boom commodity prices as a guide to the future, because this is too bearish as many commodity prices hit century lows in the early 2000's. Iron ore hit an annual low in 2002 for instance at US$36/t (real CIF) – so market fears of sustained iron ore prices of US$30-40/t would require iron ore to retrace to century low levels, into perpetuity. We do not think this is likely. Meanwhile, a number of the miners offer good value on their existing assets alone at normalised prices, the potential growth upside and high yields justify buying them – on top of that, dividends are both attractive and maintainable into the foreseeable future. Now is a good time to selectively pick up some value, in our view.

Top picks	
Rio Tinto (RIO.L),GBP2,806.50	Buy

Source: Deutsche Bank

Companies Featured

Anglo American (AAL.L),GBP994.40			Buy
	2014A	2015E	2016E
DB EPS (USD)	1.73	1.10	1.38
P/E (x)	13.8	14.1	11.2
EV/EBITA (x)	327.1	12.9	9.8
BHP Billiton Plc (BLT.L),GBP1,320.50			**Hold**
	2014A	2015E	2016E
DB EPS (USD)	2.52	1.53	1.08
P/E (x)	12.1	13.5	19.0
EV/EBITA (x)	8.2	13.8	13.4
Glencore (GLEN.L),GBP278.25			**Hold**
	2014A	2015E	2016E
DB EPS (USD)	0.33	0.22	0.29
P/E (x)	16.7	19.7	14.7
EV/EBITA (x)	16.8	17.9	14.4
Rio Tinto (RIO.L),GBP2,806.50			**Buy**
	2014A	2015E	2016E
DB EPS (USD)	5.02	3.23	4.30
P/E (x)	10.5	13.5	10.1
EV/EBITA (x)	8.6	9.7	7.5

Source: Deutsche Bank

Table Of Contents

Thinking through the cycle.

What is sustainable?

The kernel of this report is very simple: What can the miners' assets sustainably deliver in cash? Can they afford their dividends? Can they grow into the future? The answer to the last 2 questions is yes. The big four miners can pay their dividends from cash generated by their existing assets on a normalised basis/ through-the-cycle basis with cash left over for additional returns or growth.

So, today's dividend yield stacks up, what about the longer term value? As it turns out, on normalised, through the cycle cash flows the market is paying for significant resource conversion in Glencore and BHP and little to no growth in Rio Tinto and Anglo.

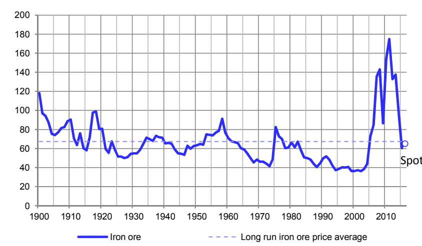
What we did

- We remodelled each asset for the big four miners using normalised margins and commodity prices. We ran the cash for three cases: until the end of reserves, until the end of measured and indicated resources and until the end of inferred resources.
- We used existing assets only and did not include cash from future potential growth – i.e. What do you as an owner of the company have in your hand right now?
- We wanted to avoid debate about long-term forecasts, which to use and how good they are – so we used history, lots of it, to determine the normalised prices and discuss our methods in the note. This data was put together from multiple industry sources and company data (see the iron ore price series in Figure 1 in the margin by example).
- Most importantly, we wanted to move away from the endless debate around marginal costs and the moving cost curves – it is like pinning down mercury. The solution is relatively simple: use margins, they are much more stable. We detail the work around this in the note as well

What we learnt:

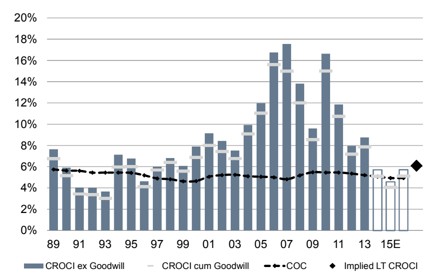
- The dividends for the big 4 miners look to be covered for at least the next 10 years on normalised prices for the reserve base alone. That is, with the existing assets only (no growth or M&A), the big 4 should be able to fund all their maintenance, corporate costs, interest payments and current dividends at through-the-cycle prices. The dividends look to be sustainable.
- Rio Tinto and Anglo's existing asset base looks undervalued by the market on normalised/through-the cycle commodity prices (Figure 3). The current Glencore and BHP Billiton valuations are factoring the entire Measured and indicated resource base for the two companies.

Figure 1: Iron ore price (CIF China equivalent)



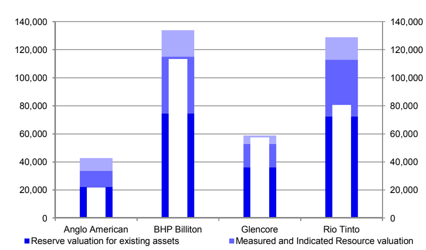
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 2: CROCI cam and ex Goodwill & Implied CROCI



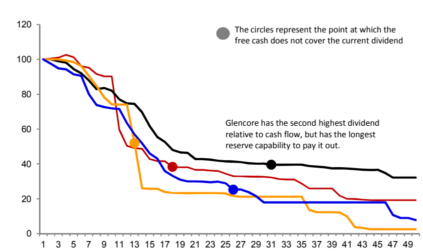
Source: Company data, Deutsche Bank CRCOI team.

Figure 3: Normalised Resource NPV and Market Cap



Source: Deutsche Bank

Figure 4: Reserve Cash Flow



Source: Deutsche Bank estimates/ forecasts.

Some of the more minor things we learned include:

- On existing assets, Rio's total resource base looks to be worth nearly as much BHP's despite BHP trading at 41% more than Rio Tinto in the equity markets.
- Only Anglo trades below its reserve valuation (Just)
- Glencore's existing assets trade above its through-the-cycle measured and indicated resource base NPV and BHP's nearly do – So you will need them to convert all of their resources and or grow more to justify their prices on normalised prices.
- Rio's near-term cash flows hold up the longest – i.e. the least relative capex would be required to maintain near-term cash flows.
- Glencore can pay its current dividend from its reserve base for the longest period (28-years).(Contrary to the popular view that it has a short asset life).
- Anglo's reserves deplete the fastest in the near term (5 and 10 year horizon) and so is the most likely to need additional capex to support this. It also has the greatest decline in total resources over the next 50 years.
- Glencore has the most diversified cash flow on a sustainable basis and Rio has the least; however, BHP's Oil & Gas resource depletion over the next decade should move it to having the least diversified cash generation on a sustainable basis.

The table below lists (in bold) the commodity prices that we have used for the analysis. These are based on Historical long-term performance of the commodities (detailed later in the note) and are not to be confused with our Long-term price forecasts (which are also included in the table for comparison).

Figure 5: The through-the cycle commodity prices used in the analysis

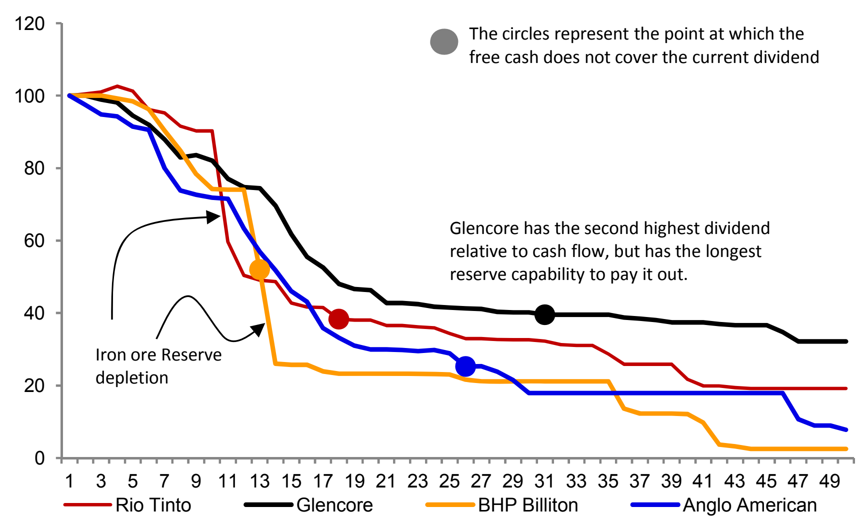
		Long term annual high	Long term annual low	**Long run price used**	DB Long term forecasts	Price used relative to DB forecast	2015 YTD average	Price used relative to 2015 YTD
Aluminium	Usc/lb	1159	77	**96**	107	-10%	82	18%
Copper	Usc/lb	542	70	**222**	322	-31%	271	-18%
Nickel	Usc/lb	1868	288	**602**	967	-38%	629	-4%
Zinc	Usc/lb	273	35	**91**	105	-13%	97	-6%
Lead	Usc/lb	162	26	**80**	102	-22%	86	-7%
Tin	Usc/lb	1814	234	**732**	862	-15%	786	-7%
Gold	US$/oz	1713	168	**754**	1300	-42%	1210	-38%
Silver	US$/oz	49	3	**11**	20	-47%	17	-38%
Platinum	US$/oz	1797	477	**851**	1675	-49%	1172	-27%
Oil	US$/bbl	117	7	**53**	78	-32%	58	-8%
Uranium	US$/lb	128	11	**48**	55	-13%	38	27%
Thermal coal	US$/t	141	33	**68**	82	-17%	64	7%
Coking coal	US$/t	326	47	**112**	150	-25%	89	25%
Iron ore (CIF China)	US$/t	175	36	**67**	80	-16%	60	12%
Bauxite	US$/t	107	24	**43**	50	-13%	59	-26%
Alumina	US$/t	505	236	**353**	390	-9%	354	0%

Source: Deutsche Bank assumptions/estimates, datastream, USGS,BGS,,Company data, ABARE

Dividends are sustainable for at least the next decade.

The chart below shows relative cash generation from reserves for the big four miners at normalised prices. The decay in cash flow occurs as the asset reserves run out. The circles represent the points at which the cash flows fall to the level of the current dividend. BHP would be the first to hit this limit in 14 years (due to the depletion of its oil reserves and Glencore would be the last in 32 years (supported by steady cash generation from its trading business).

Figure 7: Relative cash generation from Reserves



Source: Deutsche Bank estimates/assumptions

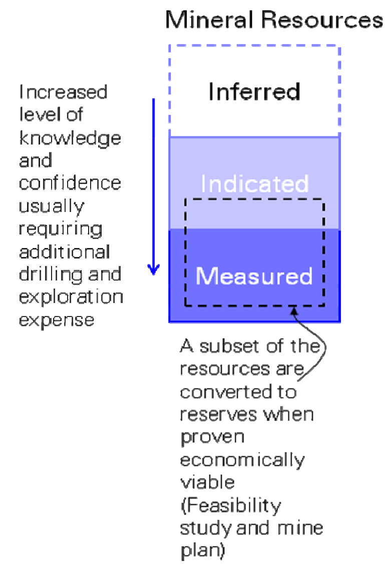
BHP is currently paying out the largest amount of its normalised cash flows as dividends (57%) as shown in the margin chart and Anglo the least at 27% - which is better?

- The higher the dividend relative to normalised cash generation the more generous the management team is to its shareholders. However, it also means that the dividend is more at risk during cyclical lows. (In BHP's case, the strong balance sheet will readily cover any shortfalls in the foreseeable future).
- The lower the dividend, the more cash the company has for growth – both of the dividend and the asset base. As we show below, the lower pay-out by Anglo makes sense in light of the faster decline in reserve cash flow and the likely need for more capital application sooner than the other miners.

Rio's resource base is worth a similar amount to BHP's, Glencore trades above its normalised measured and indicated resource base and BHP trades close to this level. Only Anglo trades below its reserve level.

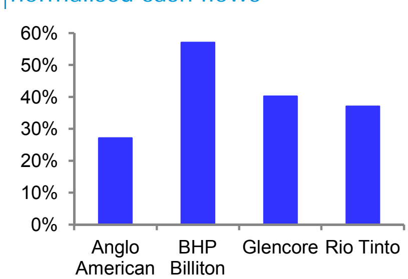
We show in the chart below the NPV for the normalised cash flows from reserves and resources for the miners. As an owner, the reserve base offers the lowest risk of additional capital spend to generate the cash. As the remaining resources are considered there is increasing risk of additional capital spend requirement to "access" the cash. At the moment, only Anglo trades below its normalised reserve base valuation – in other words, Anglo management simply have to run the current assets at their potential in order for share holders to get value. Rio management need to operate the current assets well and deliver a little bit of the resource in order to generate value.

Figure 6: Resource definition overview (full definition at the end of the report).



Source: Deutsche Bank

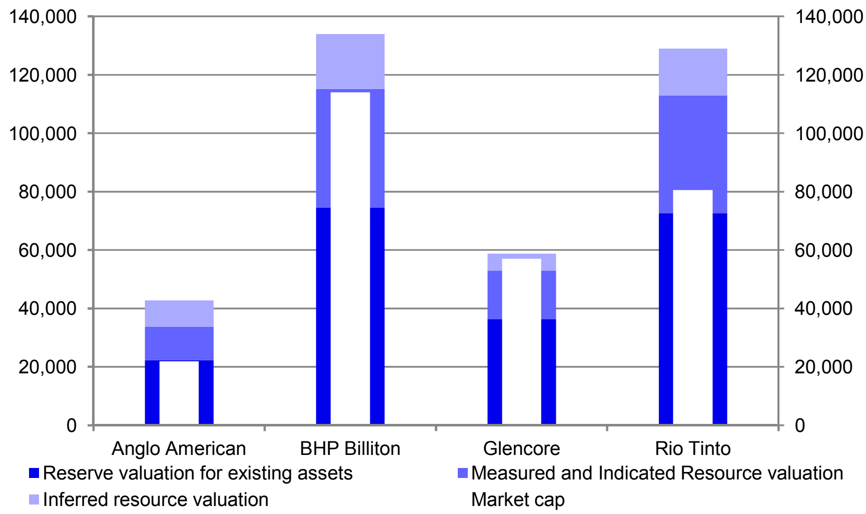
Figure 8: Dividend as % of normalised cash flows



Source: Deutsche Bank analysis

BHP and Glencore need to deliver the Measured indicated resources as well as the reserves to justify the shares prices. Note of course that this represents the normalised value from the existing assets. Future growth could also deliver additional value.

Figure 9: Reserve and resource NPV relative to market cap.

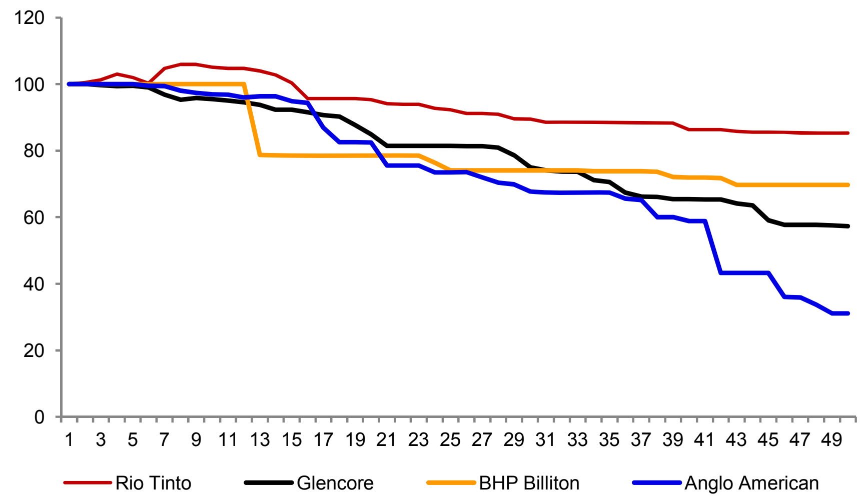


Source: Deutsche Bank estimates/assumptions

Rio has the least cash decline from Resource base and Anglo the most over the next 50 years.

How much have the miners got in the ground? 50 years is well past the investment horizon of the average investor however the cash decline from total resources over time is indicative of how much organic growth is available to the miners. As can be seen below, Rio Tinto has the least cash flow decline from its total resource base over the next 50 years and so has the most potential to bring some of that cash flow forward (organic/lower risk growth). Conversely, Anglo has the largest decline with its remaining resources in 50 years able to produce only a third of the cash that its current resources base can achieve – over time, more investment will be required to replace the resources (Quellaveco for example). This differs from the cash from Reserves chart shown earlier in Figure 7 in that it includes all the stated resources, and not just those that have been converted to economically viable resources. The certainty of these cash flows is lower, but it accounts for the long-term resources that will move into the reserves over time.

Figure 10: Cash flows from total resources at steady state.

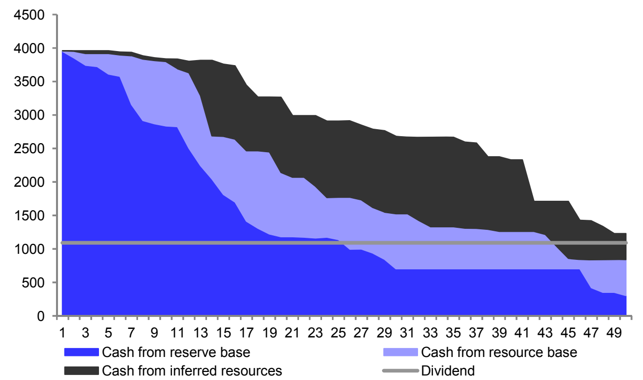


Source: Deutsche Bank estimates/assumptions.

Breaking the cash flow from resources down into its constituent parts is also instructive on the upcoming tasks for the company management teams. The four charts below show the cash flow breakdown by resource type over the next 50 years for the 4 majors. There are a number of features worth noting:

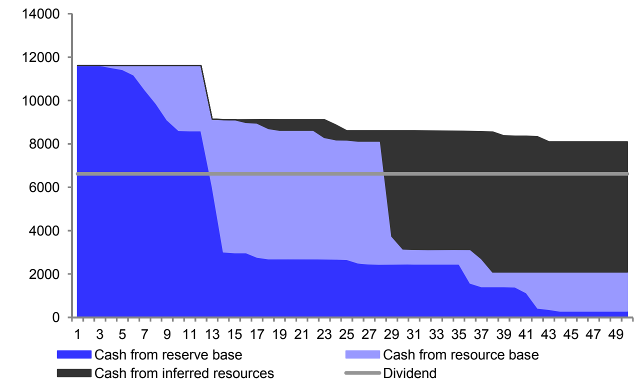
- Anglo has the lowest dividend relative to the steady state cash flow generation from its current assets, which is understandable given it has the fastest resource decline of the 4 and will need to use some of its cash flows over time to beef up its resource base.
- Glencore has the slowest decline in reserve cash flows and its cash from reserves is highest of the four in 50 years' time. This is due to cash from its trading business which we have assumed is steady with an EBIT of US$2.7b (at the bottom of its US$2.7-US$3.7b EBIT range provided by the company).
- BHP has the sharpest near-term drop in total resources, reflective of the shorter-term nature of its oil resources (which will need capital to replenish). However, the remainder of its resource base provides steady cash flows through the period. It also has the highest dividend relative to its steady state cash flows and so potentially less free cash to put into developing its resource base on a relative basis.
- Rio has the slowest total resource decline as discussed earlier. The drop in cash from reserves around year 11 is due to the iron ore reserve base depleting and it will likely need to spend on resource conversion leading into the point.

Figure 11: Anglo's steady state cash flow generation



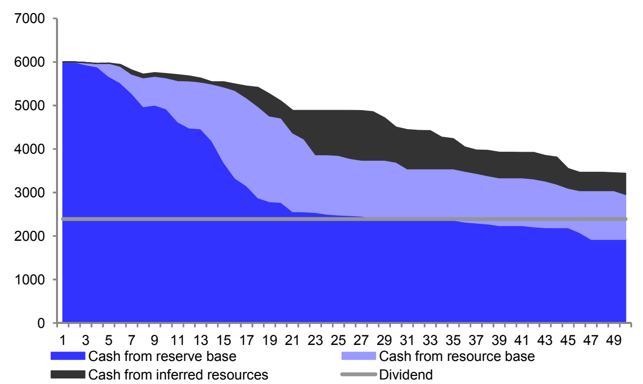
Source: Deutsche Bank estimates/forecasts, company data

Figure 12: BHP's steady state cash flow generation



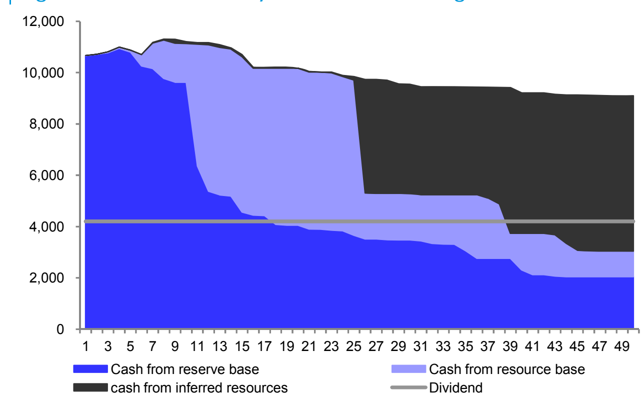
Source: Deutsche Bank estimates/forecasts, company data

Figure 13: Glencore's steady state cash flow generation



Source: Deutsche Bank estimates/forecasts, company data

Figure 14: Rio's steady state cash flow generation

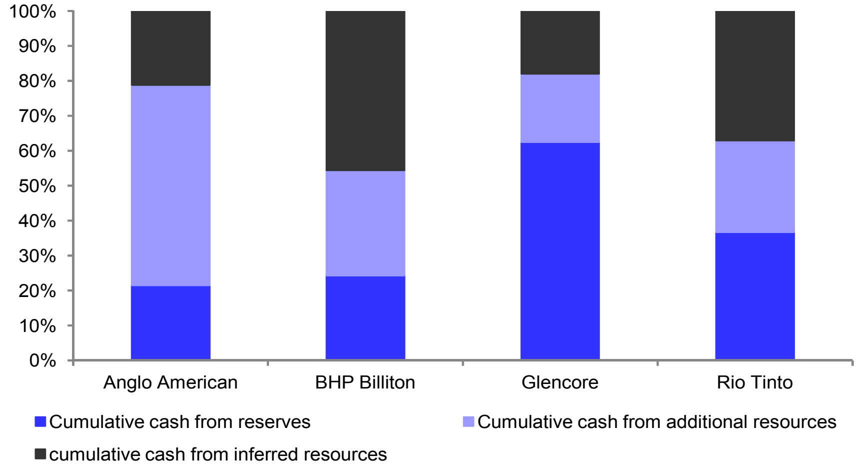


Source: Deutsche Bank estimates/forecasts, company data

An alternate way of looking at the cash flow generation over time is to compare the cumulative cash flow generation by resource type (shown in the chart below), which is essentially an undiscounted NPV. What it shows is that Glencore has the highest proportion of cash generated from its reserves so ultimately would have the least to spend to upgrade its remaining resources. BHP and Anglo have the lowest cumulative cash from reserves and, therefore, the largest requirement on resource conversion.

Anglo also has a very large proportion of its potential normalised cash generation sitting in additional measured and indicated resources. As it also has the fastest decline in reserve cash flows, it suggests that it has under spent on resource conversion and has that work ahead of it.

Figure 15: Cumulative cash generation split by resource type.



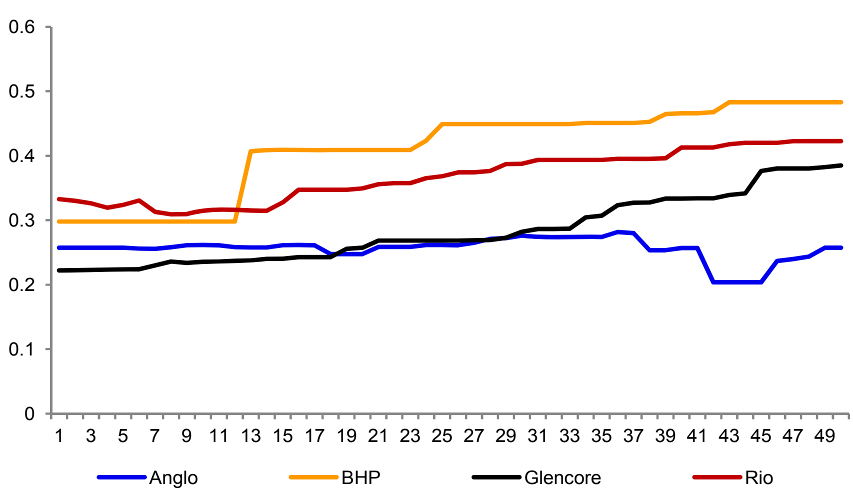
Source: Deutsche Bank

Cash flow diversification

We can also cut the cash flow generation by basic commodity to see where the miners are generating their sustainable cash flow from and then look at the concentration of the company cash flows over time.

The chart below shows the concentration of the cash flows for the big four miners (we measure concentration using a Herfindahl Hirshmann style calculation that we discuss later). What this shows is that currently Glencore's cash flows are the most diversified by source and Rio's are the least diversified. It also shows that BHP has the least diversified cash flows after its oil resources run down in just over 10 years. As BHP only reports its overall oil reserves, we model this as a step change – in reality the transition should be smoother as the individual fields run down, in which case its transition to least diversified miner occurs sooner (a consequence of driving towards a simpler structure as its most recent strategy). Retaining diversification (if that is what the miners want) will require directed investment.

Figure 16: Resource Base cash flow concentration on a HH basis.



Source: Deutsche Bank estimates/assumptions

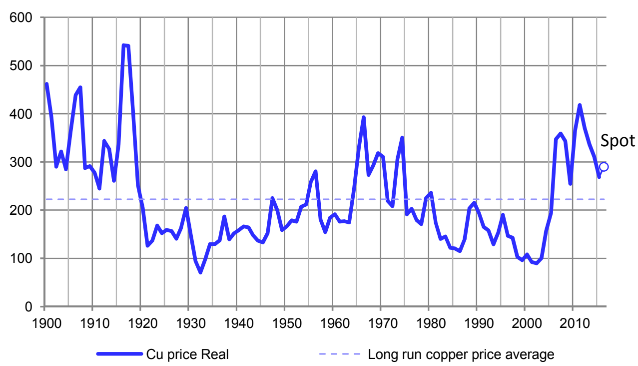
A quick look at the long-run historic prices

We show the outcome of our work on long-term historic real prices over the next couple of pages to provide a back-drop for the work on the company assets. We provide a detailed review of the long-term performance later in the study.

Base metals

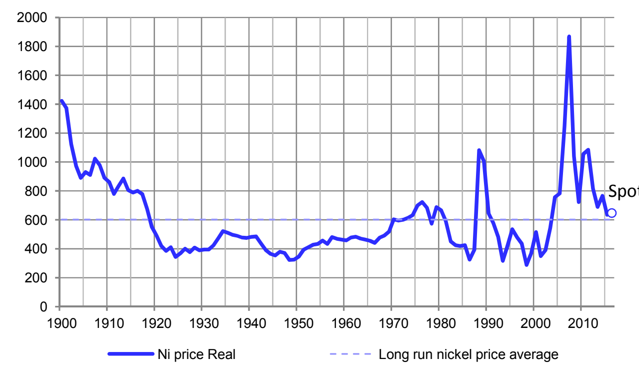
All of the base metals approached 100-year lows in the early 2000's. We describe in more detail a little later the explicit performance of some of these metals, but note initially that aluminium is the "the odd man out". It is extremely abundant, but technically difficult to extract hence the relentless price decline over time as technology improves.

Figure 17: Long run real copper price (USc/lb)



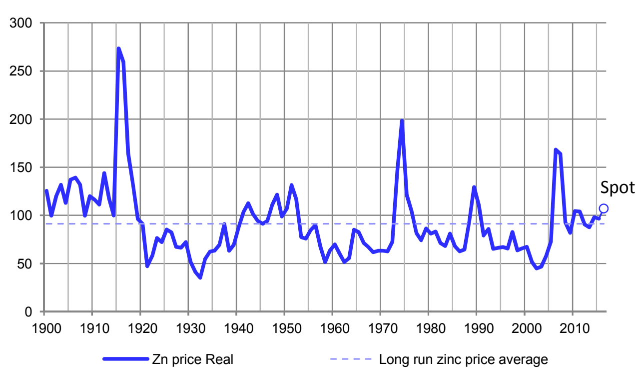
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 18: Long run real nickel price (USc/lb)



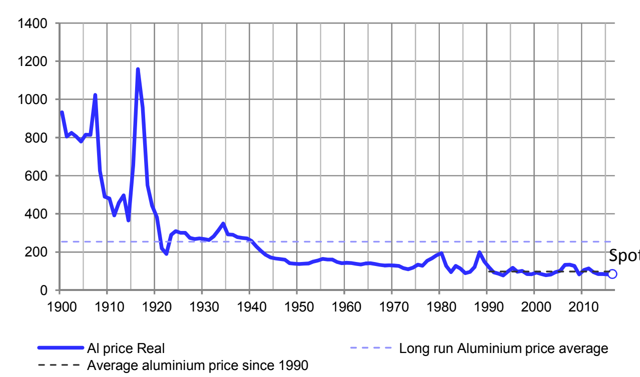
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 19: Long run real zinc price (USc/lb)



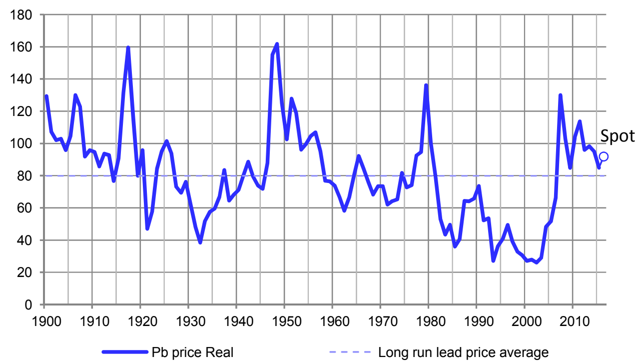
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 20: Long run real aluminium price (USc/lb)



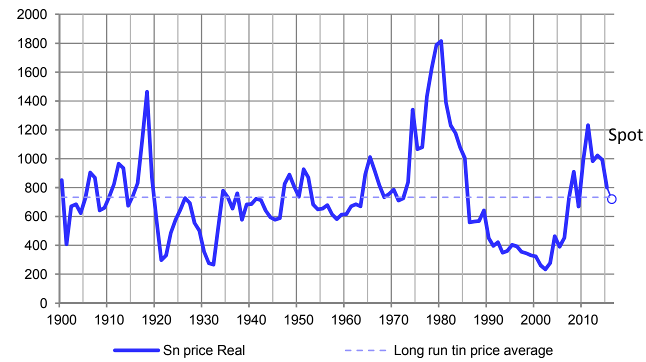
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 21: Long run real lead price (USc/lb)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 22: Long run real tin price (USc/lb)

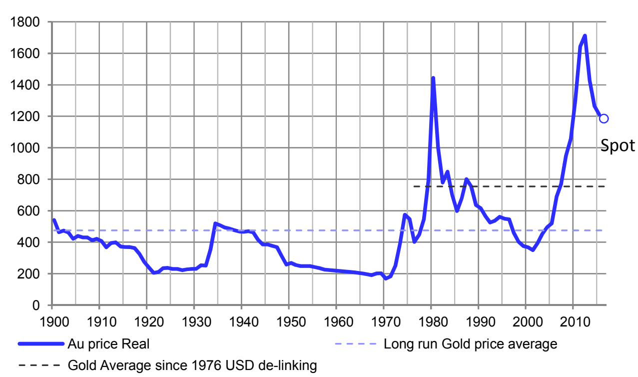


Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Precious metals

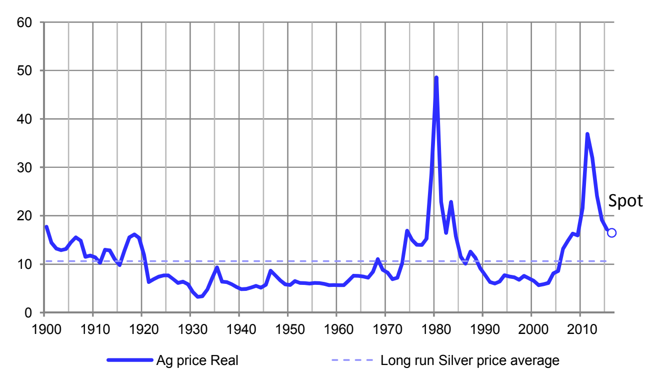
As mentioned earlier, we have used a shorter time period to produce a normalised gold price to reflect that fact that it was substantially government controlled before 1974.

Figure 23: Long run real gold price (US$/troy ounce)



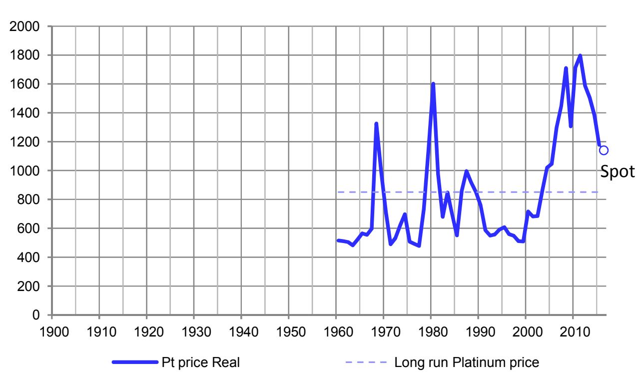
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 24: Long run real silver price (US$/troy ounce)



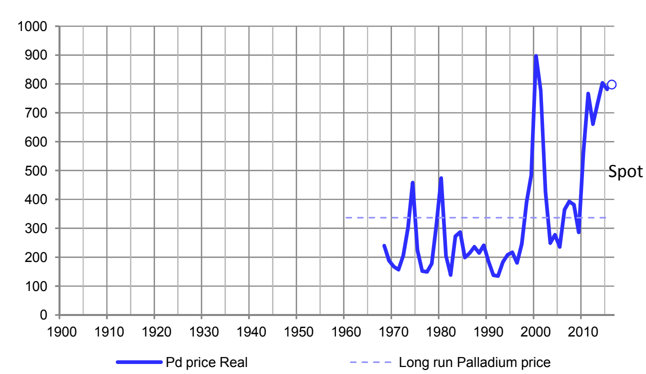
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 25: Long run real platinum price (US$/troy ounce)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 26: Long run real palladium price (US$/troy ounce)

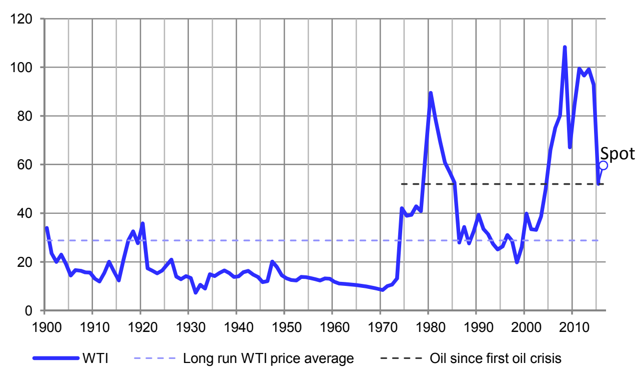


Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Energy and Bulks

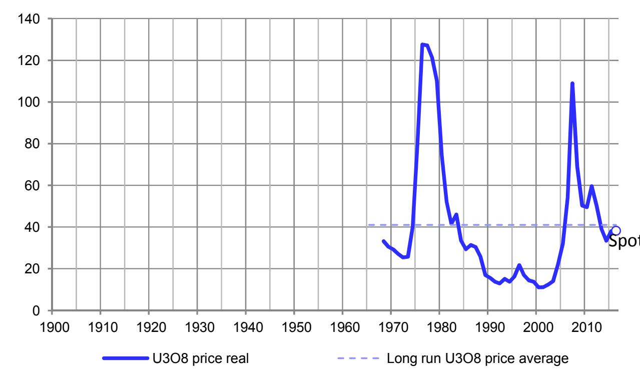
Energy commodity prices over time are shown below along with iron ore and alumina. Note similarity of the shape of the oil curve with that of gold on the preceding page – both remain significantly politically influenced.

Figure 27: Long run real oil price (US$/bbl)



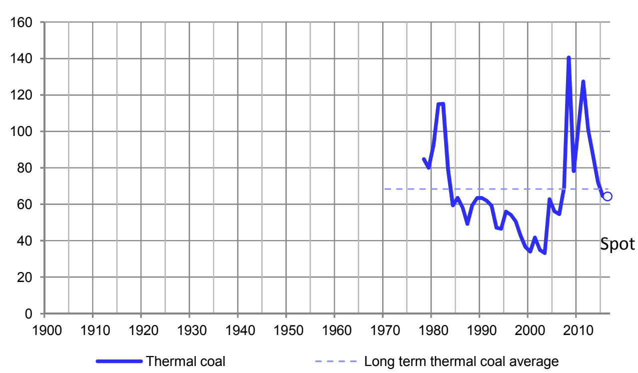
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 28: Long run real uranium price (US$/lb)



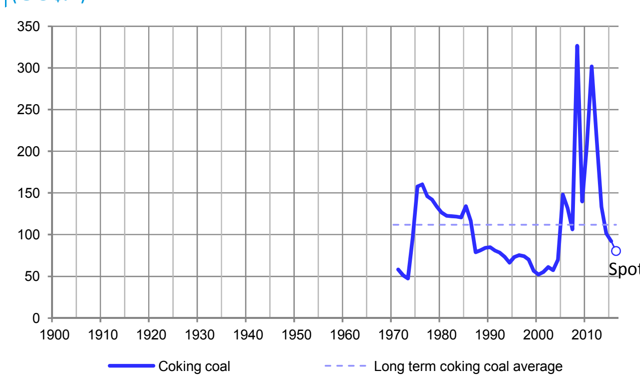
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 29: Long run real seaborne thermal coal price (US$/t)



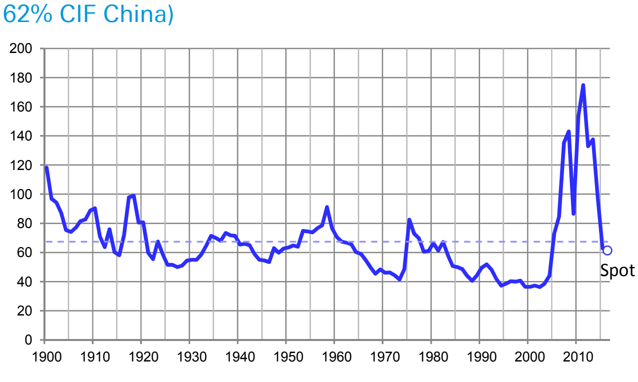
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 30: Long run real seaborne coking coal price (US$/t)



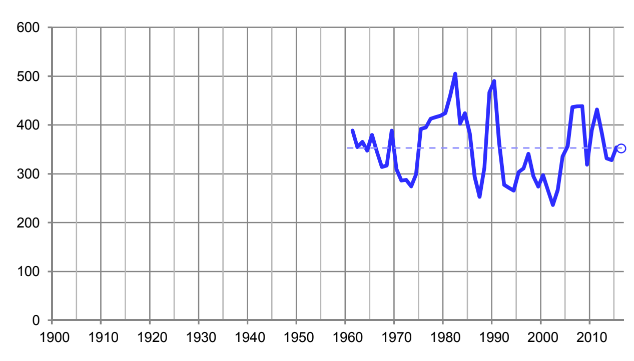
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 31: Long run real seaborne iron price (US$/t dry 62% CIF China)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 32: Long run real alumina price (US$/t)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Cycle dynamics.

The work in this study is conceptually simple: to look at the sustainable level of cash that can be generated by the miners from their existing asset bases. The complexity as always comes with the detail.

We have generated long-run commodity prices using real commodity price history. We believe this errs on the conservative side as it does not factor in scarcity impacts over time as commodity resource bases deplete. We have then analysed the margins generated by each of the miners' assets to assess the margin performance through the cycle and then calculated the margin that each asset would generate at the through-the-cycle commodity prices.

This work then generates a through-the-cycle, normalised cash flow for each of the miners which we then run asset by asset out to the end of life of each of those assets to determine how well they can fund their dividends and potential growth.

Note that this work was completed for the miners at their current states – we did not include cash flows from projects or expansions that have not yet started (e.g. Resolution, OT underground). For projects that have started, we assumed that they reach nameplate capacity for the analysis (e.g. Minas Rio).

Through the Cycle, "Normalised" Commodity prices used.

The table below lists (in bold) the commodity prices that we have used for the analysis. These are based on historical long-term performance of the commodities (detailed later in the note) and are not to be confused with our long-term price forecasts (which are also included in the table for comparison).

Figure 33: The through-the cycle commodity prices used in the analysis

		Long term annual high	Long term annual low	**Long run price used**	DB Long term forecasts	Price used relative to DB forecast	2015 YTD average	Price used relative to 2015 YTD
Aluminium	Usc/lb	1159	77	**96**	107	-10%	82	18%
Copper	Usc/lb	542	70	**222**	322	-31%	271	-18%
Nickel	Usc/lb	1868	288	**602**	967	-38%	629	-4%
Zinc	Usc/lb	273	35	**91**	105	-13%	97	-6%
Lead	Usc/lb	162	26	**80**	102	-22%	86	-7%
Tin	Usc/lb	1814	234	**732**	862	-15%	786	-7%
Gold	US$/oz	1713	168	**754**	1300	-42%	1210	-38%
Silver	US$/oz	49	3	**11**	20	-47%	17	-38%
Platinum	US$/oz	1797	477	**851**	1675	-49%	1172	-27%
Oil	US$/bbl	117	7	**53**	78	-32%	58	-8%
Uranium	US$/lb	128	11	**48**	55	-13%	38	27%
Thermal coal	US$/t	141	33	**68**	82	-17%	64	7%
Coking coal	US$/t	326	47	**112**	150	-25%	89	25%
Iron ore (CIF China)	US$/t	175	36	**67**	80	-16%	60	12%
Bauxite	US$/t	107	24	**43**	50	-13%	59	-26%
Alumina	US$/t	505	236	**353**	390	-9%	354	0%

Source: Deutsche Bank assumptions/estimates, datastream, USGS,BGS,Company data, ABARE

We go into individual commodity detail later in the report; however, there are a couple of points worth noting:

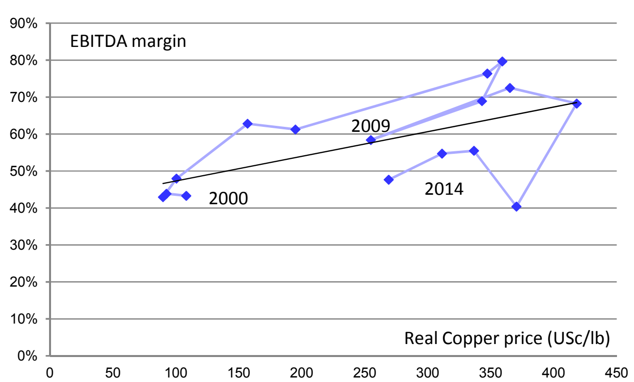
- The majority of the commodity prices we use in this analysis are below the current price levels (aluminium, uranium and coking coal are exceptions to this).
- At the current spot price of around US$65/t, iron ore is trading at close to its long-run average – we note that in the last century, the lowest annual price was US$36/t (CIF China real). The forecasts in the market for prices to fall to US$30-US$40/t and stay there would mean that iron ore would be trading at century lows into the future. This low occurred in 2002 when Global growth was 2.9% and OECD growth was 1.7%. This world growth is expected to be 3.1% and OECD growth 2.3%. So with higher growth and more emerging (metal intensive) growth coming in the future vs 2002, expectations of extended, century-low prices seem overdone (yes, overproduction will cause short term dips, but not into perpetuity)

Margins are more stable than you might think.

We have used long run EBITDA margins to calculate long-run cash flows because they are stable over an extended range of commodity prices. Take the two examples shown in the charts below - The first shows the EBITDA margins vs price by year for the Antamina copper mine in Peru and the second shows the Hamersley iron ore mines in Australia. Note that despite significant price variations for the period shown, the EBITDA margins for the operations move in a much tighter band.

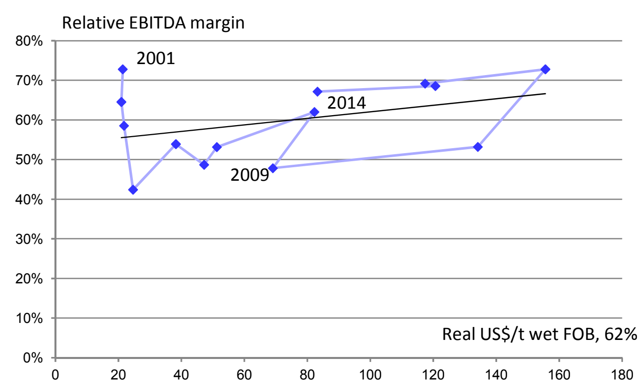
It is also worth pointing out that both copper and iron ore prices hit their century lows in the period covered in the charts below, so we are not just showing the "good times".

Figure 34: Antamina EBITDA margin vs copper price



Source: Deutsche Bank estimates, company data, datastream

Figure 35: Rio Hamersley iron ore



Source: Deutsche Bank estimates, company data, datastream

The reason for the relative stability in the margins is well known, but not well anticipated by the market. That is that costs flex with the commodity prices and flex readily both up and down. For an equity market that scans many industry segments, this cost flexing is not the norm and in particular the speed of cost reductions is often surprising given that "cost out" is usually a tough exercise in many industries. The reason for the rapid movements in costs is that there are three significant components to the cost movements and they can all move simultaneously during significant swings in the commodity cycles.

The three flexing cost components

The three key drivers of mining cost movement are:

- Exchange rates
- Mining specific inflation/deflation
- Deliberate fat/ "Good costs"

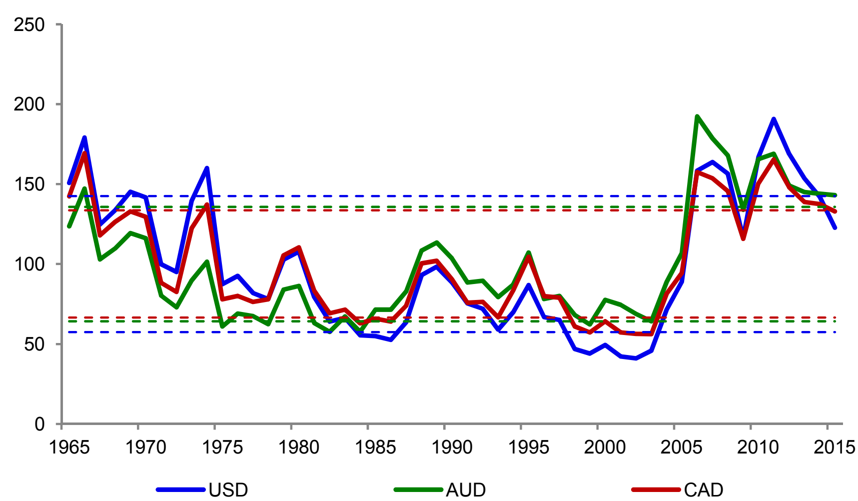
Exchange rates.

Commodities by convention are traded in US dollars; consequently, any mine with operations outside the United States will have significant FX exposure. In the case of the big four miners, they all report in USD, so the impact comes at the cost line when they convert their local costs into USD (by contrast companies such as Norsk Hydro and Boliden that report in local currencies have the variation at the revenue line when they convert their US$ sales back into local currency).

There are myriads of drivers for exchange rates, and for economies with large mining industries, the received commodity prices will influence the strength of the currency. The relationship between the commodity process and mining currencies is not as strong (or as coincidental) as the market and the miners would like to believe, but it certainly has an impact.

The chart below shoes the real copper price performance in USD, AUD and CAD relative to the average price over the last 50 years. We have included on the chart the ±1 standard deviation lines for each series. Note that both the copper price in Canadian dollars and Australian dollars have a tighter spread over the period than the copper price in USD. So in general, through a commodity weakening cycle, operations in mining economies will gain some fx benefits to their costs in USD terms.

Figure 36: Real copper price performance in 3 currencies over the last 50 years



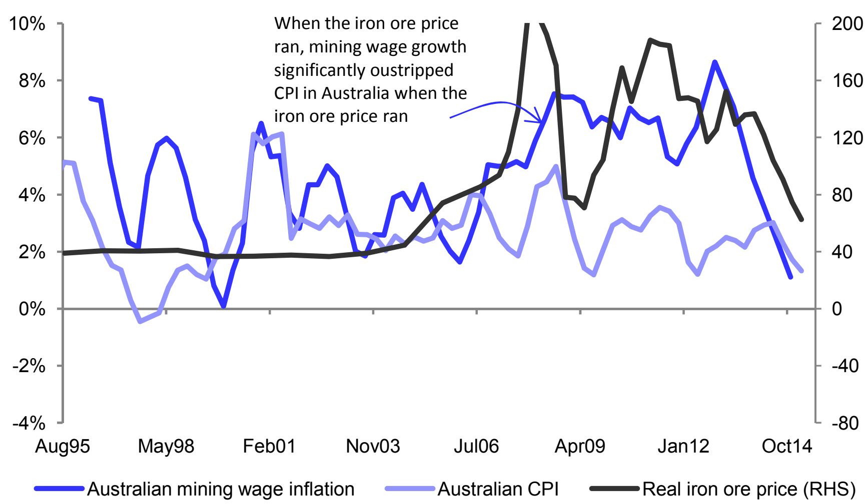
Source: Deutsche Bank estimates/assumptions, datastream

Mining specific Inflation/Deflation

During commodity price runs, there is never enough supply of mining inputs to meet the increased demand from the miners ranging from tyres, equipment, engineers, manpower through to accommodation, transportation and administration services. Economics 101 kicks in at this point and supply prices rise. Coupling this with rising energy prices from increased coal, gas and oil prices will drive cost inflation at the mines at much greater levels than the underlying CPI. These pressures reverse in commodity price downturns when the balance of negotiating power shifts and the miners can negotiate down the cost of supplies and services.

The chart below shows mining wage inflation in Australia significantly outstripped Australian CPI when the iron ore price ramped in the middle of the last decade; from 2006, wage growth averaged more than 3 percentage points higher than CPI. Note also now that the iron ore price has corrected, the latest data point shows that mining wage growth has fallen below CPI – so a wage decline in real terms.

Figure 37: Mining wage inflation oustrips CPI when commodities run.



Source: Deutsche Bank

Deliberate fat/"Good costs"

The third cyclical cost driver is deliberate costs put in by the miners themselves. This is really the result of a complete shift in paradigm. When commodity prices ramp, the focus shifts from cost control to maximising tonnes to chase higher revenue per tonne. A good example of this is in coal mining where open pit mines move vast quantities of material. In large open pit coal mines the overburden is typically removed by drag lines. During the coal price boom, many coal miners augmented overburden removal with contracted truck and shovel operations at 7x the unit cost (but when the price trebles in a two-year period the additional costs can be accommodated).

The deliberate costs also include things such as spares stockpiling to reduce breakdown times, additional equipment and manning. As commodity prices fall, the mining paradigm switches from maximising production to maximising margins and the deliberate costs are then stripped back out of the system. The relative ease at which these costs can be shed has been the key driver of the positive earnings surprise seen over the last 18 months in our opinion.

Calculating concentration

We have used the Herfindahl-Hirschman Index methodology for calculating the concentration of the cash flows for the miners. For each year we squared the percentage share of cash generated by commodity and then summed them to produce a concentration figure. The table below shows the calculation for year 1 of Anglo American.

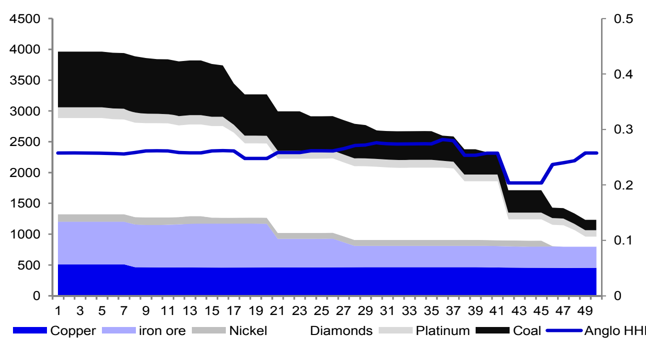
Figure 38: Year 1 concentration calculation for Anglo

	Normalised cash flows	% split	%split
Copper	491	12%	0.015
iron ore	785	19%	0.038
Nickel	122	3%	0.001
Diamonds	1560	39%	0.150
Platinum	171	4%	0.002
Coal	905	22%	0.050
Total	4034	100%	**0.255**

Source: Deutsche Bank estimates/assumptions

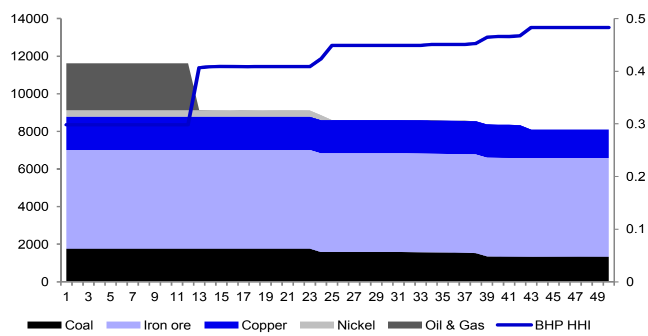
The higher the concentration number, the more concentrated the cash flows are. The charts below show graphically the split of resources cash flows over time by commodity and the movement in cash flow concentration over time for the miners.

Figure 39: Anglo total resource cash flows by commodity



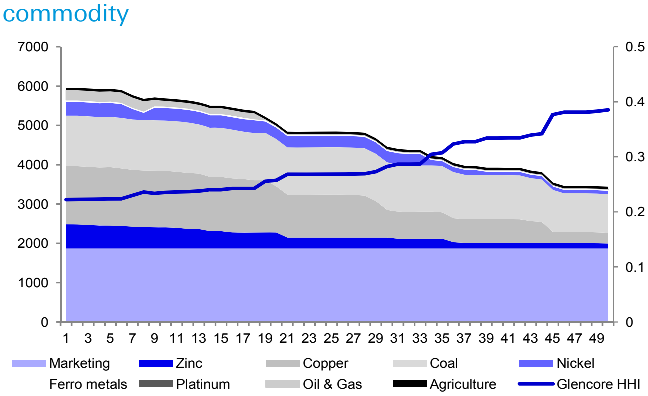
Source: Deutsche Bank estimates/assumptions

Figure 40: BHP total resource cash flows by commodity



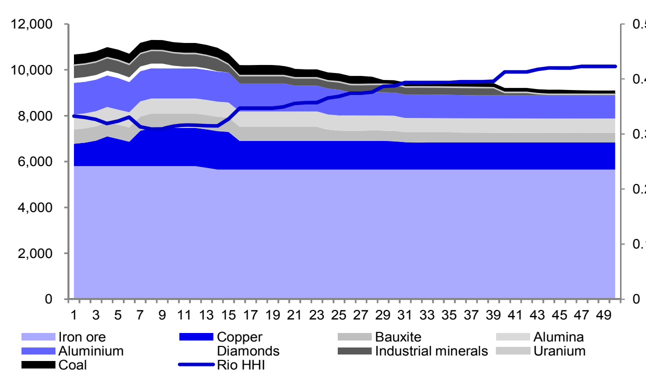
Source: Deutsche Bank estimates/assumptions

Figure 41: Glencore total resource cash flows by commodity



Source: Deutsche Bank estimates/assumptions

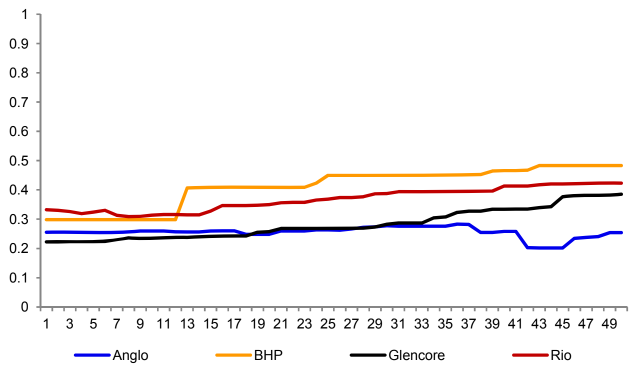
Figure 42: RIO total resource cash flows by commodity.



Source: Deutsche Bank estimates/assumptions

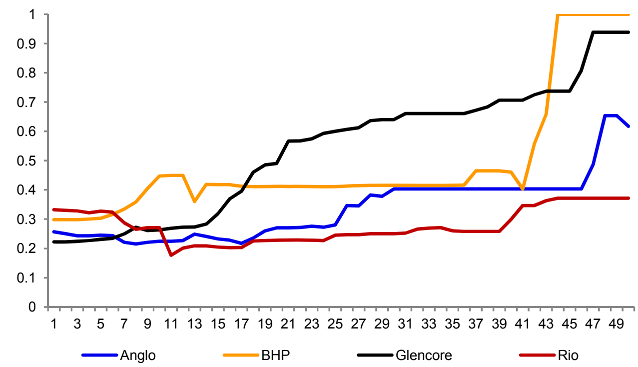
We commented earlier about the cash flow concentrations from the respective resource bases of the miners and we show these again in the chart below, but we also show the cash flow concentrations from the current reserve bases only which show a couple of interesting features for the miners. Over the next 10 years, Rio's reserve base would move from the most concentrated to the least concentrated of the miners. BHP still moves relatively quickly to have the least diversified cash flows from its current reserve base, but is then over taken by Glencore in around 18 year's time.

Figure 43: Resource base cash flow concentrations



Source: Deutsche Bank estimates/assumptions

Figure 44: Reserve base cash flow concentrations



Source: Deutsche Bank estimates/assumptions

Long-run valuation methodology

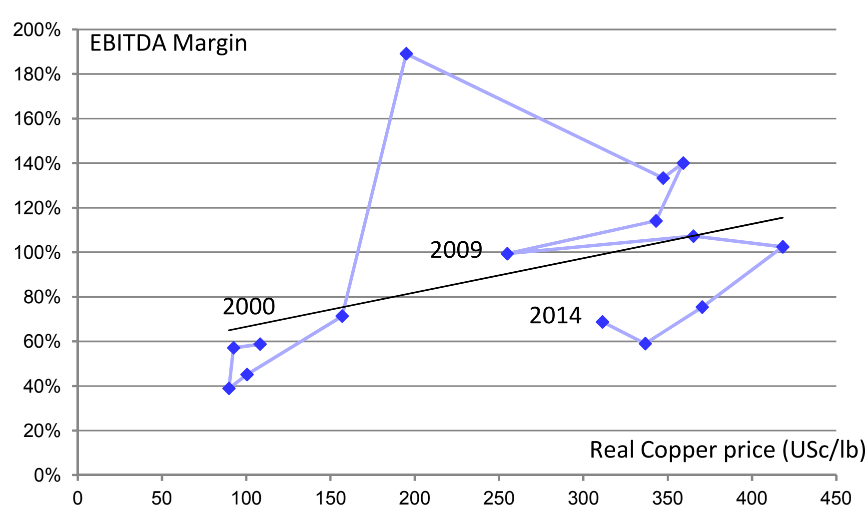
For each of the majors, we have modelled each asset at long-run margins and long-run commodity prices for the life of mine. As defined by the reserves and resource statements for the companies. As always, we have made a number of assumptions in the analysis for the assets including:

- We assume that each operation is in steady state as defined by the current approved plans of the company; i.e., if the company is currently spending capital on project, we model the asset at steady state assuming the planned production tonnes are achieved. We do not model unapproved capex. For example, we model Rio Tinto's Oyu Tolgoi open pit, but do not model the unapproved underground.
- We calculate the long-run margin based on the regression of the historical margins at our long-run price assumption.
- We assume that only maintenance capex is spent at each site, and no growth capex.
- We assume at steady state that depreciation matches the maintenance capex.

Bingham canyon as an example.

We will not provide the detail on every asset (readers can contact us and we will send it through), but have used the Bingham canyon mine here as an example of the approach that we have taken. Bingham Canyon is a copper mine in the US and part of Rio Tinto's KUC assets. We show below its EBITDA Margin vs copper price over the last 15 years in the chart below. The time period captures the century low prices experienced in the early 2000's.

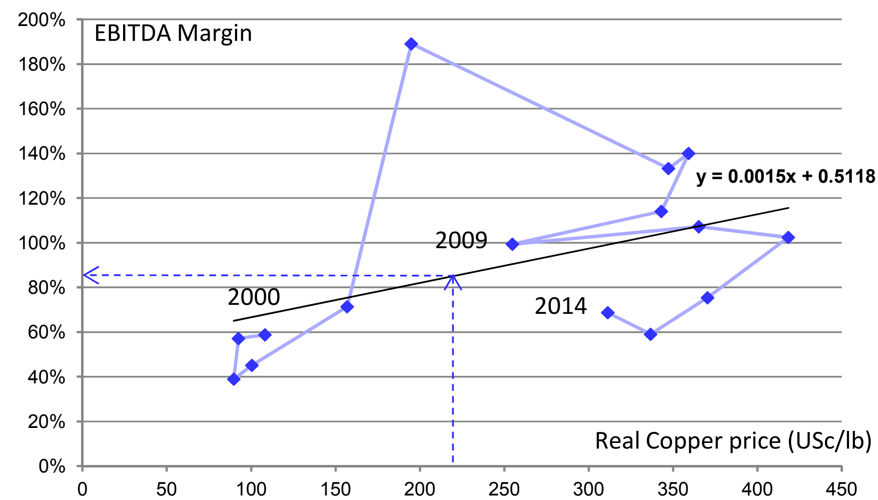
Figure 45: Bingham canyon EBITDA Margin and real copper price by year.



Source: Company data, Deutsche Bank estimates/assumptions LME, Datastream, Wood Mackenzie

We then applied a linear regression fit to the data as shown in the chart below and used this to calculate the EBITDA margin at the long-run average real copper price of US$2.22/lb. Note that the relatively high margin is generated because of the high levels of by-products which offset some of the costs.

Figure 46: We assume a long run EBITDA margin for Bingham Canyon of 84.5% at a copper price of US$2.22/lb



Source: Company data, Deutsche Bank estimates/assumptions LME, Datastream, Wood Mackenzie

From these assumptions, we generate a real cash generation model over the life of the assets. We show an abridged version of this in the table below.

Figure 47: Cash flow at steady state for Bingham Canyon

Reserves		2.65	2.46	2.27	2.08	1.89	1.70	1.51	1.32	1.13	0.94	0.75	0.56	0.37	0.18	0.00	0.00
Additional resources		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.00
Inferred resources		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.00
Ownership	100%	Recovery	85%	Tax	35%	Royalty	2%										
Year		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Copper Price	US$/t	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904	4904
Production	kt	190	190	190	190	190	190	190	190	190	190	190	190	190	181	0	
Additional Resource production	kt	0	0	0	0	0	0	0	0	0	0	0	0	0	9	150	
Inferred resource production	kt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	
Revenue	US$m	932	932	932	932	932	932	932	932	932	932	932	932	932	886		
Margin		84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%	84.5%		
EBITDA		788	788	788	788	788	788	788	788	788	788	788	788	788	749		
Sustaining Capex		110	110	110	110	110	110	110	110	110	110	110	110	110	105		
Tax		251	251	251	251	251	251	251	251	251	251	251	251	251	239		
Reserve FCF		427	427	427	427	427	427	427	427	427	427	427	427	427	406		
M&I Resource FCF		0	0	0	0	0	0	0	0	0	0	0	0	0	21	338	0
Inferred resource FCF		0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	0
Reserve NPV	3931																
M&I resource NPV	148																
Inferred NPV	22																

Source: Deutsche Bank forecasts/estimates/assumptions

Company Asset performance

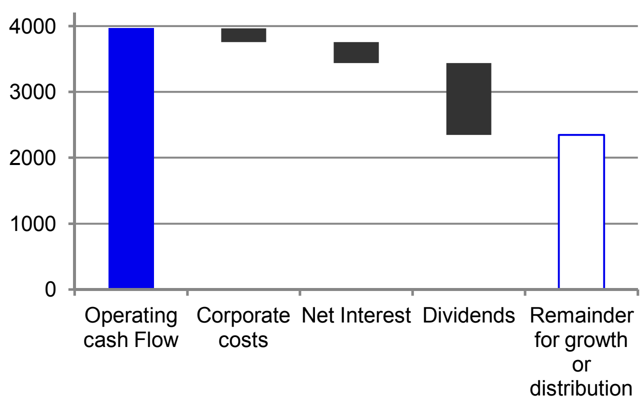
In the following pages, we provide detail on the analysis performed for each the companies.

Anglo American

On a normalised basis, Anglo's current dividend of US$1,091m represents 28% of the operating cash flow (cash generated minus sustaining capex) leaving US$5.4b for additional distribution or growth as shown in the chart below.

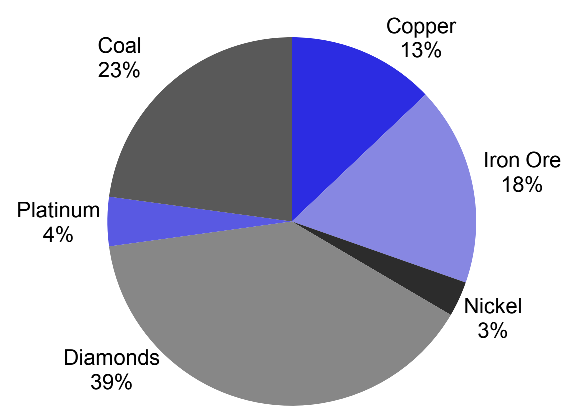
Over a third of the cash flow is generated from the diamond assets on a normalised basis and just over half comes from coal, copper and iron ore combined.

Figure 48: Anglo normalised cash flow bridge



Source: Deutsche Bank estimates/assumptions

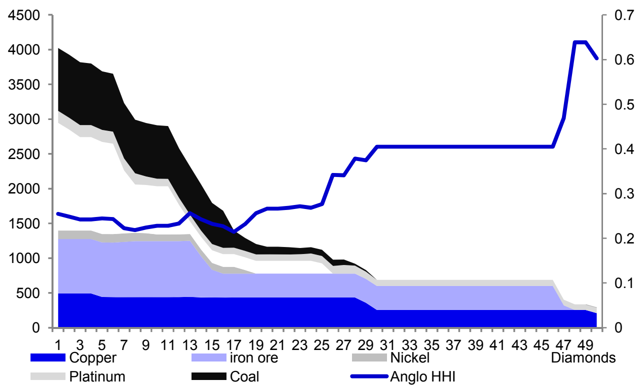
Figure 49: Anglo normalised cash flow split.



Source: Deutsche Bank estimates/assumptions

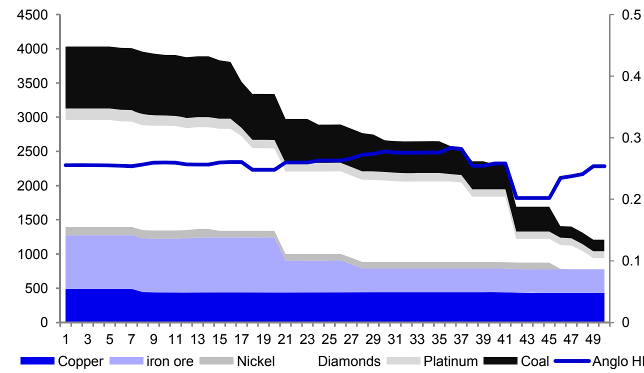
As we look at the normalised cash flows out over time we show both the reserve and resource cash flows by commodity in the charts below. Cash flow from reserves starts falling away immediately due to some short lived mines in the group (Letlhakane and Namdeb diamonds where declared reserves are low as Namdeb is an alluvial operation). Anglo currently has the second most diverse cash flows by source and remains this way for some decades as its reserve bases decline at similar rates across its various commodities.

Figure 50: Reserve cash flows by commodity over time



Source: Deutsche Bank

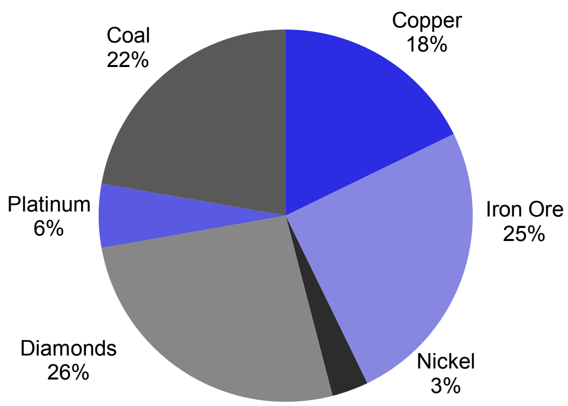
Figure 51: Resource cash flows by commodity over time



Source: Deutsche Bank

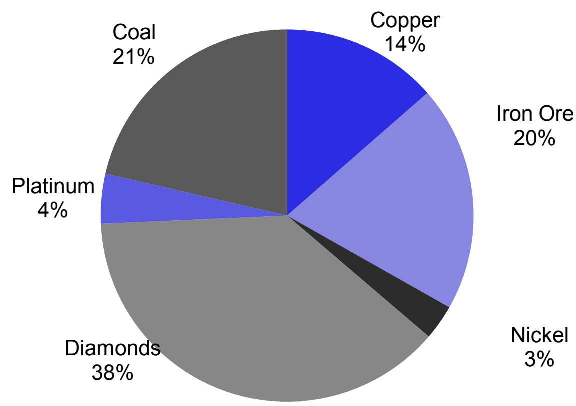
These cash flows translate to the following split of operating NPVs for Anglo on a normalised basis. On a reserve basis (i.e., what you are buying now) the value is driven a quarter each from Diamonds and Iron ore and a further 5th each from coal and copper. The change in value generation split when we look at the value from the total resources comes from the diamond division reflecting the large resource base for the group relative to reserves.

Figure 52: Anglo normalised Reserve NPV split



Source: Deutsche Bank estimates/assumptions

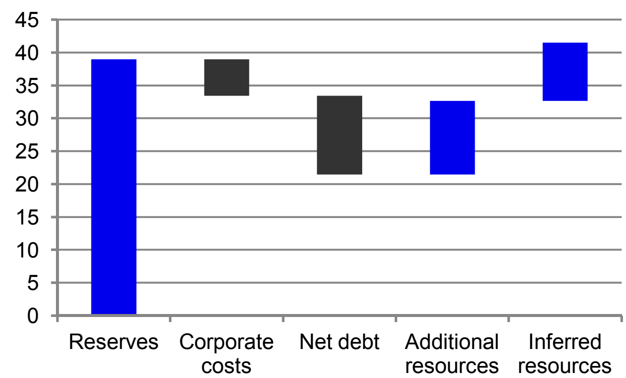
Figure 53: Anglo normalised Resource NPV split



Source: Deutsche Bank estimates/assumptions

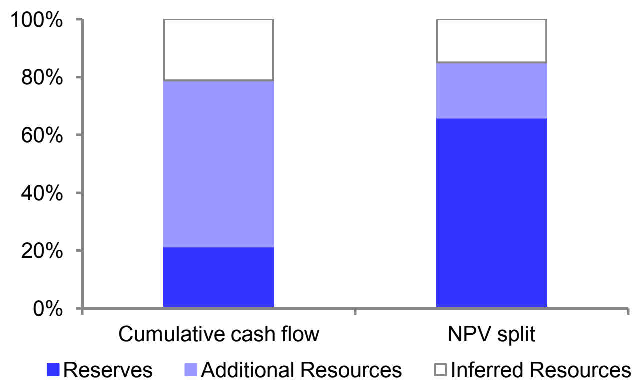
Unusually, only about 20% of the cumulative cash flows for Anglo sit in its reserves. A considerable 60% sits in its additional resources ex inferred resources. What this means is that the company has spent money on exploration to firm up its resource certainty, but then has not developed it further (also partially a result of the management review of the current asset base). This is a significant value enhancement opportunity for Anglo, in our view, if it can bring this cash flow forward.

Figure 54: Anglo Normalised NPV bridge



Source: Deutsche Bank estimates/assumptions

Figure 55: Anglo Normalised operating cash flow and NPV split



Source: Deutsche Bank estimates/assumptions

We detail the normalised valuation split by asset in the table below

Figure 56: Normalised free cash flow and NPV for Anglo Assets (US$m)

		Steady state free cash flow	Reserve NPV	Additional Measured and Indicated resource NPV	Inferred resource NPV
Copper					
	Mantos Blancos	10	92	55	13
	Mantoverde	52	184	110	5
	El Soldado	-6	-47	-25	-2
	Los Bronces	179	2491	373	220
	Collahuasi	276	4542	235	72
Iron Ore					
	Sishen	248	2277	550	87
	Kolomela	121	1170	227	237
	Thabazimbi	-20	-107	-43	-20
	Minas Rio	344	5568	468	0
Nickel					
	Codemin (Niquelândia)	25	166	61	8
	Barro Alto	97	1059	264	242
Niobium					
	Boa Vista (Catalão)				
Diamonds					
	Snap Lake	23	88	100	144
	Victor	18	75	3	0
	Gacho Kue	283	2362	119	510
	Venetia	184	2407	252	333
	Damtshaa	7	56	12	21
	Jwaneng	609	3167	2230	4189
	Letlhakane	12	5	52	7
	Orapa	221	1801	969	614
	Namdeb - Offshore	161	249	976	1583
	Namdeb - Terrestrial	42	37	34	264

Source: Deutsche Bank estimates

Figure 56: Normalised free cash flow and NPV for Anglo Assets (US$m) (Cont'd)

	Steady state free cash flow	Reserve NPV	Additional Measured and Indicated resource NPV	Inferred resource NPV
Platinum				
Bathopele	-2	-25	-3	0
Thembelani	-15	-188	-74	0
Siphumelele	-9	-114	-36	0
Tumela	10	85	83	0
Dishaba	-4	-70	-2	0
Union	-12	-156	-47	0
Mogalakwena	83	1462	1	0
Unki	9	143	12	0
Modikwa	27	381	99	0
Kroondal	22	139	0	0
Mototolo	25	165	86	5
BRPM	12	165	46	1
WLTR	18	104	159	0
Purchased concentrate	7	56	50	8
Coal				
Callide	28	386	85	6
Dawson	54	424	298	85
Capcoal	82	764	266	8
Moranbah North	75	845	198	10
Grosvenor	93	1262	278	22
Foxleigh	1	4	0	4
Goedehoop	46	239	462	7
Greenside	30	297	54	0
Kleinkopje	17	91	28	0
Mafube	21	261	32	1
Kriel	39	119	278	1
Zibulo	49	475	307	47
Cerrejón	226	2351	1239	42
Landau	33	123	169	22
Isibonelo	23	191	34	0
New Denmark	-31	-424	-78	-2
New Vaal	122	1258	0	0
Total Operations	**3962**	**38455**	**11046**	**8794**
Corporate costs	-205	-5537		
Net Debt		-11999		
Dividends	-1091.4			
Net interest	-320			
Total	**2551**	**20919**		

Source: Deutsche Bank estimates

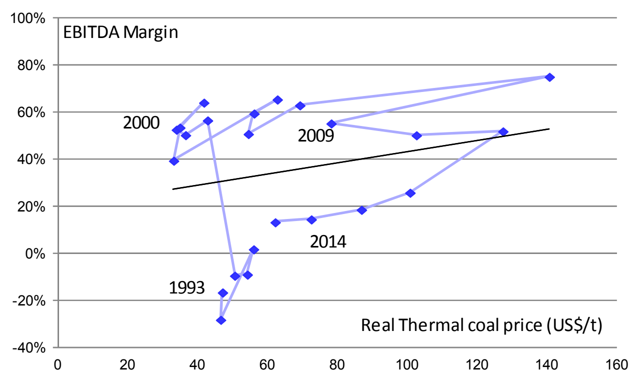
Coal

Anglo has a variety of different types of coal mines. For our long-run margin analysis we therefore used some blended long-run prices to reflect the different products across the division. We used a domestic coal price for the South African mines 60% lower than the export thermal coal price. For the price received by Callide mine in Australia domestically, we assumed it is a consistent 40% of the export thermal coal price.

Anglo has announced its intention to sell four mines in Australia: Callide, Dawson, Dartbrook (not included in our analysis as on care and maintenance) and Foxleigh. Looking at the normalised margins for these mines which we have calculated (a range of 25 to 29%), it makes sense for Anglo to exit when compared with the mines on which it wants to focus – hard coking coal mines such as Moranbah North and Grosvenor which have 42% and 37% margins on our estimates.

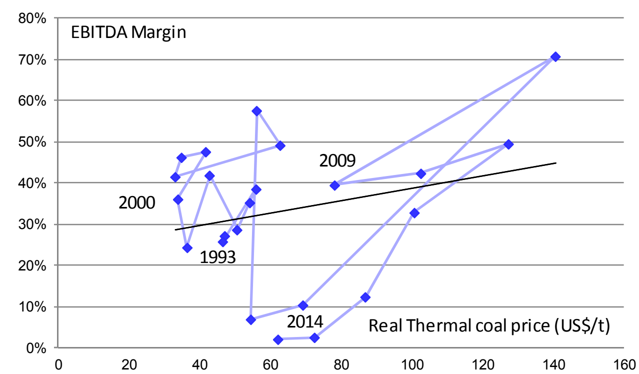
In terms of thermal coal, the Cerrejon mine in Colombia in which Anglo has a 33% share with BHP (33%) and Glencore (33%) generates high margins of 43% and strong free cash flows at long-run thermal coal prices. Anglo's South African thermal coal mines have lower margins in general but, with the exception of New Denmark mine which supplies Eskom and is loss-making at long-run prices, they generate positive free cash flow.

Figure 57: Callide (29% relative margin LT)



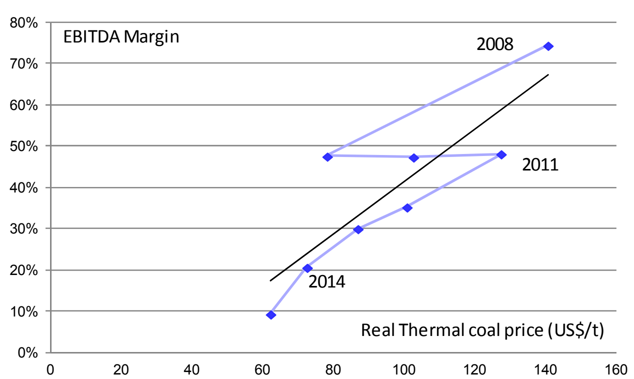
Source: Company data, Deutsche Bank estimates, datastream

Figure 58: Dawson (25.2% relative margin LT)



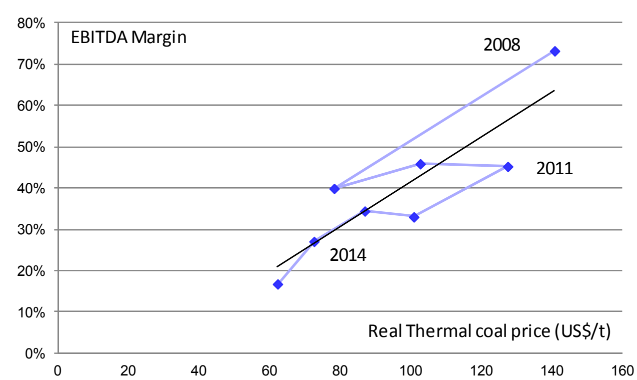
Source: Company data, Deutsche Bank estimates, datastream

Figure 59: Goedehoop (21.5% relative margin LT)



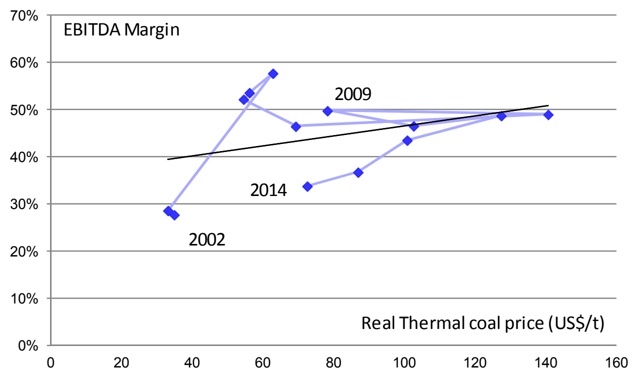
Source: Company data, Deutsche Bank estimates, datastream

Figure 60: Greenside (23.9% relative margin LT)



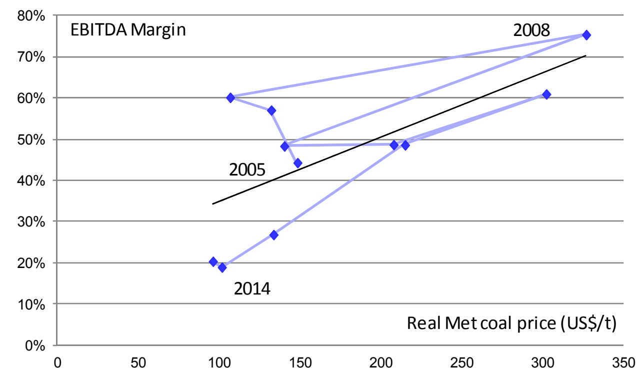
Source: Company data, Deutsche Bank estimates, datastream

Figure 61: Cerrejon (43.5% relative margin LT)



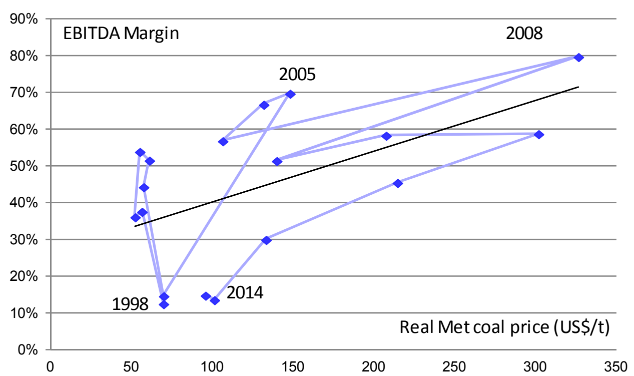
Source: Company data, Deutsche Bank estimates, datastream

Figure 62: Capcoal (37.4% relative margin LT)



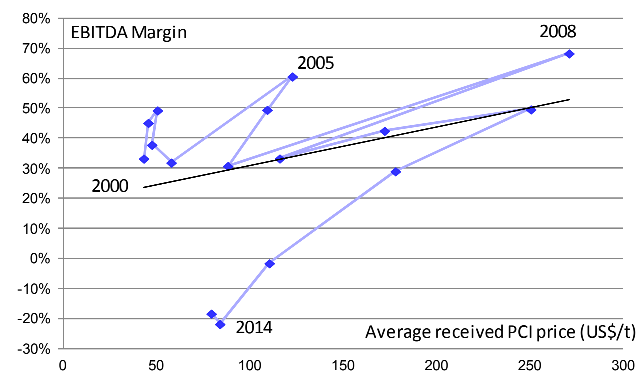
Source: Company data, Deutsche Bank estimates, datastream

Figure 63: Moranbah North (42.0% relative margin LT)



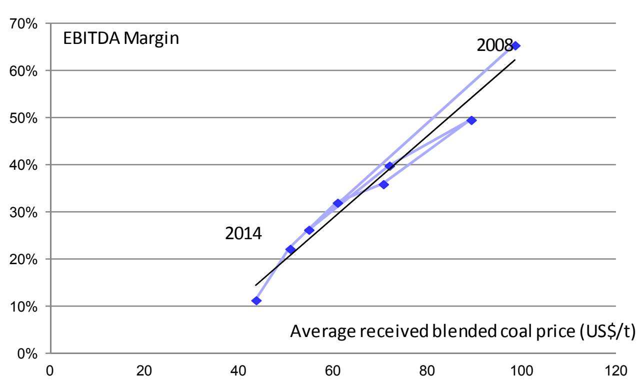
Source: Company data, Deutsche Bank estimates, datastream

Figure 64: Foxleigh (29% relative margin)



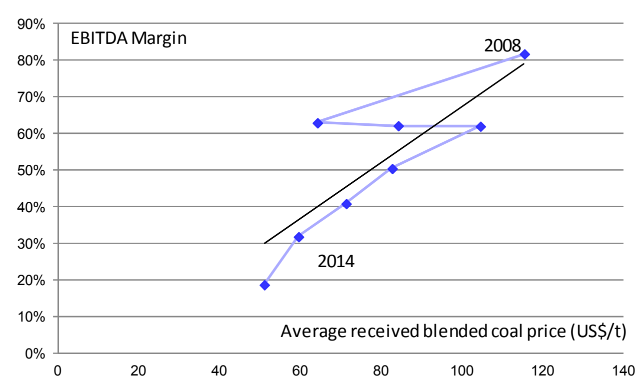
Source: Company data, Deutsche Bank estimates, datastream

Figure 65: Kleinkopje (18.1% relative margin LT)



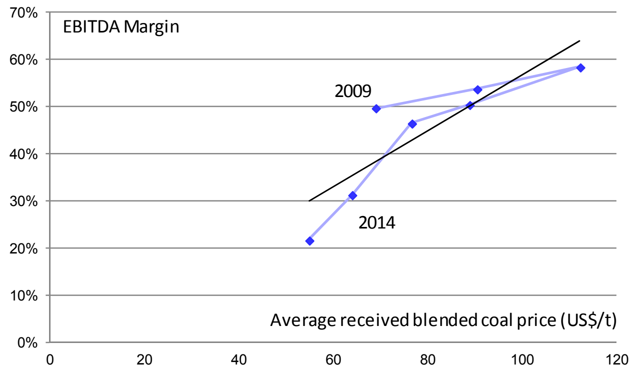
Source: Company data, Deutsche Bank estimates, datastream

Figure 66: Mafube (33.7% relative margin LT)



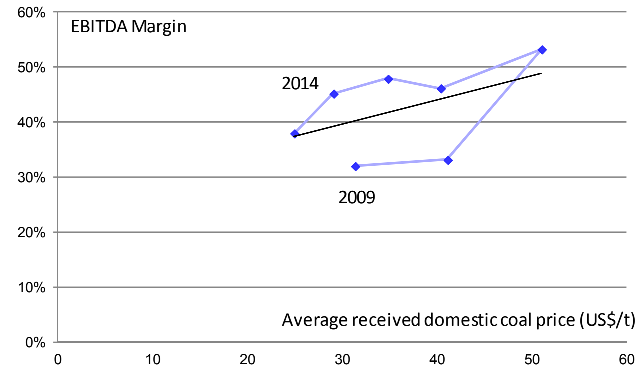
Source: Company data, Deutsche Bank estimates, datastream

Figure 67: Zibulo (33.5% relative margin LT)



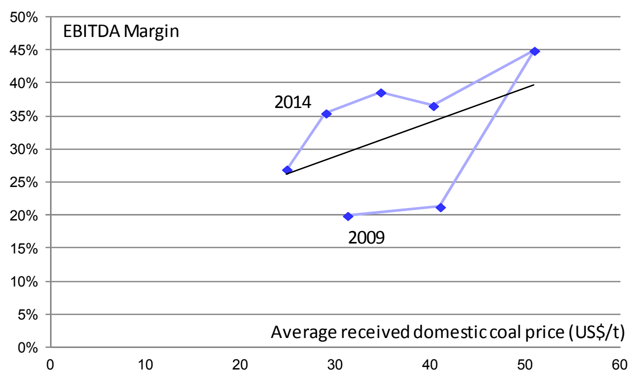
Source: Company data, Deutsche Bank estimates, datastream

Figure 68: Kriel (38.8% relative margin LT)



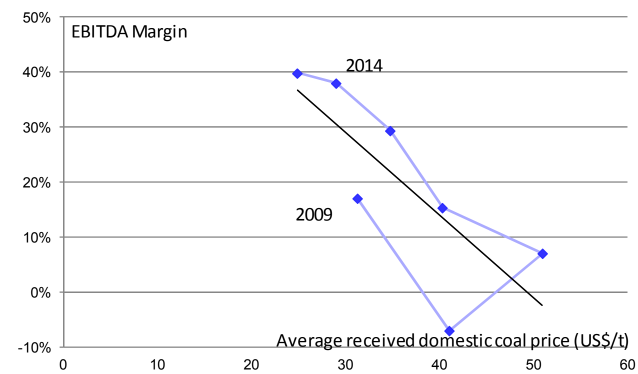
Source: Company data, Deutsche Bank estimates, datastream

Figure 69: Isibonelo (28.2% relative margin)



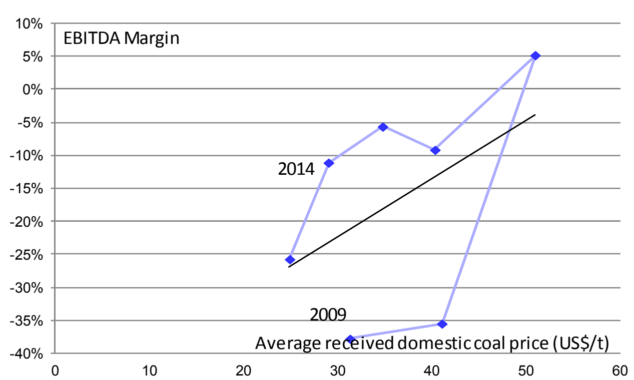
Source: Company data, Deutsche Bank estimates, datastream

Figure 70: Landau (20.0% relative margin)



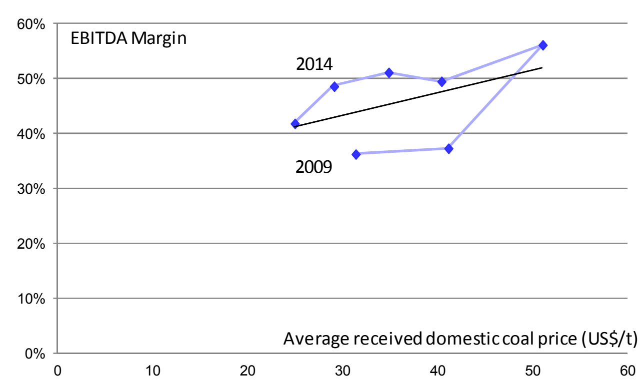
Source: Company data, Deutsche Bank estimates, datastream

Figure 71: New Denmark (-23.8% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 72: New Vaal (42.8% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Diamonds

We have very few historical financial and operating data for Anglo's diamond mines and as such the diamonds mines owned by both Anglo and Rio were more difficult to fit into the normalised model. Every diamond mine has a characteristic size and quality population distribution that will mean the achieved prices are very different – so there is no single long-run price for diamonds.

Instead, for Anglo, we used the 2020 cost curve provided at its 2014 De Beers Investor Day. This cost curve guides to the 2020 direct cash costs which Anglo expects (in real terms). We then use the average received price for each of Anglo's diamond mines to get revenue and from there derive a normalised margin. Figure 73 shows the range of implied margins on this basis from 87% at Anglo's largest diamond mine Jwaneng in Botswana, down to 22% at its short-lived high-cost Canadian mine Snap Lake.

Figure 73: Diamond mine margins implied by 2020 cost curve

Mine	Direct cash costs/Rev	Estimated revenue	Implied costs	Implied margin
Jwaneng	0.13	2,490	324	87.0%
Orapa	0.23	1,356	312	77.0%
Venetia	0.24	660	158	76.0%
Letlhakane	0.27	79	21	73.0%
Damtshaa	0.28	45	13	72.0%
Namdeb - Offshore	0.29	719	208	71.0%
Gacho Kue	0.40	1,522	609	60.0%
Namdeb - Terrestrial	0.58	326	189	42.0%
Snap Lake	0.78	255	199	22.0%

Source: Deutsche Bank estimates, Company data

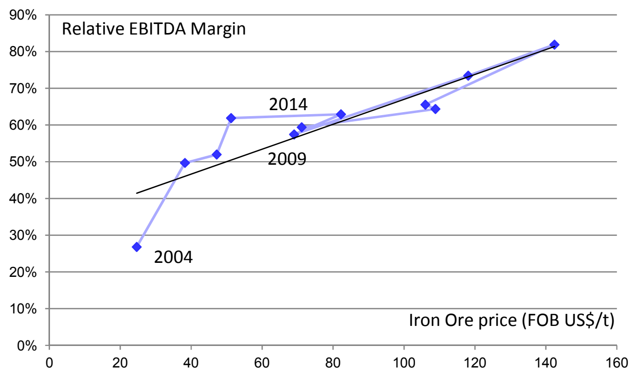
To calculate capex we assumed a unit SIB rate of US$14 per carat. We then added US$16 per carat of stripping capex to the open pit mines in southern Africa.

Iron ore

For Anglo's two main South African iron ore mines we assume that they run at steady-state capacity – at the moment Sishen's production is some 4mtpa below its nameplate and Kolomela is running above its 11 Mtpa nameplate at 13Mtpa. Between the two mines we assume steady-state SIB capex is US$390m per year, or US$7.4/tonne at steady-state production of 40mt and 13mt for Sishen and Kolomela respectively. Thabazimbi mine supplies Arcelor Mittal with iron ore for domestic use – we assume the SIB capex for Anglo's account is US$9/t.

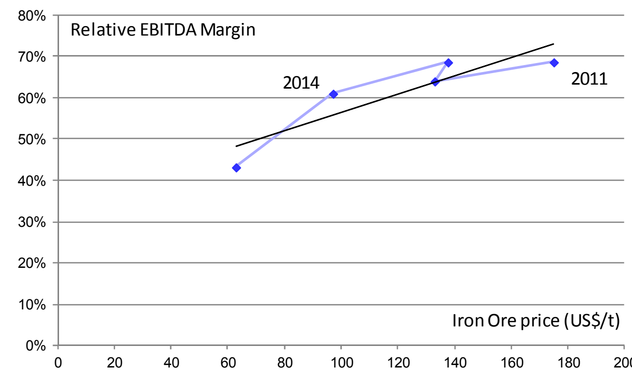
There is no margin history and, hence, no chart for Minas Rio, Anglo's Brazilian iron ore mine in ramp-up. We have assumed steady-state production of 26.5mtpa (there is an opportunity to de-bottleneck the filtration plants at port to get to 29mtpa) and that a normalised margin should be around 38% - we based this on our view of a middle of the cost curve position for Minas Rio. We base annual SIB capex of US$220m on company guidance for a starting point of US$5/t for SIB plus port capex of US$1/tonne (Anglo's share) at the mine's commissioning and then averaged out over the mine's life.

Figure 74: Sishen (49.8% relative margin LT)



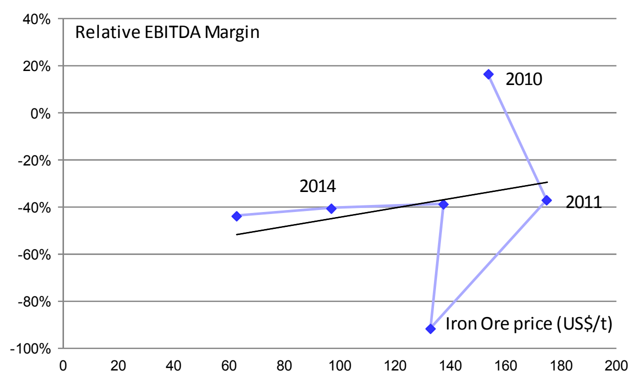
Source: Company data, Deutsche Bank estimates, datastream,

Figure 75: Kolomela (49.2% relative margin LT)



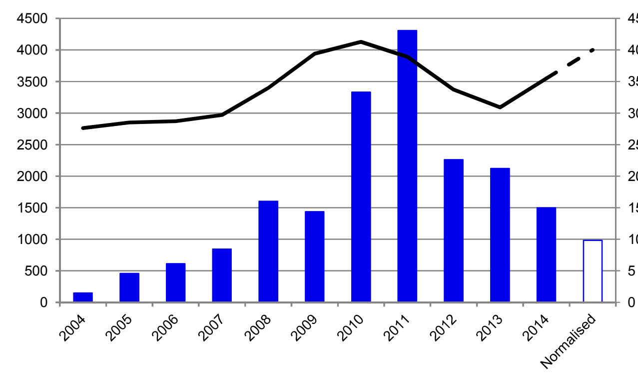
Source: Company data, Deutsche Bank estimates, datastream,

Figure 76: Thabazimbi (-57.2% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream,

Figure 77: Sishen Real EBITDA (US$m)



Source: Company data, Deutsche Bank, datastream

Copper

Although Anglo has announced its intention to sell its three smaller copper mines in Chile –Mantos Blancos, Mantoverde and El Soldado – plus its Chagres smelter, we include them in our analysis along with the bigger Los Bronces and Collahuasi mines. We do not include Anglo's Quelleveco project in Peru as it is not yet approved by the Anglo board.

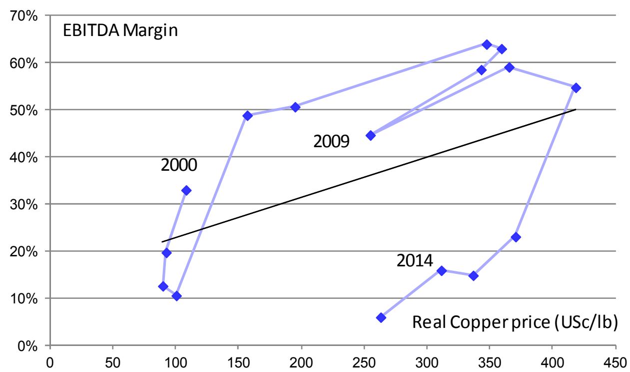
The margins we calculate for the mines which are for sale are solid but lower than those for Los Bronces and Collahuasi due to their lower grade and shorter lives. El Soldado does not generate free cash flow at long-run copper prices.

For the larger mines we reflected Anglo's guidance in terms of normalised annual capacity:

For Los Bronces, today's production is around 340ktpa, which then drops down to 280ktpa and 245ktpa as grades decrease. We have used an average annual capacity of 320kt, which ties in to the life of mine Anglo disclosed in its 2014 annual Reserves statement of around 35 years.

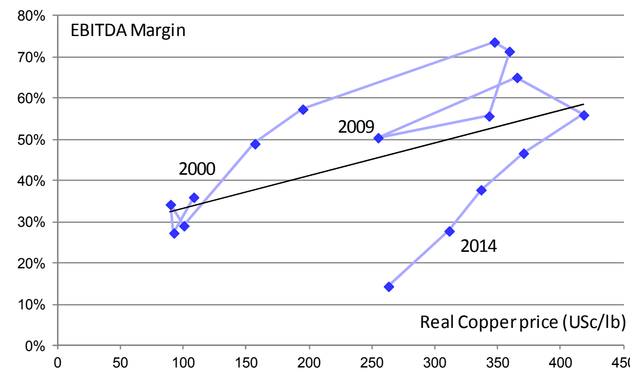
For Collahuasi, today's production is around 195kt. We forecast this to increase to a peak of 232kt due to increased throughput in the next five years. However, for this analysis, we assume life of mine normalised production of 200ktpa.

Figure 78: Mantos Blancos (32.2% relative margin LT)



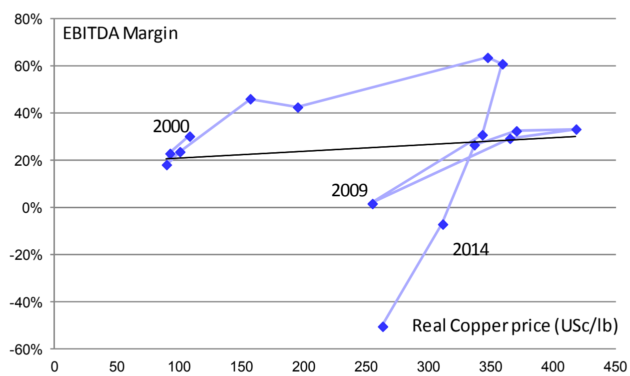
Source: Company data, Deutsche Bank estimates, datastream

Figure 79: Mantoverde (43.1% relative margin LT)



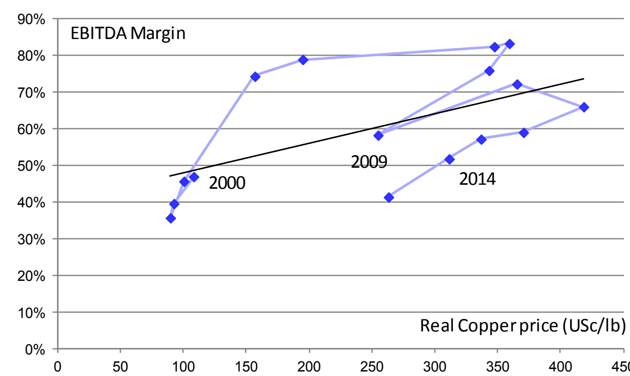
Source: Company data, Deutsche Bank estimates, datastream

Figure 80: El Soldado (24.4% relative margin LT)



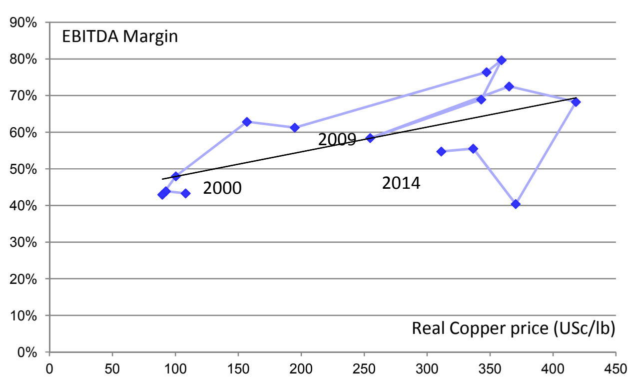
Source: Company data, Deutsche Bank estimates, datastream

Figure 81: Los Bronces (57.8% relative margin LT)



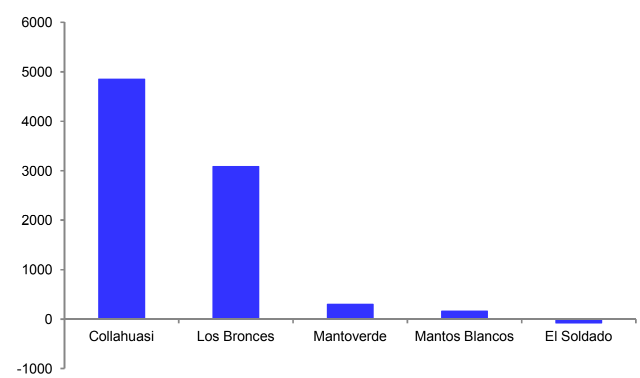
Source: Company data, Deutsche Bank estimates, datastream

Figure 82: Collahuasi (56.8% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 83: Normalised total resource NPVs

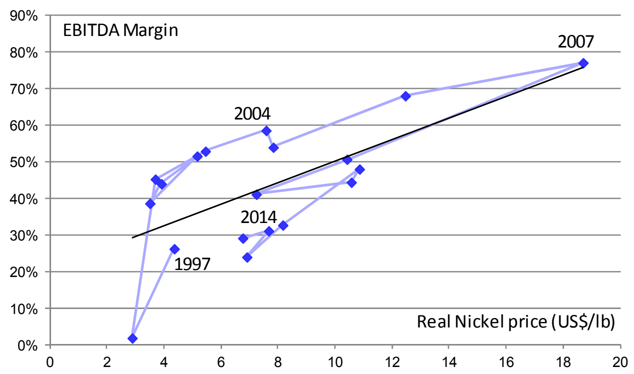


Source: Company data, Deutsche Bank estimates, datastream

Nickel

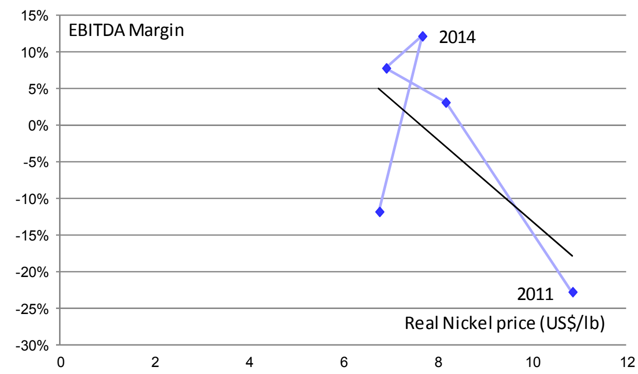
For Anglo's main nickel operation, Barro Alto, we have only five years of financial history – our analysis of this suggests a long-term normalised margin of 9%. We don't think that correctly reflects the cost position of the mine at steady state and thus, we use our forecast long-term margin of 43%.

Figure 84: Codemin (38.7% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 85: Barro Alto (43% relative margin LT)



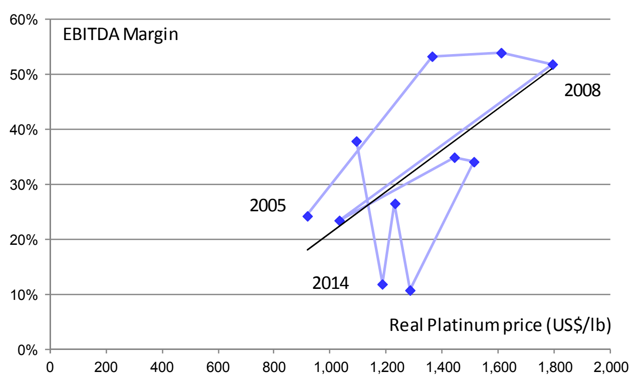
Source: Company data, Deutsche Bank estimates, datastream

Platinum

Our analysis of the normalised margins of Anglo's platinum mines lends support to the group's plan to exit its deeper, conventional, labour intensive mines in the Western Limb. The margins for those mines range from (1.5)% at Thembelani in Rustenburg to 16% at Tumela mine. The mines which are partly or fully mechanised have much higher margins – up to 50% at the smaller JV mines (mining margin) and 40% at the group's flagship platinum mine Mogalakwena.

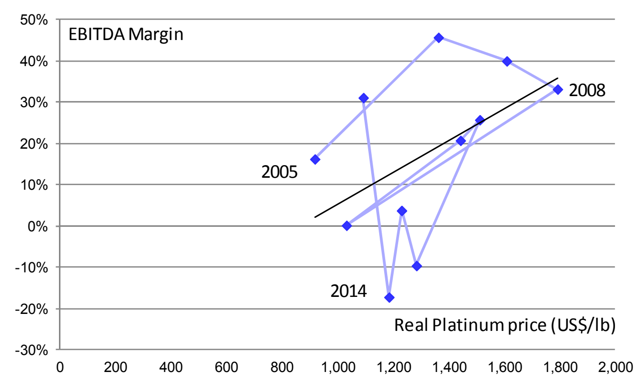
On a cash flow basis, using the long-run average Rand basket price, and assuming SIB capex remains at the average level seen over the last 10 year cycle (2005-2015), we estimate that the three Rustenburg mines are marginally cash flow negative, as is Union mine, and one of the two Amandelbult mines. The lower-cost mines, Mogalakwena, Unki, the three JVs, BRPM and the Western Limb tailings facility all generate free cash flow at long-run prices and margins.

Figure 86: Bathopele (15.7% relative margin LT)



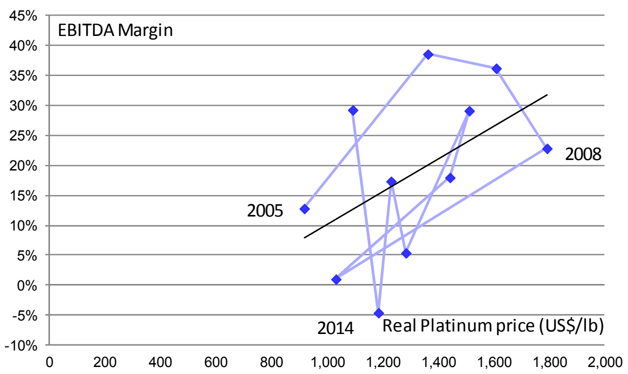
Source: Company data, Deutsche Bank estimates, datastream

Figure 87: Thembelani (-1.5% relative margin LT)



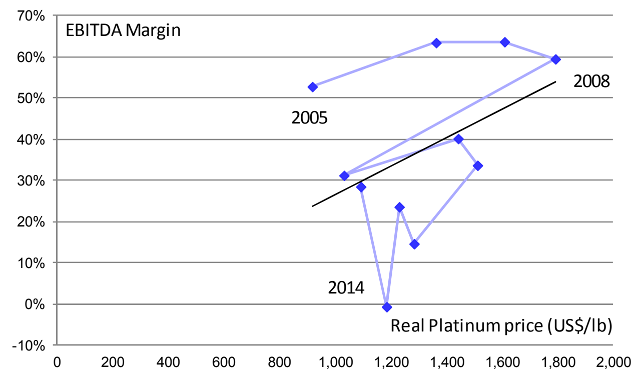
Source: Company data, Deutsche Bank estimates, datastream

Figure 88: Siphumelele (6.9% relative margin LT)



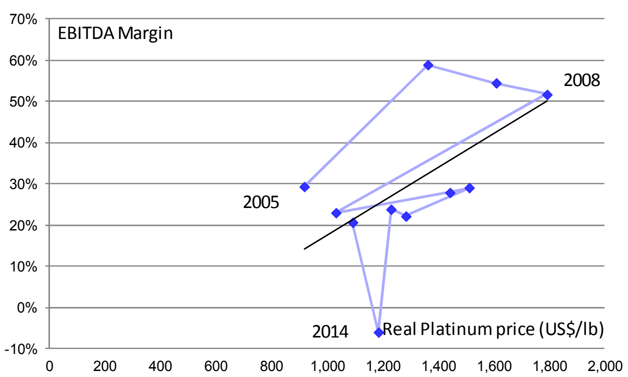
Source: Company data, Deutsche Bank estimates, datastream

Figure 89: Tumela (16% relative margin LT)



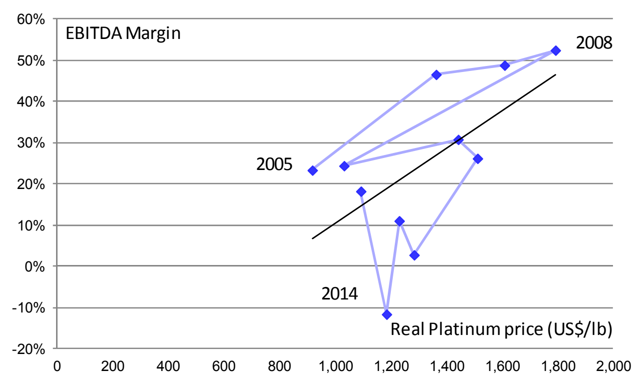
Source: Company data, Deutsche Bank estimates, datastream

Figure 90: Dishaba (8.1% relative margin LT)



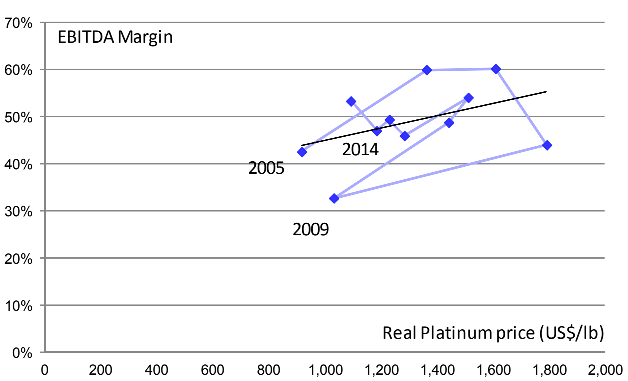
Source: Company data, Deutsche Bank estimates, datastream

Figure 91: Union (5.0% relative margin LT)



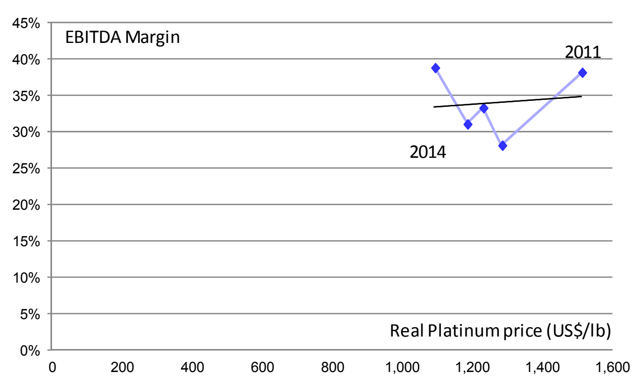
Source: Company data, Deutsche Bank estimates, datastream

Figure 92: Mogalakwena (39.8% relative margin LT)



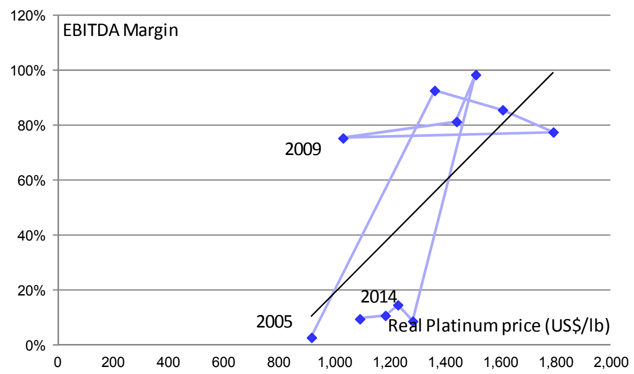
Source: Company data, Deutsche Bank estimates, datastream

Figure 93: Unki (29.5% relative margin LT)



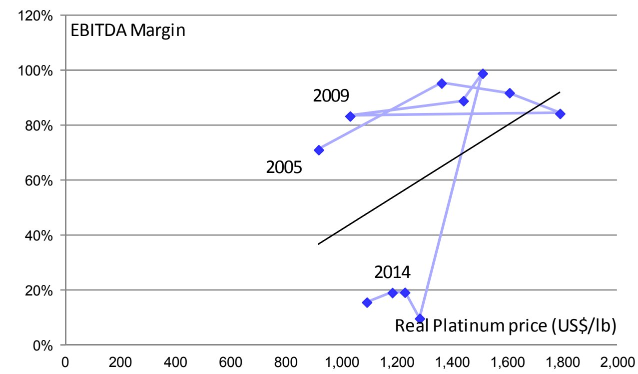
Source: Company data, Deutsche Bank estimates, datastream

Figure 94: Modikwa (50.8% relative margin LT)



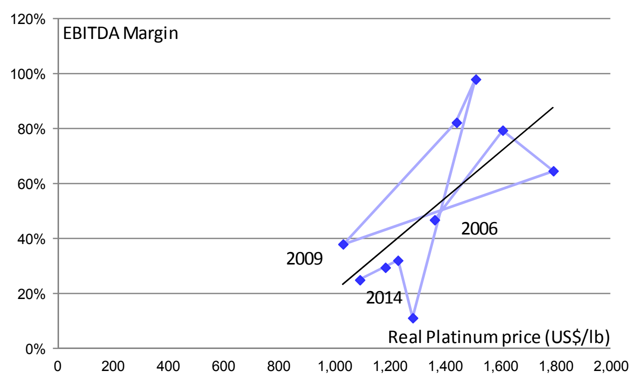
Source: Company data, Deutsche Bank estimates, datastream

Figure 95: Kroondal (26.5% relative margin)



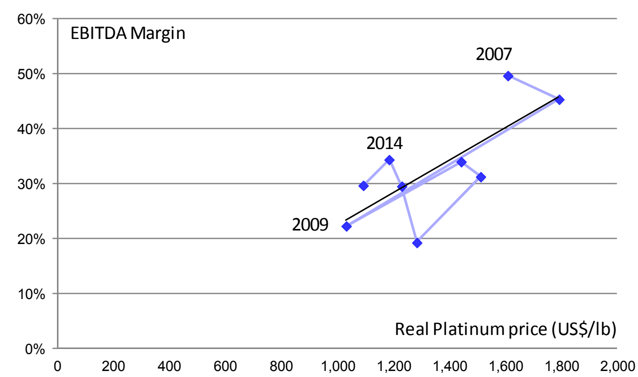
Source: Company data, Deutsche Bank estimates, datastream

Figure 96: Mototolo (50.8% relative margin LT)



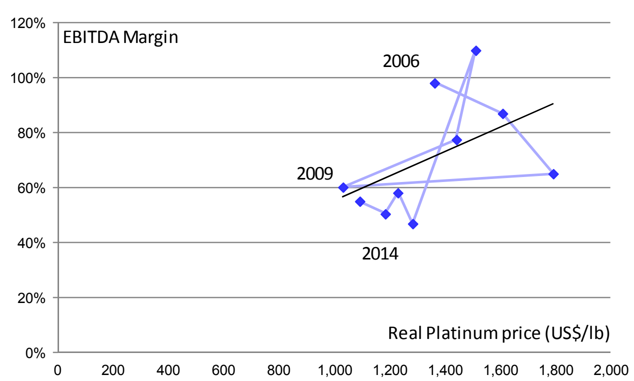
Source: Company data, Deutsche Bank estimates, datastream

Figure 97: BRPM (17.2% relative margin LT)



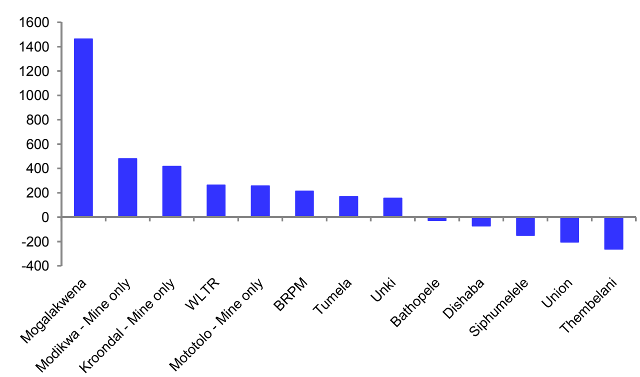
Source: Company data, Deutsche Bank estimates, datastream

Figure 98: WLTR (42.5% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 99: Normalised total resource NPV



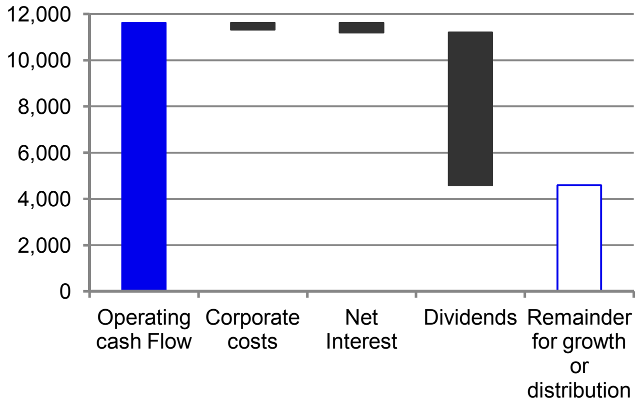
Source: Company data, Deutsche Bank estimates, datastream

BHP Billiton

On a normalised basis, BHP's current dividend of US$4.6b represents 57% of the operating cash flow (cash generated minus sustaining capex) leaving US$4.6b for additional distribution or growth as shown in the chart below.

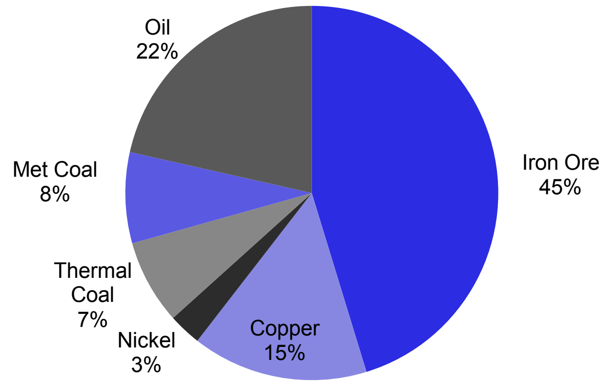
On a normalised cash flow basis, nearly half of the cash is generated by the iron ore business and just under a quarter by Oil and Gas.

Figure 100: BHP normalised cash flow bridge



Source: Deutsche Bank estimates/assumptions

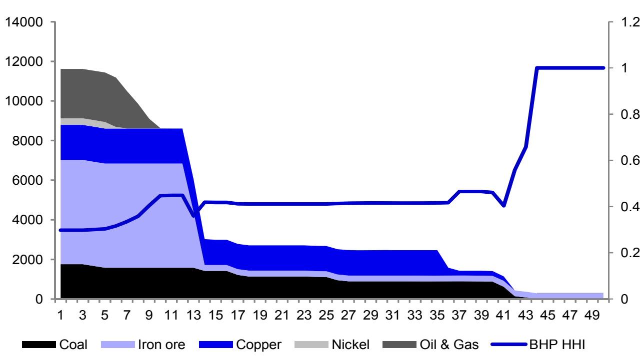
Figure 101: BHP normalised cash flow split.



Source: Deutsche Bank estimates/assumptions

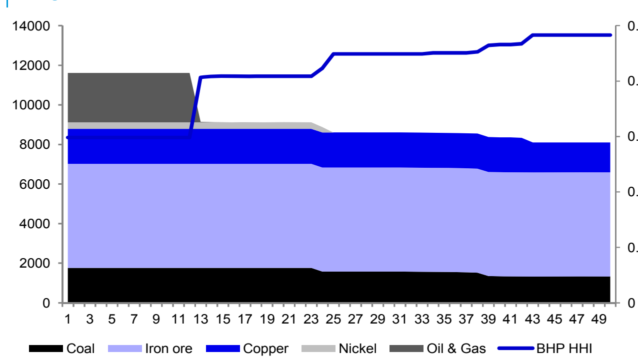
As we look at the normalised cash flows out over time we show both the reserve and resource cash flows by commodity in the charts below. Cash flow from reserves starts falling away reasonably rapidly in around 8 years as the oil reserves come to an end. A couple of years later there is a sharp drop as the iron ore reserves cut out as well. Moving to the resource outlook, the iron ore issue is not apparent as the resource base is large (For iron ore with its relatively consistent ore bodies, there is no need to convert more than around 10 years of resources into reserves), however the Oil and Gas cash flows still drop away sharply and will need to be replaced relatively shortly by the company if it plans to continue to be an oil and gas producer past the next decade. We note that BHP's reported reserve and resource definitions are not very granular with the oil and gas division simply reporting them as Australia, US and Other.

Figure 102: Reserve cash flows by commodity over time



Source: Deutsche Bank

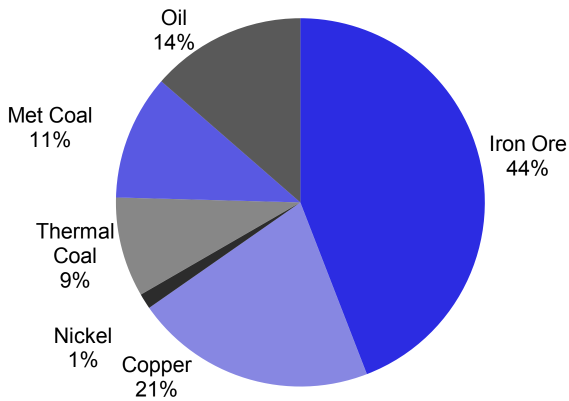
Figure 103: Resource cash flows by commodity over time



Source: Deutsche Bank

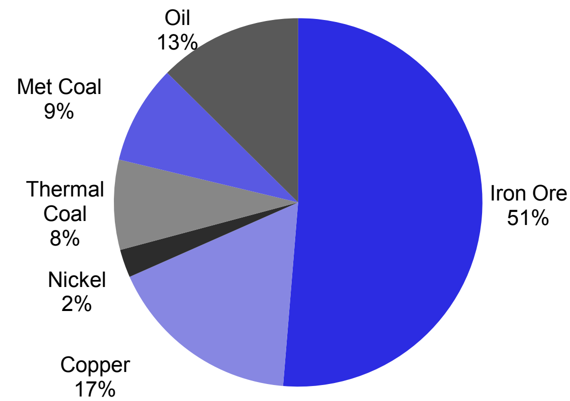
These cash flows translate to the following split of operating NPVs for BHP on a normalised basis. On a reserve basis (i.e. what you are buying now) the value is driven almost a half by iron ore and a fifth by copper with a similar split at the resource level. This reflects the large undeveloped resources in these two commodities for the existing assets, but unlocking these will require some further capital.

Figure 104: BHP normalised Reserve NPV split



Source: Deutsche Bank estimates/assumptions

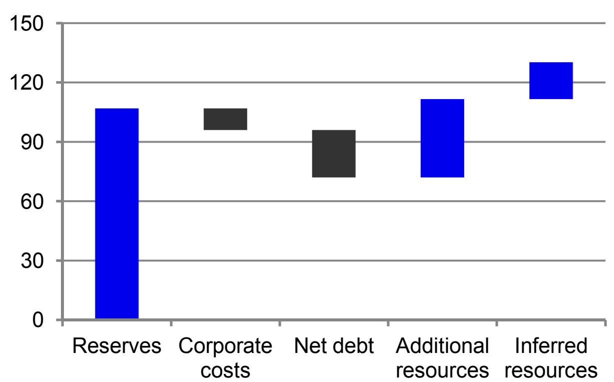
Figure 105: BHP normalised Resource NPV split



Source: Deutsche Bank estimates/assumptions

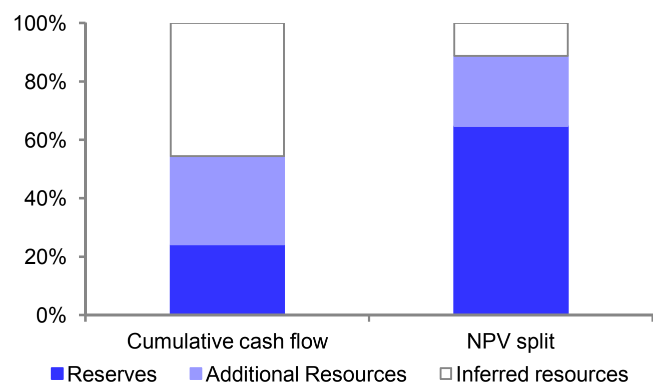
Only around 20% of the normalised cumulative cash flow for BHP sits in the reserves with most of the value sitting in the inferred resources, highlighting the large deposits that BHP has in its portfolio.

Figure 106: BHP Normalised NPV bridge



Source: Deutsche Bank estimates/assumptions

Figure 107: BHP Normalised operating cash flow and NPV split



Source: Deutsche Bank estimates/assumptions

We detail the normalised valuation split by asset in the table below

Figure 108: Normalised valuation by asset for BHP (US$m)

	Steady state free cashflow	Reserve NPV	additional measured and indicated resource NPV	Inferred resource NPV
Iron ore				
Mt Newman	1016	8683	4742	2934
Yandi	1355	11577	6323	3912
Mining Area C	1023	8741	4774	2953
Jimblebar	1575	13458	7350	4547
Samarco	290	4688	16	0
Copper				
Escondida	1038	14788	170	1711
Pampa Norte (Spence and Cerro Colorado)	236	2083	1618	85
Antamina	259	2216	881	767
Olympic Dam	238	3533	335	0
Nickel				
Nicket West (Mt Keith, Leinster, Cliffs)	330	1440	2009	621
Thermal coal				
Cerrejón	223	2245	1359	6
San Juan	183	559	1618	39
Mt Arthur	444	6575	624	3
Navajo	0	0	0	0
Met coal				
Goonyella	215	2715	734	15
Blackwater	192	2834	245	42
Peak Downs and Caval Ridge	142	2129	162	14
Saraji	116	1719	153	3
Daunia	28	338	36	13
South Walker Creek	157	1373	143	765
Poitrel	63	633	152	123
Oil				
Australia	1223	7816	2347	0
US	1249	6532	3849	0
Other	24	173	39	0
Total operations	**11616**	**106846**	**39679**	**18552**
Corporate costs	-300	-10,815		
Net Debt		-24,109		
Dividends	-6619			
Net interest	-413			
Total US$m	**4285**	**71,922**	**39,679**	**18,552**

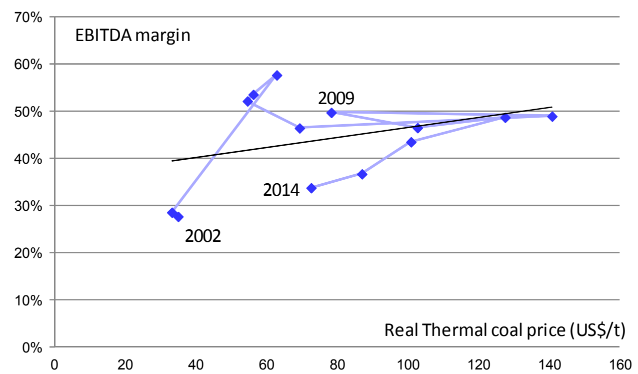
Source: Deutsche Bank estimates

Coal

We have included three thermal coal mines for BHP and excluded Navajo, of which BHP disposed in 2014 but will continue to operate until end 2016. Our Cerrejon analysis is in line with our estimates for the stakes held by Anglo and Glencore.

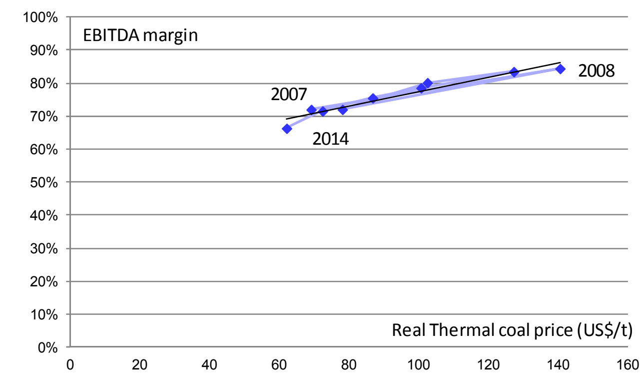
BHP's coking coal mines provide the majority of the cash flow and more reserve NPV than the thermal coal mines. To estimate the free cash flow of the group's seven met coal mines we assumed US$500m of annual SIB capex for the met coal division and weighted it by our estimate of normalised annual production. The long-run margins of BHP's older mines are high, ranging from 40 to 57%. The newer mines which BHP invested in over the past five years (when coking coal prices were at 40-year highs), Daunia and Caval Ridge, yield only 22-32% long-run EBITDA margins.

Figure 109: Cerrejon (43% relative margin LT)



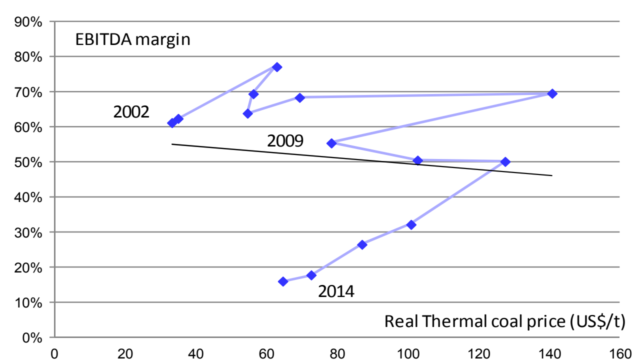
Source: Company data, Deutsche Bank estimates, datastream

Figure 110: San Juan (70.7% relative margin LT)



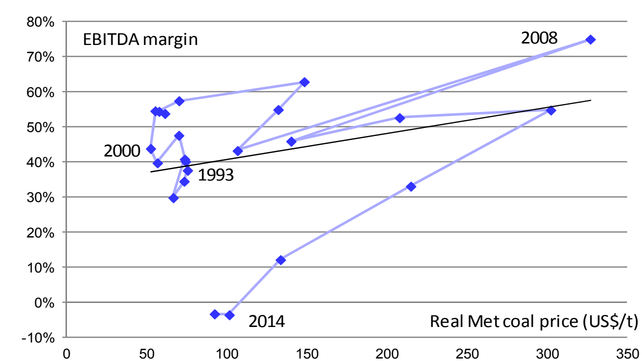
Source: Company data, Deutsche Bank estimates, datastream

Figure 111: Mt Arthur (52% relative margin LT)



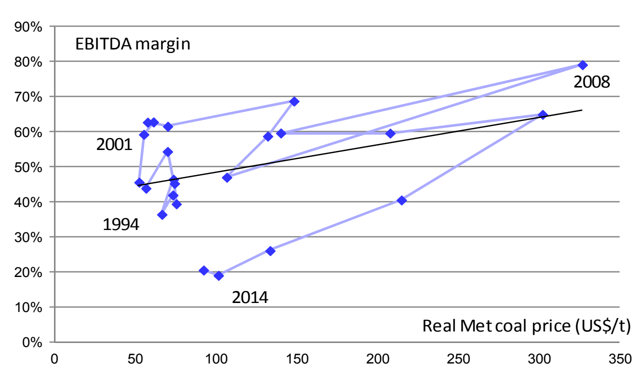
Source: Company data, Deutsche Bank estimates, datastream

Figure 112: Goonyella (41.4% relative margin LT)



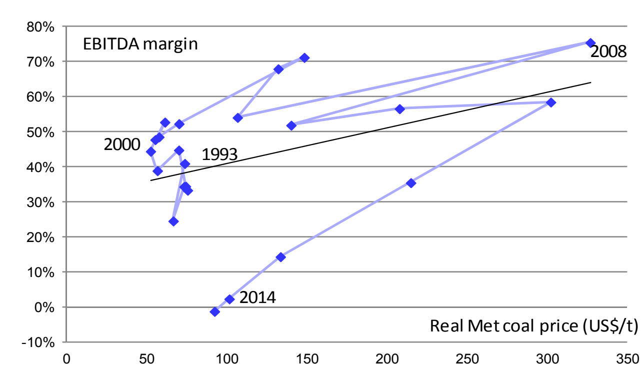
Source: Company data, Deutsche Bank estimates, datastream

Figure 113: Blackwater (49.8% relative margin LT)



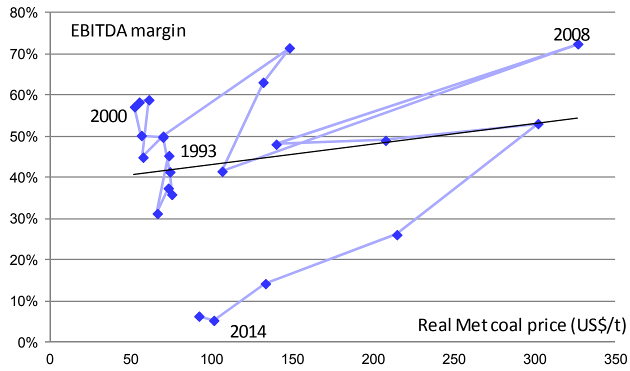
Source: Company data, Deutsche Bank estimates, datastream

Figure 114: Peak Down & Caval Ridge (32.4% margin LT)



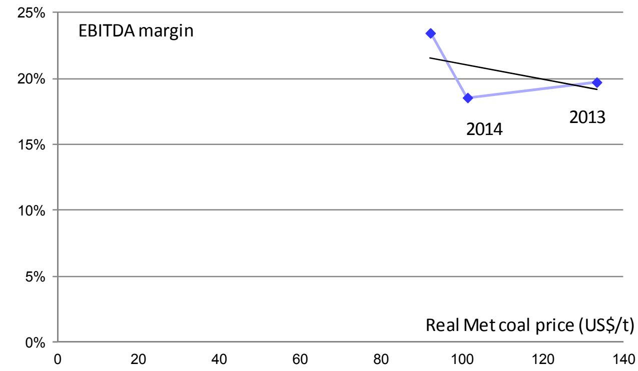
Source: Company data, Deutsche Bank estimates, datastream

Figure 115: Saraji (44.2% relative margin LT)



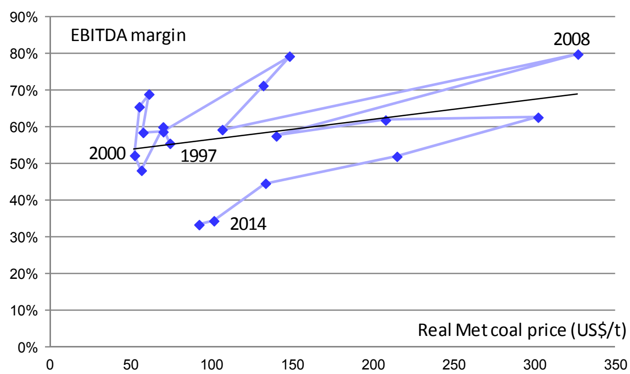
Source: Company data, Deutsche Bank estimates, datastream

Figure 116: Daunia (21.9% relative margin LT)



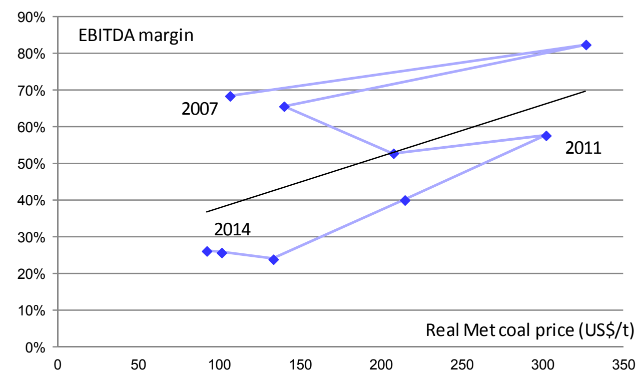
Source: Company data, Deutsche Bank estimates, datastream

Figure 117: South Walker Creek (57.1% margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 118: Poitrel (40.4% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

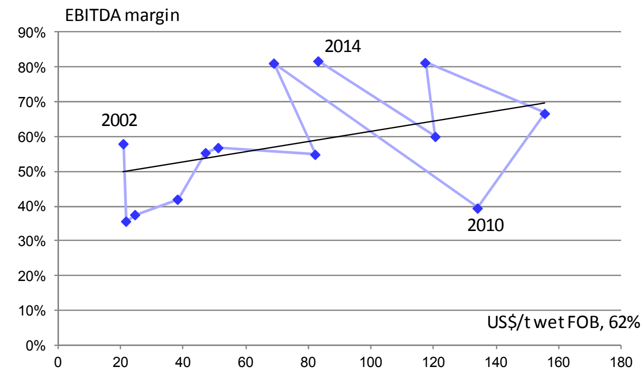
Iron Ore

BHP discloses its iron ore reserves and resources in Western Australia across four different mining complexes/areas, and then discloses tonnes sold on an aggregate basis.

As with our Rio iron ore analysis, we plot a "relative EBITDA margin" for the iron ore mines as we are plotting against a single iron ore price in US$/wet tonne FOB – which is ultimately the margin that the mines make. This means that the EBITDA margins shown in the charts are elevated relative to what would have been actually reported at the sites because they sell higher grade products at a premium over and above the benchmark 62% price (e.g. lumps and pellet products).

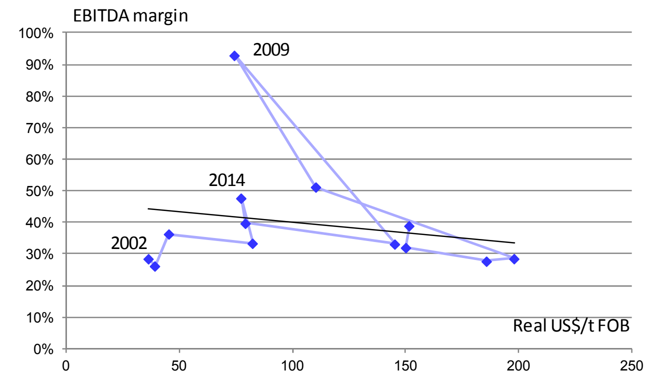
For Samarco, we add a pellet premium to the FOB price in US$/wet tonne.

Figure 119: Western Australia (54.5% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 120: Samarco (41.3% relative margin LT)

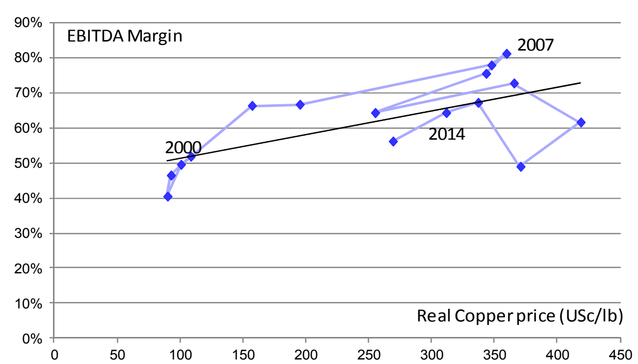


Source: Company data, Deutsche Bank estimates, datastream

Copper

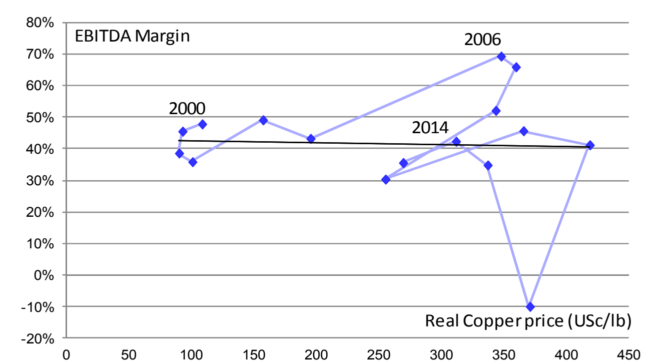
For BHP's copper division, we model Escondida in line with our analysis for Rio's share. To model Pampa Norte, we use a weighted average of the long-run margins of Cerro Colorado SxEw and Spence SxEw. For Olympic Dam, we assume annual capacity of 200ktpa copper. BHP has stated it has a stretch target of 235ktpa which we do not include. We don't model the potential Olympic Dam expansion project, nor do we include the Spence Hypogene project which is not yet approved by the BHP Board.

Figure 121: Escondida (60.1% relative margin LT)



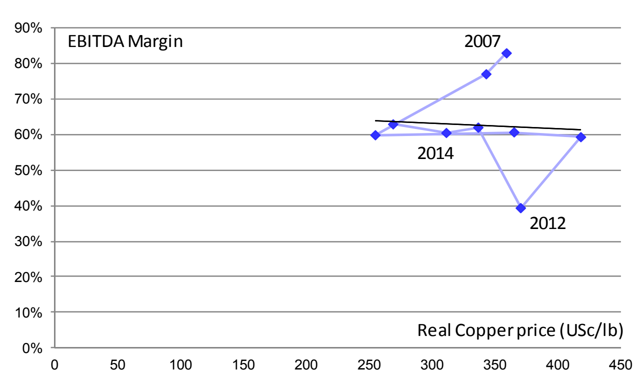
Source: Company data, Deutsche Bank estimates, datastream

Figure 122: Cerro Colorado (43.1% relative margin LT)



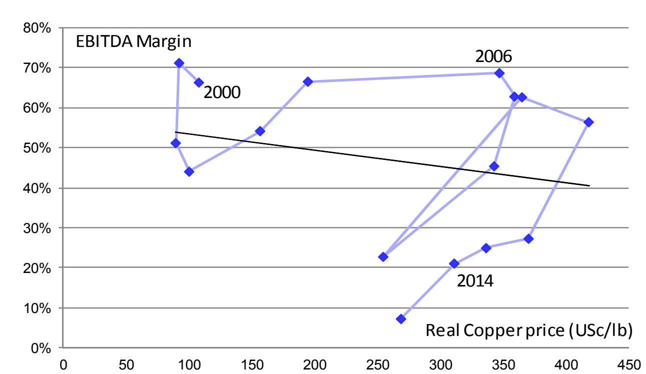
Source: Company data, Deutsche Bank estimates, datastream

Figure 123: Spence (64.7% relative margin LT)



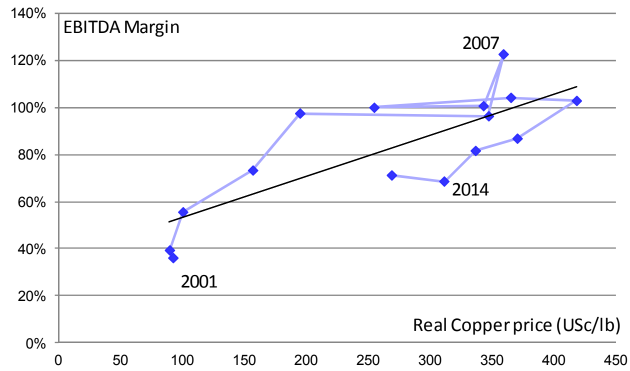
Source: Company data, Deutsche Bank estimates, datastream

Figure 124: Olympic Dam (48.4% relative margin LT)



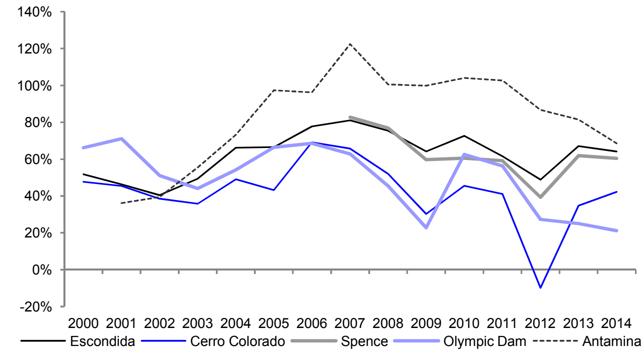
Source: Company data, Deutsche Bank estimates, datastream

Figure 125: Antamina (73.5% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 126: Copper mine margins over time.

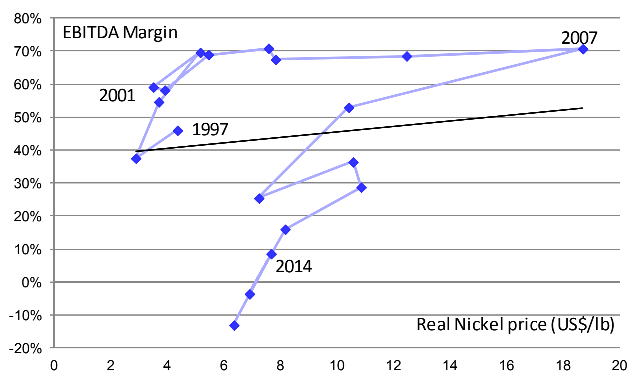


Source: Company data, Deutsche Bank estimates, datastream

Nickel

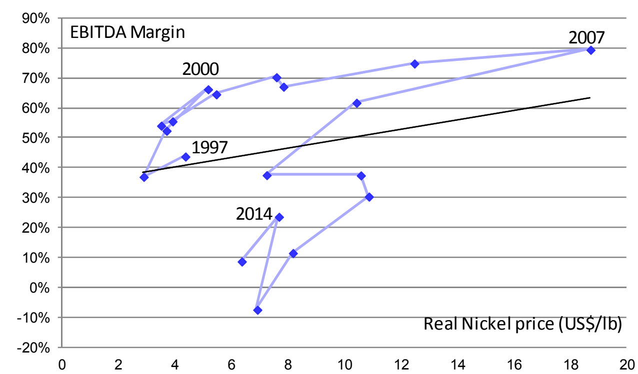
We have modelled Mt Keith and Leinster mines within BHP's Nickel West complex and used an average of the long-run margins for each mine to model the division as a whole.

Figure 127: Mt Keith (43% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 128: Leinster (43.8% relative margin LT)



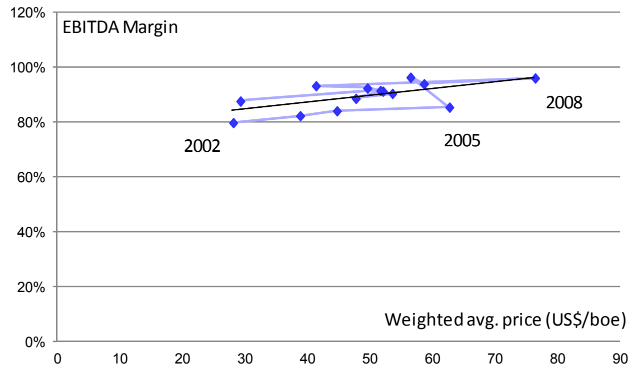
Source: Company data, Deutsche Bank estimates, datastream

Oil and gas

BHP discloses its oil and gas reserves on a geographic basis, across Australia, the US and "Other". The US includes on- and offshore reserves. We estimated BHP's share of the annual output of each division on an oil equivalent basis (Mmboe). For received prices, we used long-run Brent prices for oil, and then turned long-run natural gas prices into an oil equivalent using the standard formula of 5,800 cubic feet of natural gas for one BOE (barrel oil equivalent).

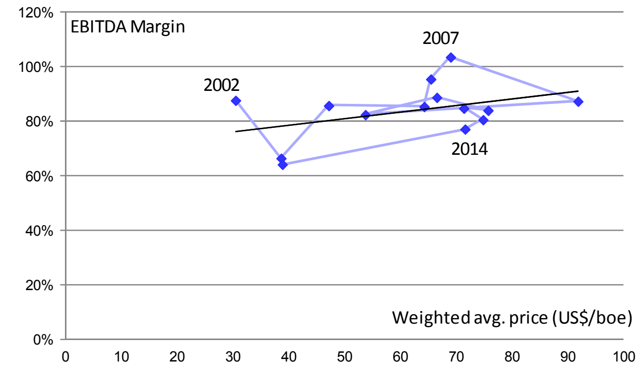
To calculate long-run margins for each division we estimated a blended price, based on a steady-state oil/gas split of each major field. To then ascertain a normalised unit capex figure to use in our free cash flow calculations, we used our long-range forecasts for capex per BOE for each main production area (Bass Strait and North West shelf in Australia, Atlantis, Shenzi, Mad Dog and US Onshore in the US), and weighted by production. The US capex estimates are higher than Australia – at US$22/boe vs. US$6.2/boe – due to the inclusion of the higher-cost onshore fields.

Figure 129: Australia (86.5% relative margin LT)



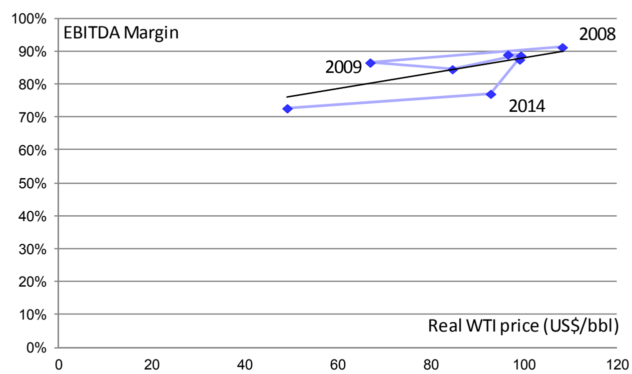
Source: Company data, Deutsche Bank estimates, datastream

Figure 130: US (79.8% relative margin LT)



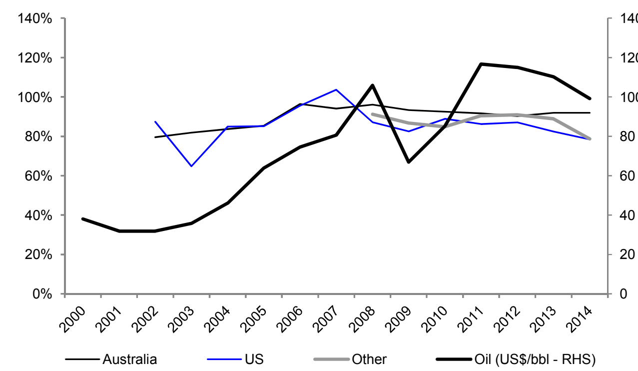
Source: Company data, Deutsche Bank estimates, datastream

Figure 131: Other (76.5% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 132: Margins over time and the oil price



Source: Company data, Deutsche Bank estimates, datastream

Potash

We have included our estimated NPV for BHP's Jansen potash project of US$2.6bn, but clearly the project is not yet approved by the Board so we do not include long-run margin analysis.

Glencore

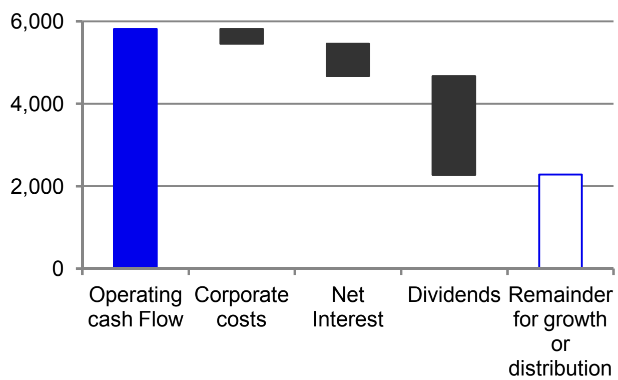
A key differentiator of the Glencore business is its trading division which does not fit as neatly into the broader analysis that we have undertaken here. We have included the business by assuming steady cash generation at the bottom of the trading range provided by the company. That is that we assume that Glencore with deliver US$2.7b of EBIT on a steady state basis. The key points for using this method are:

- Glencore states that it will deliver US$2.7 to US$3.7b of EBIT each year from the trading business. It also says that the bottom of the range represents the simple profit from managing the logistics, sales and funding (ie, a logistics company). Profit above this is generated during years when arbitrage opportunities occur.
- In the steady state/normalised world that we are considering, the arbitrage opportunities would be limited and the trading business would default to generating earnings from the basic logistics work.

On a normalised basis, Glencore's current dividend of US$2.4b represents 40% of the operating cash flow (cash generated minus sustaining capex) leaving US$2.3b for additional distribution or growth as shown in the chart below.

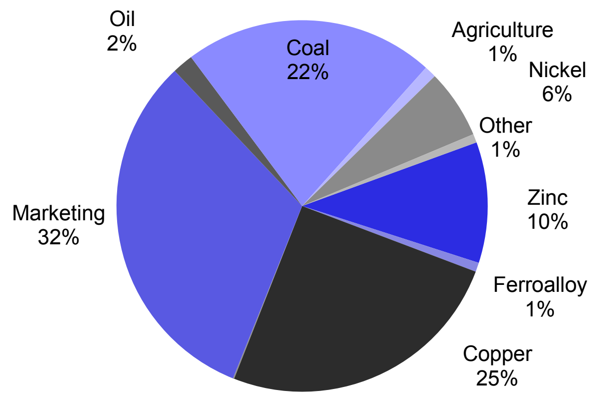
Glencore has the most diversified cash flows at the moment with a third coming from the marketing business and roughly a quarter each from coal and copper.

Figure 133: Glencore normalised cash flow bridge



Source: Deutsche Bank estimates/assumptions

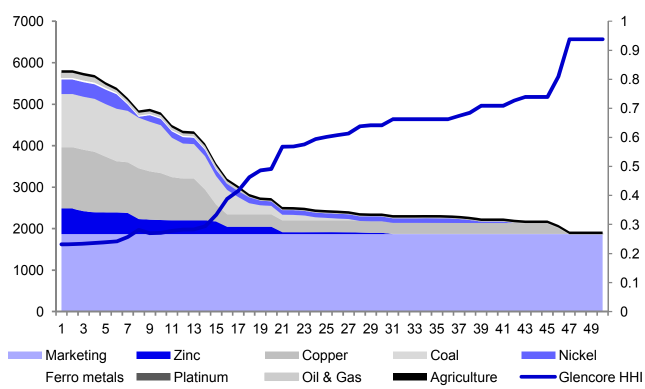
Figure 134: Glencore normalised cash flow split.



Source: Deutsche Bank estimates/assumptions

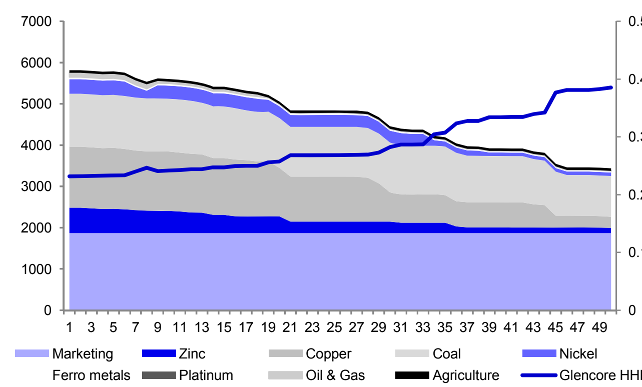
As we look at the normalised cash flows out over time, we show both the reserve and resource cash flows by commodity in the charts below. Note the drop off in reserve cash flows in around 14 years, which is by and large deliberate as more conversion of resources to reserves further out would not be a good use of capital.

Figure 135: Reserve cash flows by commodity over time



Source: Deutsche Bank estimates/assumptions

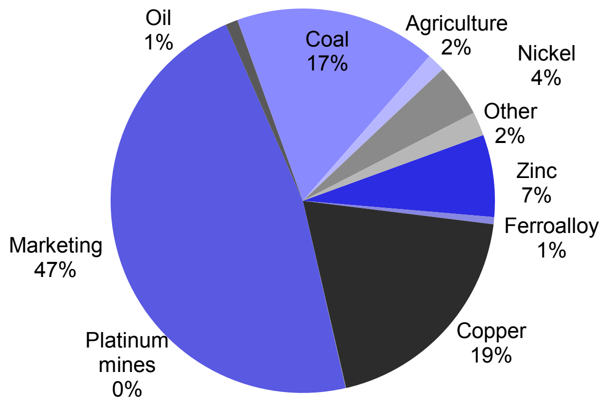
Figure 136: Resource cashflows by commodity over time



Source: Deutsche Bank estimates/assumptions

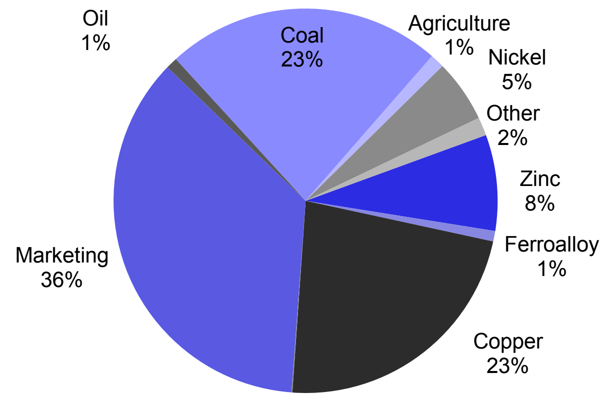
These cash flows translate to the following split of operating NPVs for Glencore on a normalised basis. Marketing contributes around half of the normalised reserve NPV – that is a function of the fact that we do not have any decay in these cash flows (indefinite reserve) vs the operations. In the resource split chart, we see marketing back at around a third in line with its current normalised cash flow generation.

Figure 137: Glencore normalised Reserve NPV split



Source: Deutsche Bank estimates/assumptions

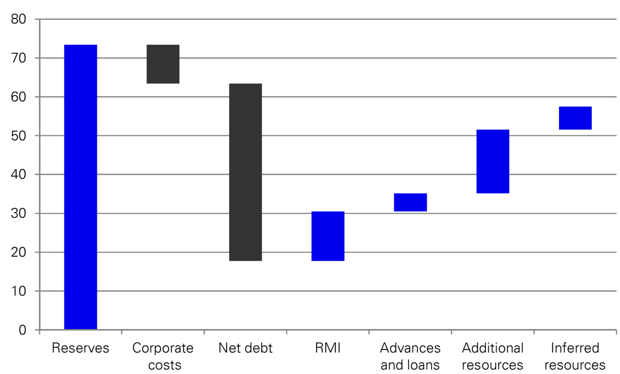
Figure 138: Glencore normalised Resource NPV split



Source: Deutsche Bank estimates/assumptions

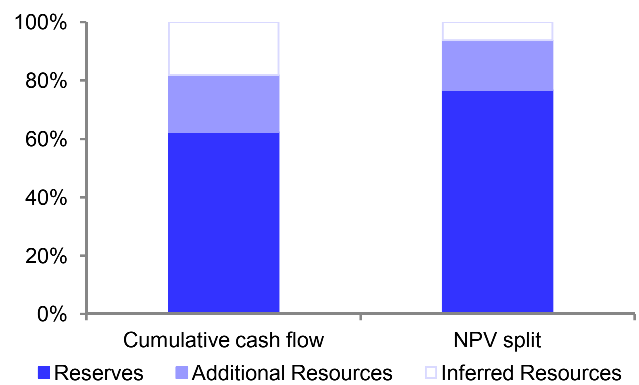
Other manifestations of the trading business impacts on the valuation are shown in the figures below. The valuation bridge includes a back-out of RMI (we use 80% of the total) – the compensating factor for this is that we use the interest on the RMI in the NPV calculation for the marketing business. The bridge also includes an item for advances and loans – part of the financing activities of Glencore. The amount of the contribution to the NPV from reserves it also very high at 74% and this is driven by the inclusion of the steady Glencore cash flows.

Figure 139: Glencore Normalised NPV bridge



Source: Deutsche Bank estimates/assumptions

Figure 140: Glencore Normalised operating cash flow and NPV split

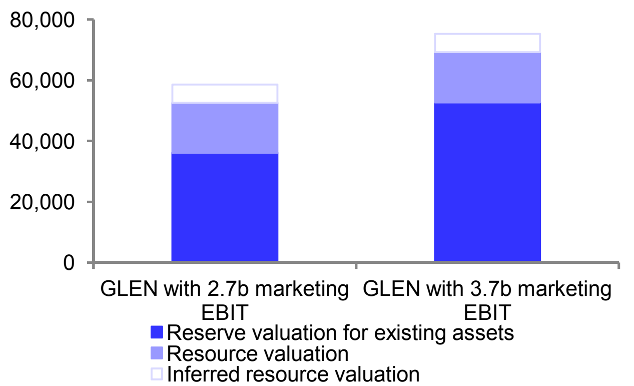


Source: Deutsche Bank estimates/assumptions

What if?.... the trading business does better.

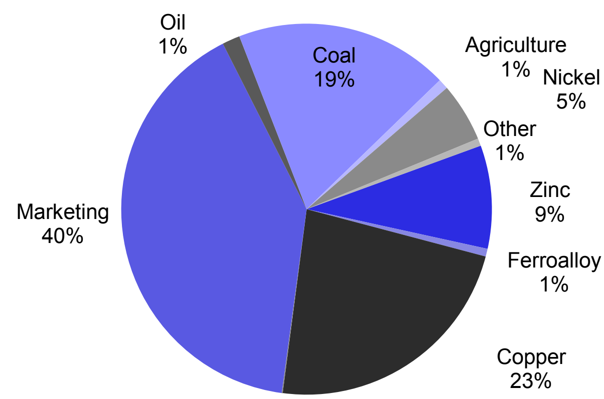
If we assume that the trading business runs at the top of the company guidance (EBIT of US$3.7b), it adds US$17b to our normalised valuation and increases the cash flow share from marketing to 40% as shown in the charts below.

Figure 141: Valuation impact of increasing trading business to US$3.7b EBIT



Source: Deutsche Bank estimates/assumptions

Figure 142: marketing cash jumps to 40%



Source: Deutsche Bank estimates/assumptions

We detail the normalised valuation split by asset in the table below

Figure 143: Glencore asset normalised cash flows and valuations

	Steady state free cashflow	Reserve NPV	additional measured and indicated resource NPV	Inferred resource NPV
Zinc				
Kazzinc mines	111	642	408	683
Mt Isa	119	1,189	916	74
McArthur River	17	246	53	0
Kidd	57	318	104	96
Matagami / BraceMac Mcleod	36	45	117	6
Los Quenuales	4	26	14	21
Sinchi Wayra & Illapa	29	61	56	111
Rosh Pinah	7	54		
Perkoa	10	42		
AR Zinc	27	87		
Kazzinc Smelter	28	413		
Brunswick smelting	9	88		
CEZ Refinery	6	70		
Portovesme	5	65		
San Juan de Nieva	117	1,413		
Nordenham	27	271		
Northfleet (Britannia)	6	48		
Copper				
Katanga Mines	78	508	557	149
Mopani (Nkana)	4	69	8	2
Mopani (Mufulira)	15	116	80	56
Mutanda	228	2,248	619	439
Collahuasi	270	4,547	331	121
Antamina	257	2,376	877	1,038
Alumbrera	35	163	0	0
Lomas Bayas acid leach	66	512	448	124

Source: Deutsche Bank estimates/assumptions

Figure 143: Glencore asset normalised cash flows and valuations (Cont'd)

	Steady state free cashflow	Reserve NPV	additional measured and indicated resource NPV	Inferred resource NPV
Antapaccay	221	2,107	257	239
Punitaqui	7	17	14	7
Mt Isa	164	640	1,344	352
Ernest Henry	46	341	133	26
Cobar	48	162	71	200
Townsville Refinery	13	95		
CCR	-3	-38		
Horne	7	105		
Altonorte	7	110		
Pasar	19	232		
Coal				
Calenturitas	27	253	122	33
La Jagua	46	448	29	0
Cerrejón	223	2,370	1,742	8
Bulga Underground	29	390	148	1
Bulga open cut	105	1,157	776	14
Liddell	43	228	480	83
Mt Owen	93	680	683	197
Ulan	155	1,224	1,364	263
Ravensworth	56	541	393	35
Mangoola	86	652	367	562
Tahmoor	18	216	125	0
Rolleston	62	743	237	130
Clermont	32	268	7	0
Collinsville	3	41	18	2
Newlands	19	117	219	10
Oaky Creek	104	1,041	760	35
Tweefontein	58	754	310	3
Impunzi Division	41	467	216	1
Goedgevonden	48	678	84	1
Koornfontein	8	50	91	0
Shanduka	11	102	64	3
Umcebo	13	46	181	2
Nickel				
Murrin Murrin JV	38	604	50	5
Koniambo	111	1,317	34	64
INO mines	163	706	954	678
Nikkelverk	39	632		
Ferroalloys				
Ferrochrome	42	425	318	28
Vanadium Pentoxide	4	14	18	31
Platinum mines				
Mototolo JV	4	26	31	0
Eland Platinum	1	10	15	0

Source: Deutsche Bank estimates/assumptions

Figure 143: Glencore asset normalised cash flows and valuations (Cont'd)

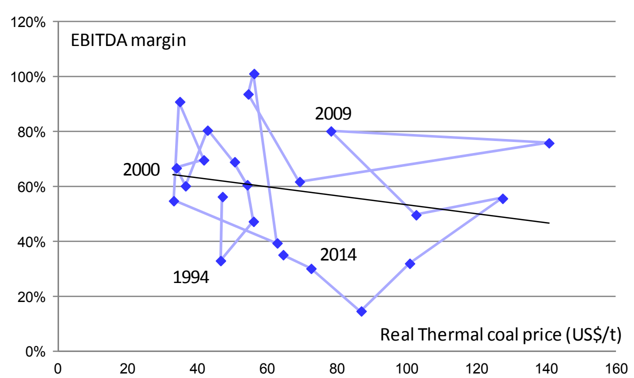
	Steady state free cashflow	Reserve NPV	additional measured and indicated resource NPV	Inferred resource NPV
Investments				
United Company Rusal plc	27	895		
Volcan Compania Minera S.A.A.	4	149		
Century Aluminum Company	7	223		
Jurong Aromatics Corporation Pte Ltd	2	55		
Other	5	150		
Oil				
Equatorial Guinea	59	219	163	
Chad	48	527	19	
Agriculture	61	1,136		
Marketing	1,868	34,506		
Total Operations	**5,961**	**74,567**	**16,617**	**5,932**
Corporate costs	-362	-10013		
Net debt		-45,623		
RMI Recovery		12,784		
Advances and loans		4597		
Dividends	-2390			
Net interest	-787			
Total US$m	**2,422**	**36,312**	**16,617**	**5,932**

Source: Deutsche Bank estimates/assumptions

Coal

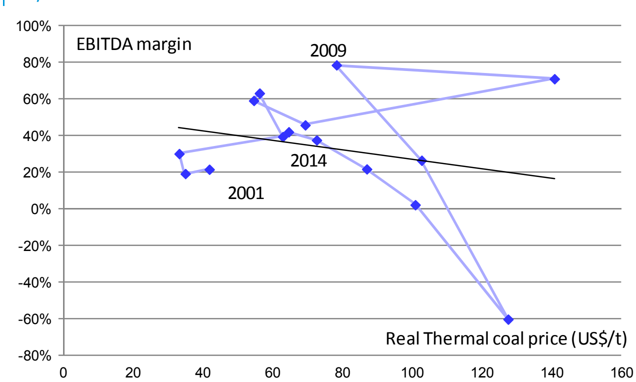
Glencore is a significant producer of coal in Australia, South Africa and Colombia. Where its coal mines produce both thermal and coking coal, we have used the weighted average price for that asset. It is apparent scanning through the assets why certain assets are slated for closure or significant cost cutting (Optimum, Tahmoor, Newlands).

Figure 144: Bulga (58.9% relative margin LT)



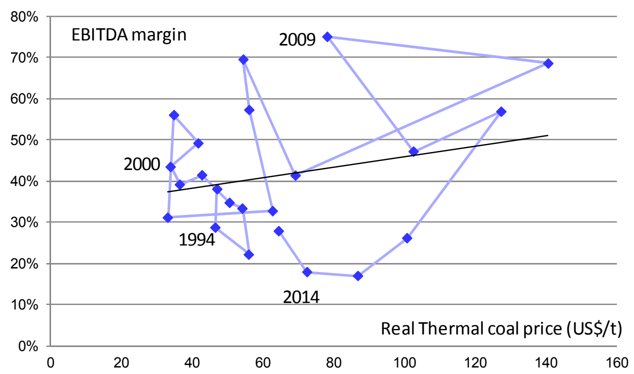
Source: Company data, Deutsche Bank estimates, datastream

Figure 145: Bulga underground(35.1% relative margin LT)



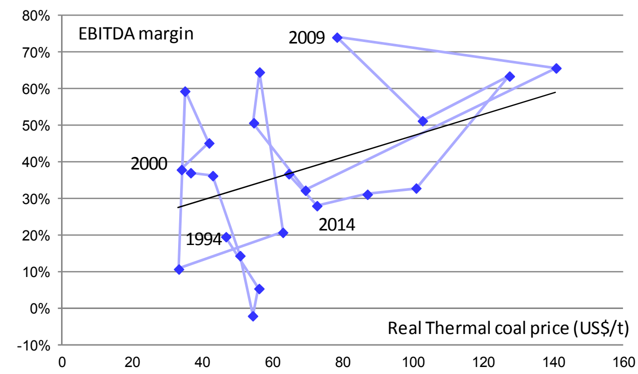
Source: Company data, Deutsche Bank estimates, datastream

Figure 146: Liddell (42.2% relative margin LT)



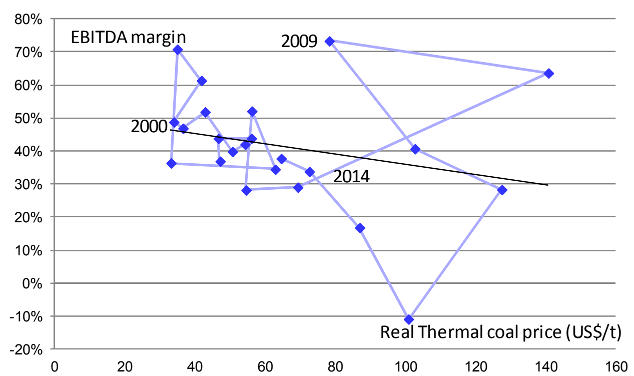
Source: Company data, Deutsche Bank estimates, datastream

Figure 147: Mt Owen complex (37.9% relative margin LT)



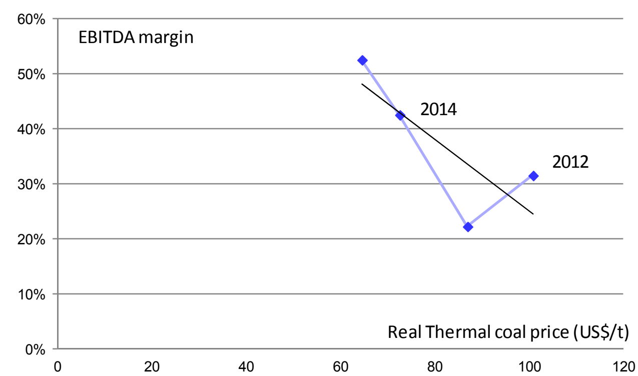
Source: Company data, Deutsche Bank estimates, datastream

Figure 148: Ulan (40.54% relative margin LT)



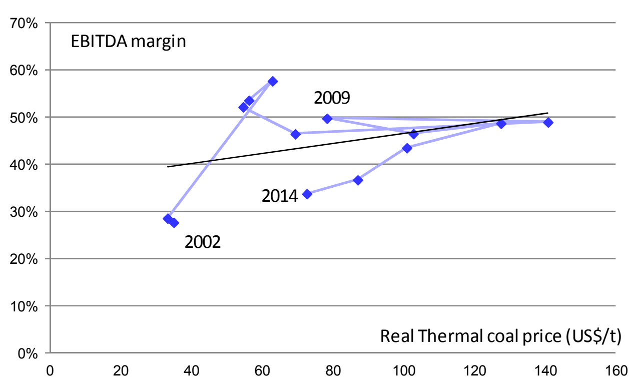
Source: Company data, Deutsche Bank estimates, datastream

Figure 149: Ravensworth (31.15% relative margin LT)



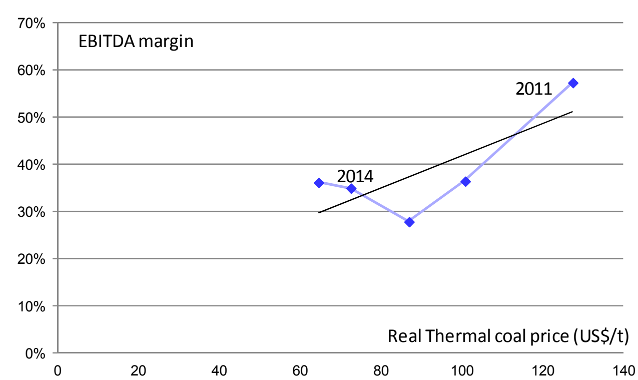
Source: Company data, Deutsche Bank estimates, datastream

Figure 150: Cerrejon (43.46% relative margin LT)



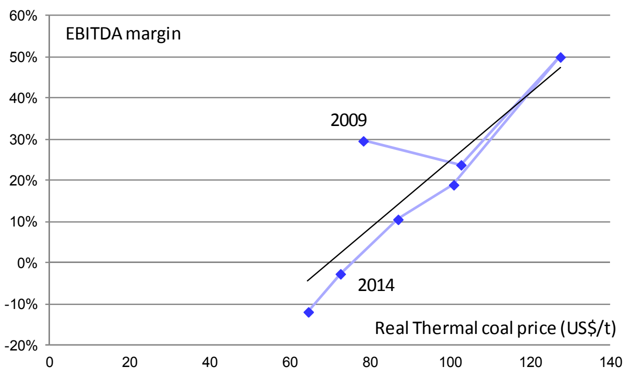
Source: Company data, Deutsche Bank estimates, datastream

Figure 151: Mangoola (32.23% relative margin LT)



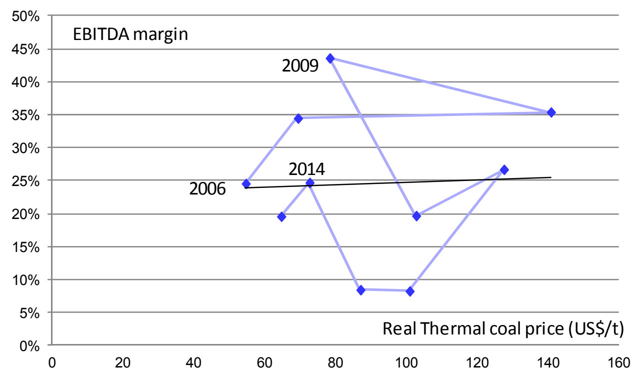
Source: Company data, Deutsche Bank estimates, datastream

Figure 152: Tahmoor (34.1% relative margin)



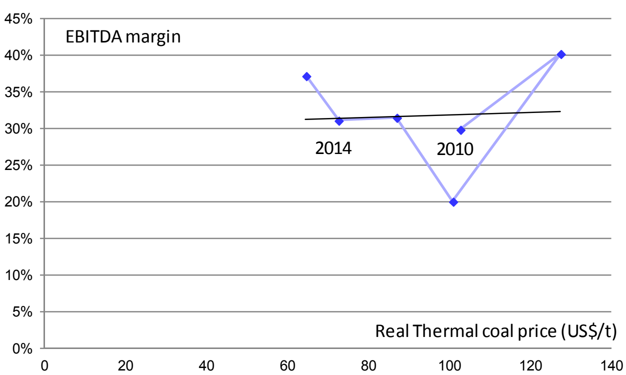
Source: Company data, Deutsche Bank estimates, datastream

Figure 153: Rolleston (24.35% relative margin LT)



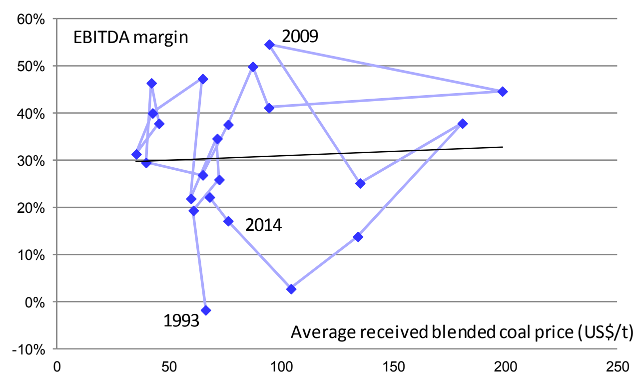
Source: Company data, Deutsche Bank estimates, datastream

Figure 154: Clermont (32.0% relative margin LT)



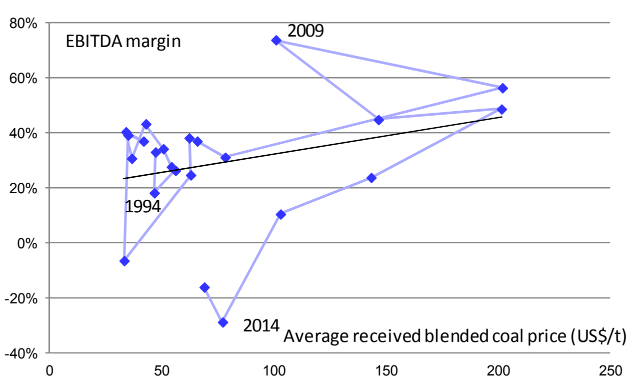
Source: Company data, Deutsche Bank estimates, datastream

Figure 155: Collinsville (30.85% relative margin LT)



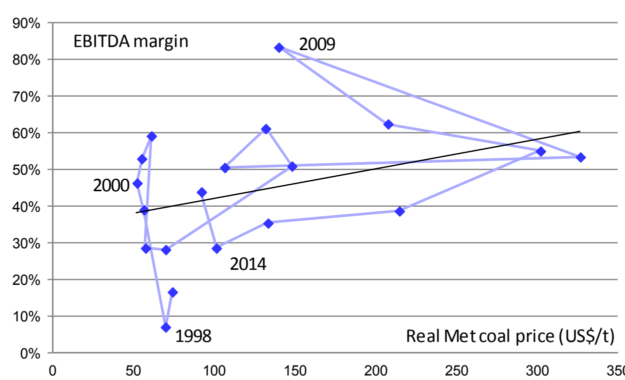
Source: Company data, Deutsche Bank estimates, datastream

Figure 156: Newlands (29.1% relative margin LT)



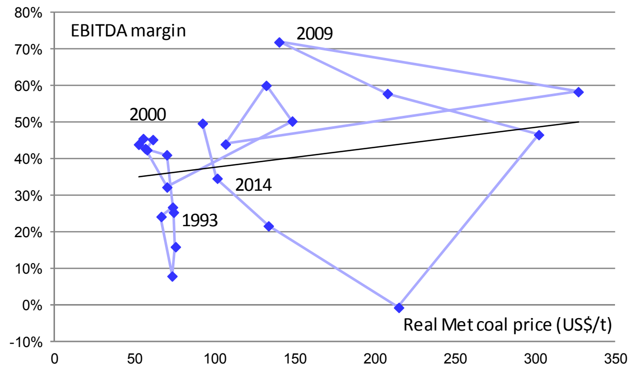
Source: Company data, Deutsche Bank estimates, datastream

Figure 157: Oaky North (4.9% relative margin LT)



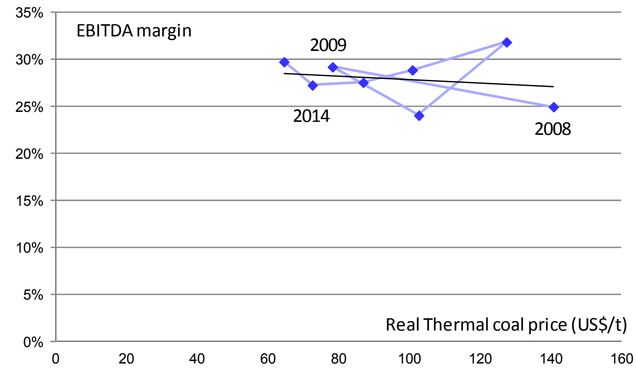
Source: Company data, Deutsche Bank estimates, datastream

Figure 158: Oaky Number1 (37.7% relative margin LT)



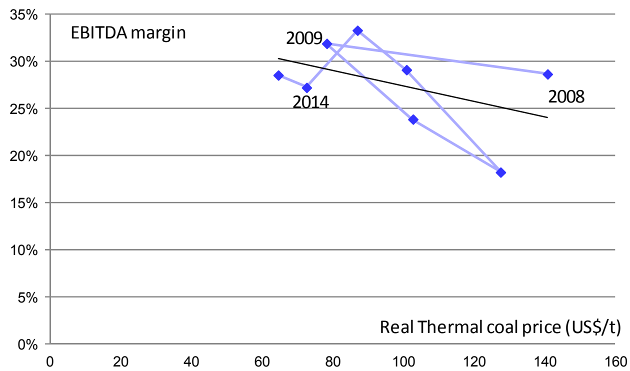
Source: Company data, Deutsche Bank estimates, datastream

Figure 159: Koornfontein (15.1% relative margin LT)



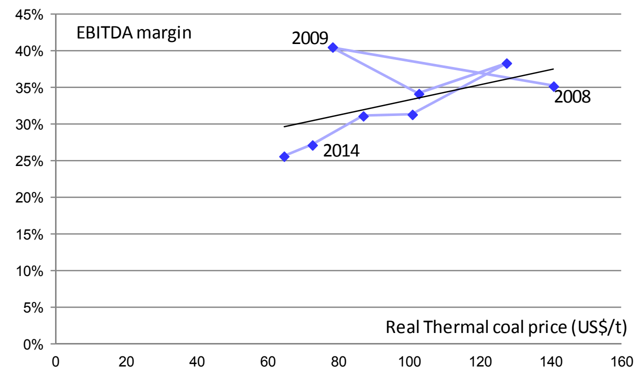
Source: Company data, Deutsche Bank estimates, datastream

Figure 160: Tweefontein (30\.9% relative margin LT)



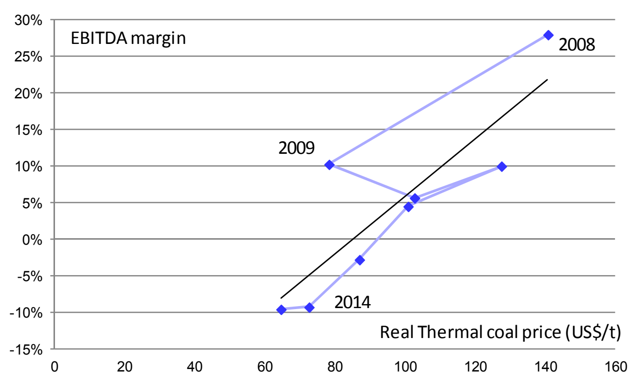
Source: Company data, Deutsche Bank estimates, datastream

Figure 161: Tweefontein UG(30.49% relative margin LT)



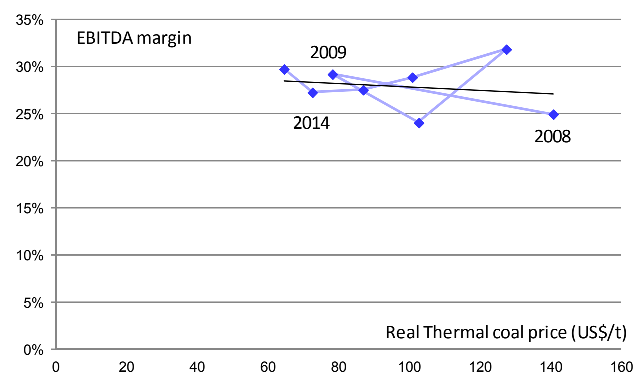
Source: Company data, Deutsche Bank estimates, datastream

Figure 162: Optimum (-6.3% relative margin LT)



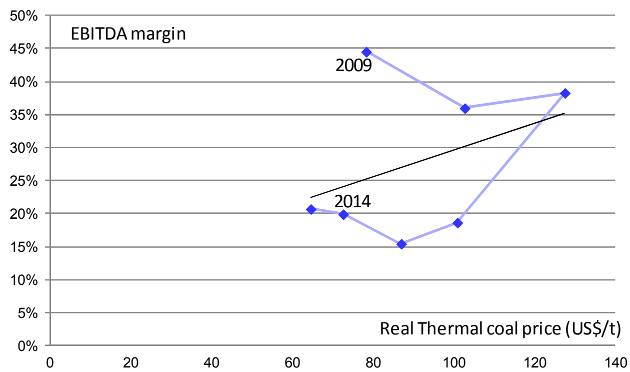
Source: Company data, Deutsche Bank estimates, datastream

Figure 163: Goedgevonden (28.5% relative margin LT)



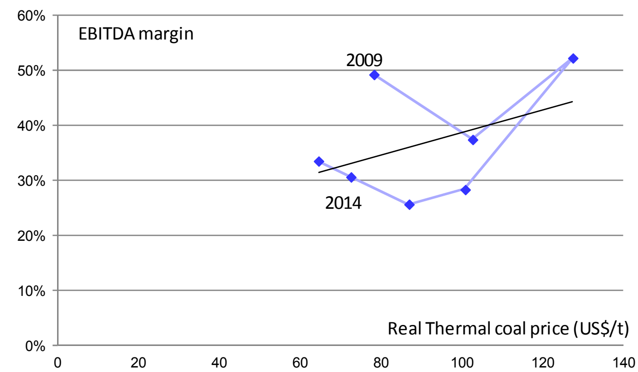
Source: Company data, Deutsche Bank estimates, datastream

Figure 164: Calenturitas (23.6% relative margin LT))



Source: Company data, Deutsche Bank estimates, datastream

Figure 165: La Jagua (32.9% relative margin LT)

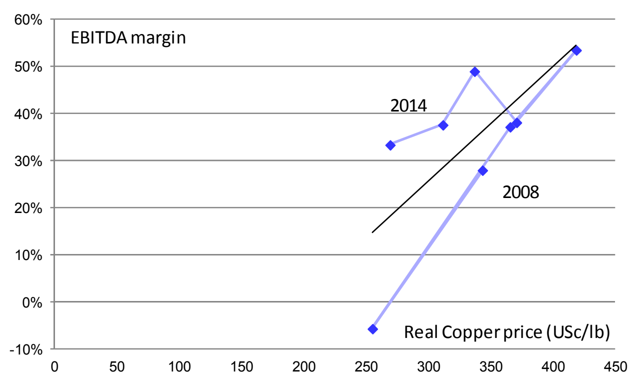


Source: Company data, Deutsche Bank estimates, datastream

Copper Mines

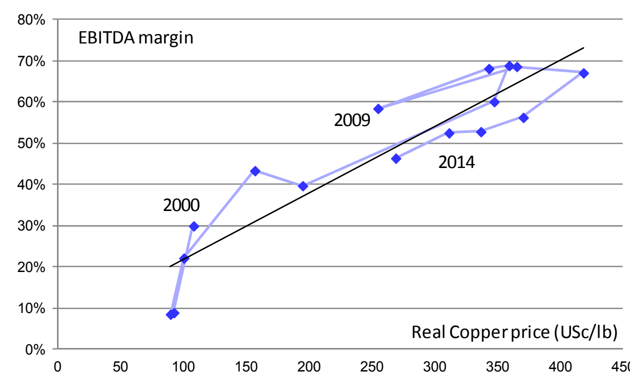
Glencore has a very diverse copper portfolio with assets all the way along the cost curve.

Figure 166: Kamoto_Kov (26.1% relative margin LT)



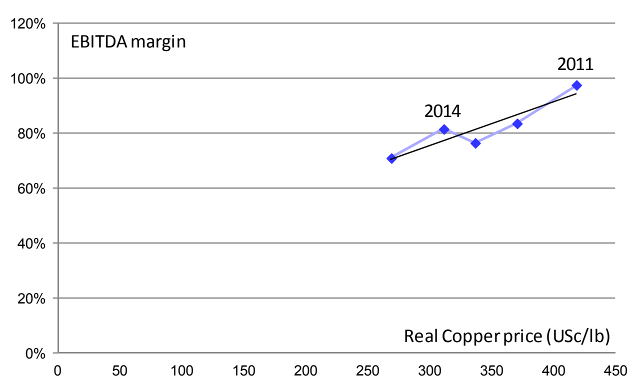
Source: Company data, Deutsche Bank estimates, datastream

Figure 167: Cobar CSA (41% relative margin LT)



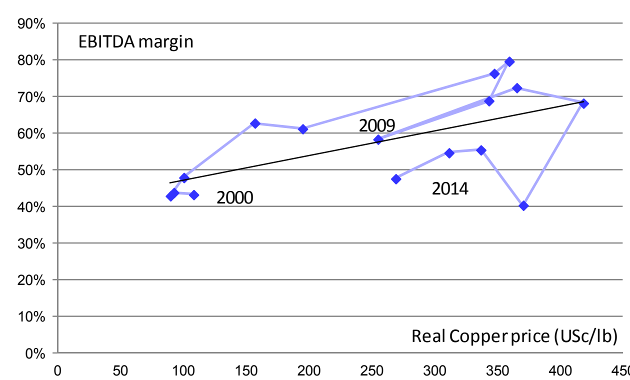
Source: Company data, Deutsche Bank estimates, datastream

Figure 168: Mutanda (63.5% relative margin LT)



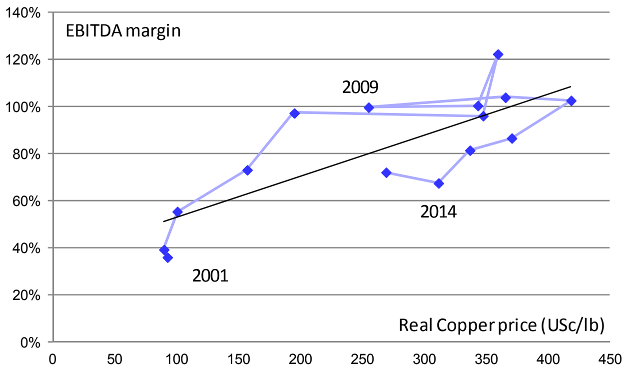
Source: Company data, Deutsche Bank estimates, datastream

Figure 169: Collahuasi (56.1% relative margin LT)



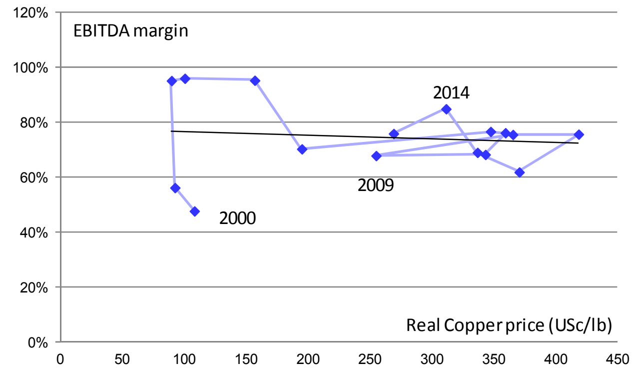
Source: Company data, Deutsche Bank estimates, datastream

Figure 170: Antamina (73.5% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

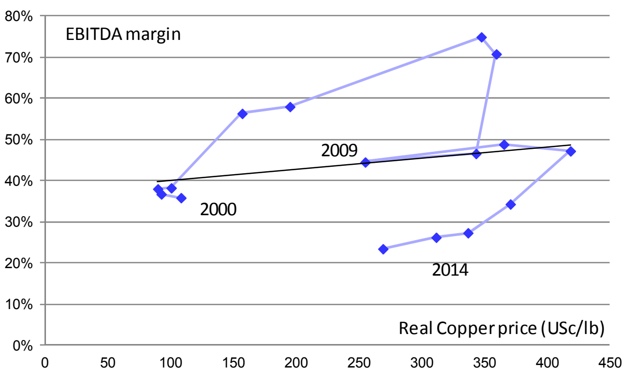
Figure 171: Alumbrera (75.9% relative margin)



Source: Company data, Deutsche Bank estimates, datastream

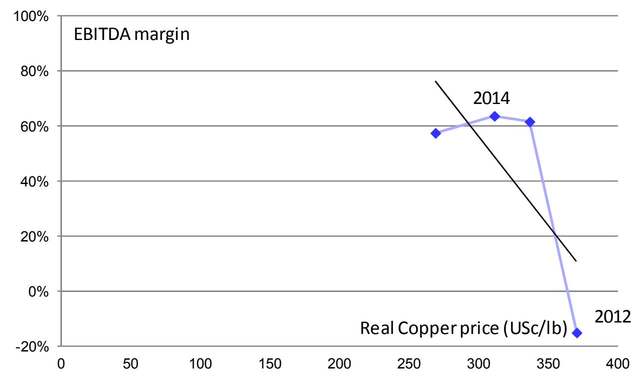
We do not have enough Antapaccay history, so have used a simple average over its stable operating years to determine the margin.

Figure 172: Lomas Bayas (43.8% relative margin LT)



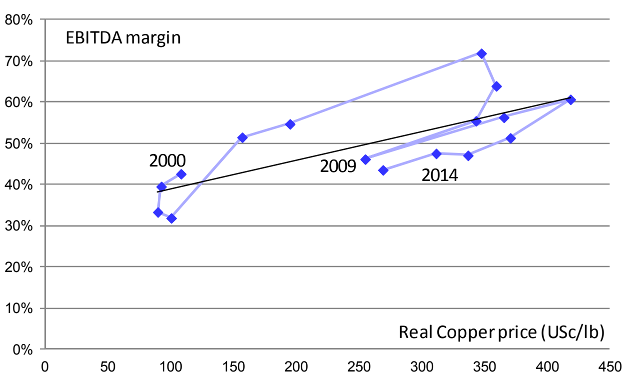
Source: Company data, Deutsche Bank estimates, datastream

Figure 173: Antapaccay (61.2% relative margin LT)



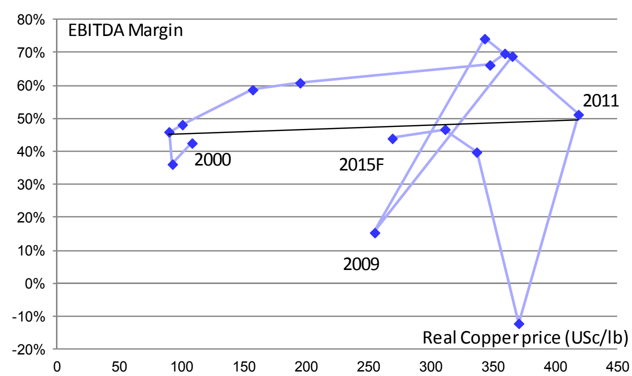
Source: Company data, Deutsche Bank estimates, datastream

Figure 174: Mt Isa (47.4% relative margin LT)



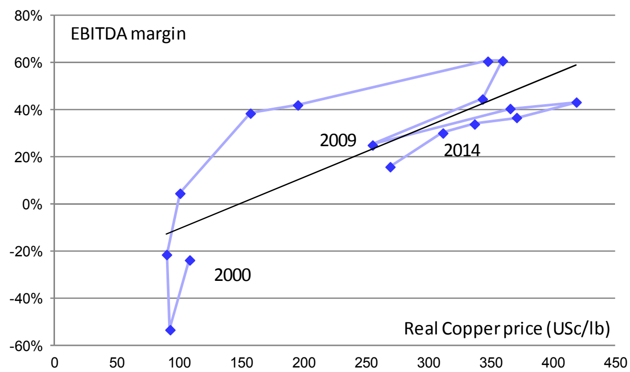
Source: Company data, Deutsche Bank estimates, datastream

Figure 175: Ernest Henry (46.2% relative margin LT)



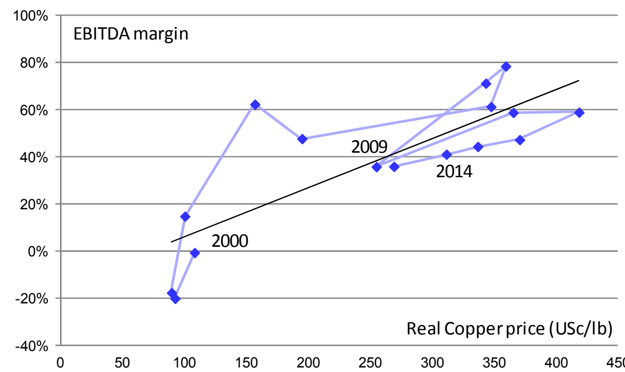
Source: Company data, Deutsche Bank estimates, datastream

Figure 176: Mufulira (16.4% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 177: Nkana (32.4% relative margin LT)

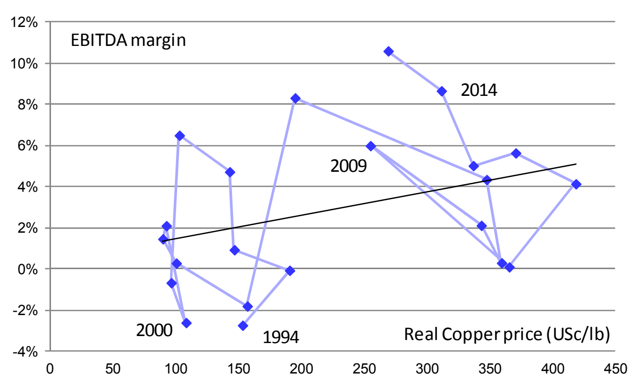


Source: Company data, Deutsche Bank estimates, datastream

Smelters and refineries

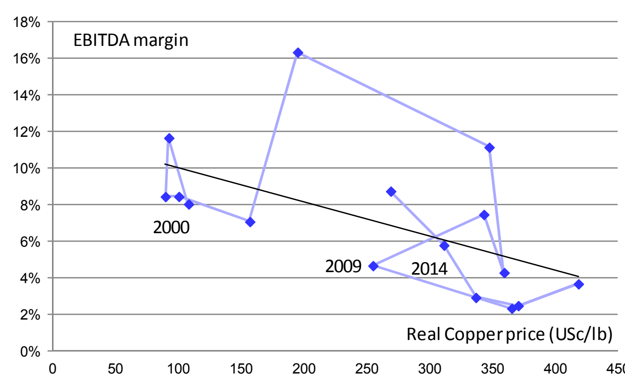
In contrast to the mines, the smelters produce very low margins and are used primarily by Glencore as part of the marketing and distribution function with the smelters enabling the company to blend concentrate feeds to take advantage of cheaper "dirty" concentrates.)

Figure 178: Altonorte (2.6% relative margin LT)



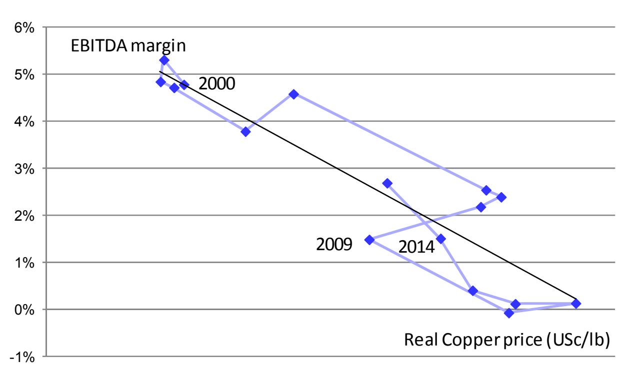
Source: Company data, Deutsche Bank estimates, datastream

Figure 179: Pasar (6.2% relative margin LT)



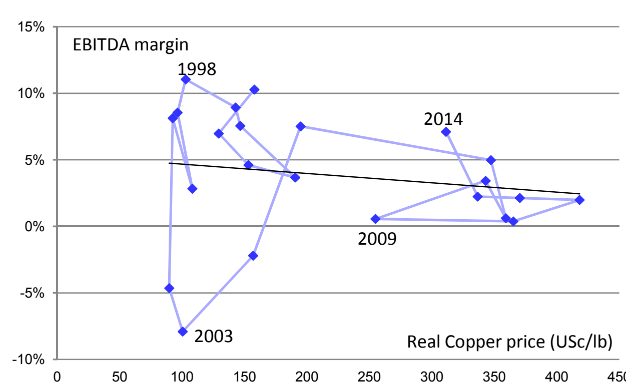
Source: Company data, Deutsche Bank estimates, datastream

Figure 180: Townsville (2.7% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 181: Horne smelter (4.1% relative margin LT)

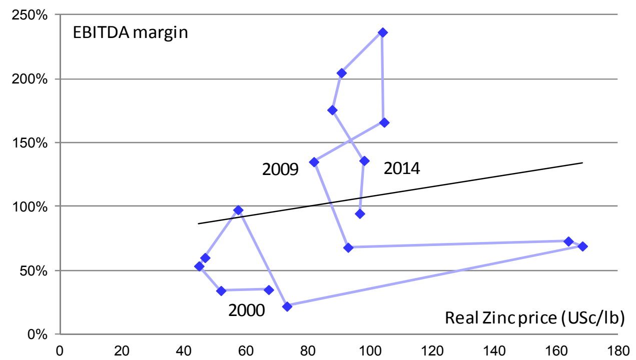


Source: Company data, Deutsche Bank estimates, datastream

Zinc

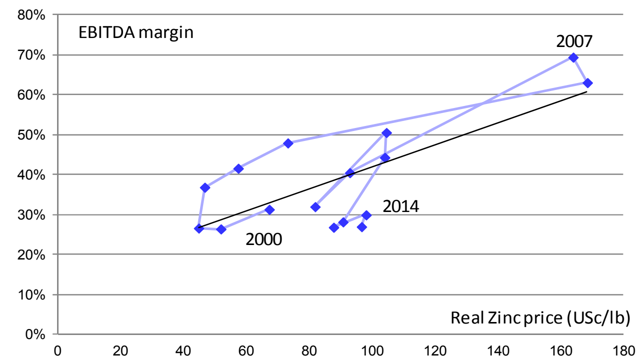
Another differentiator for Glencore is its zinc division. Zinc deposits are typically smaller than other base metal deposits hence zinc mining operations are typically smaller. This has driven the other large miners to either exit the metal or not get involved as the mines are considered sub scale. Anglo was the most recent with the sale of its zinc assets to Vedanta. Despite this view, Glencore generates good margins from its suite of zinc mines – Zinc often occurs with other metals (silver, lead and copper in particular) hence the by-product credits also drive robust margins for the mines.

Figure 182: Ridder (104.16% relative margin LT)



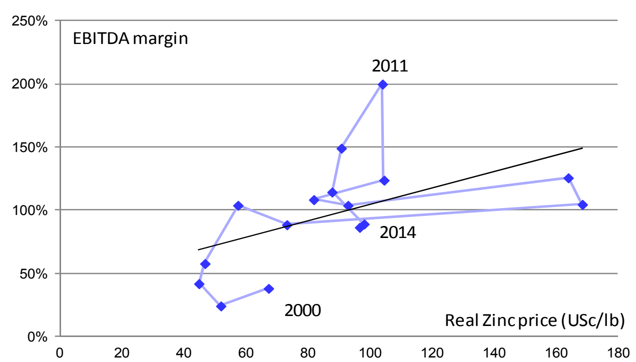
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 183: Iscaycruz (37.38% relative margin LT)



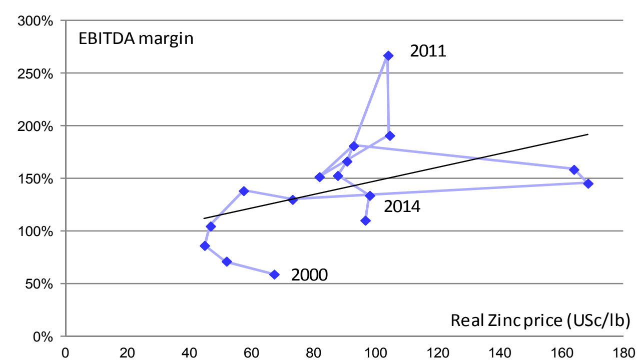
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 184: Yauliyacu (99.03% relative margin LT)



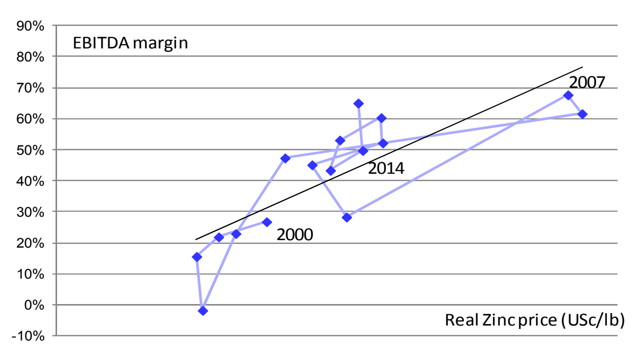
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 185: Zyryanovsk (142.45% relative margin LT)



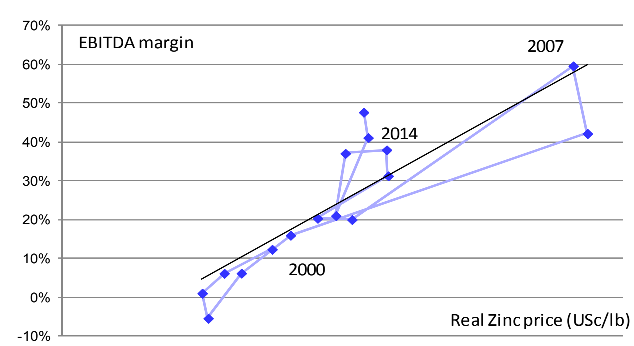
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 186: Mount Isa (42.23% relative margin LT)



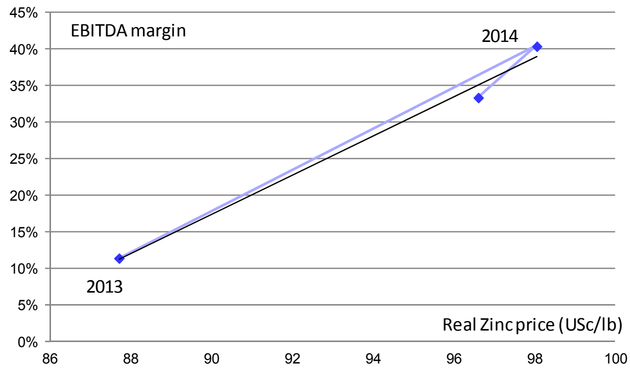
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 187: McArthur River (25.94% relative margin LT)



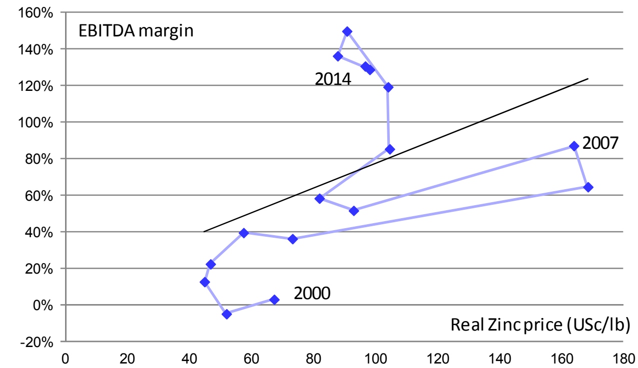
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 188: Perkoa (21.3% relative margin LT)



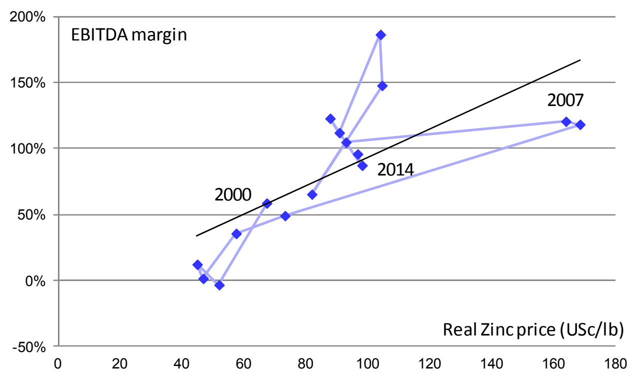
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 189: Aguilar (71.90% relative margin LT)



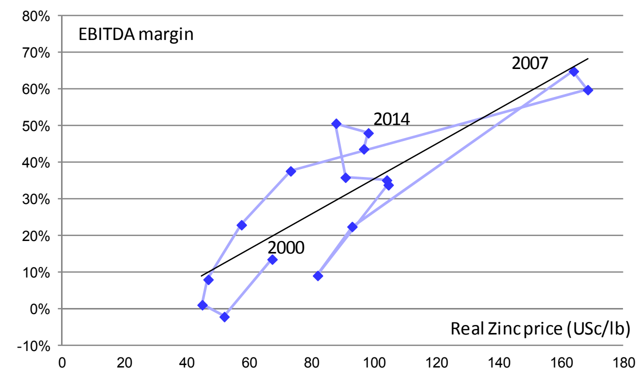
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 190: Kidd (83.81% relative margin LT)(



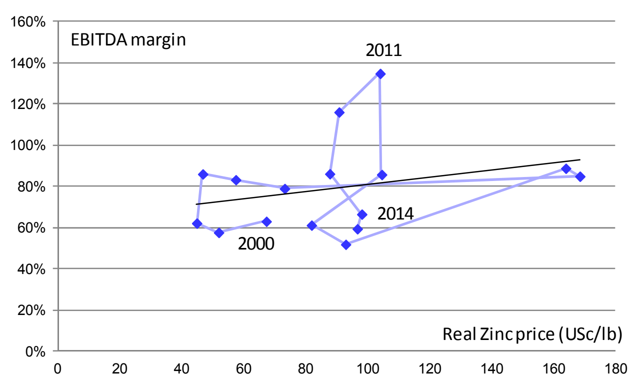
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 191: Rosh Pinah (29.80% relative margin LT)



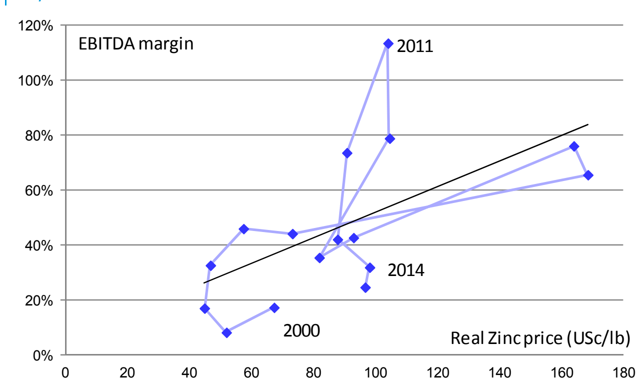
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 192: Sinchi Wayra - Bolivar (80.62% relative margin LT)



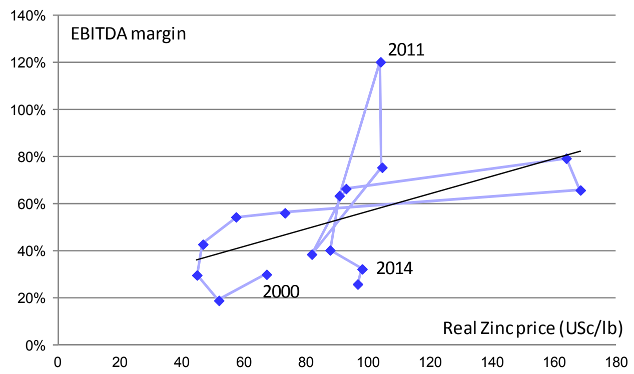
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 193: Sinchi Wayra - Porco (48.60% relative margin LT)



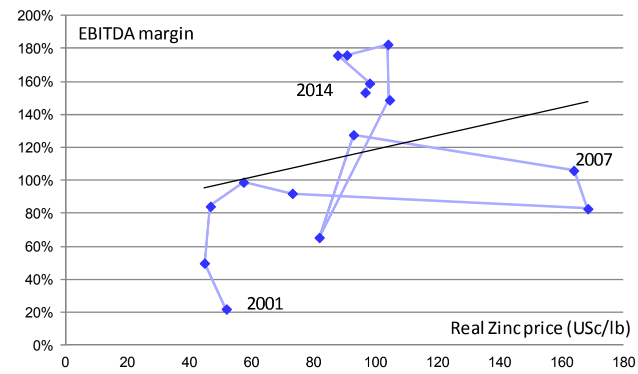
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 194: Caballo Blanco (54.27% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Figure 195: Colquiri (115.29% relative margin LT)



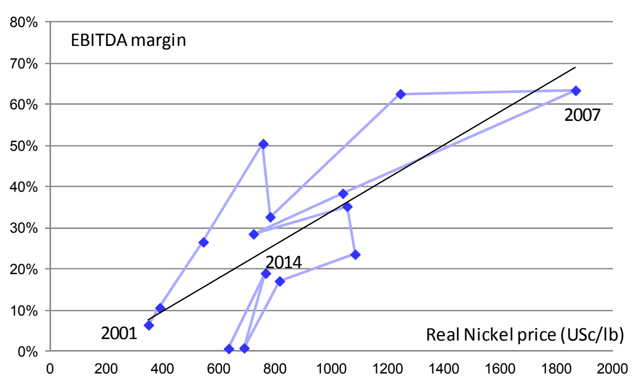
Source: Company data, Deutsche Bank estimates, datastream, Wood Mac

Nickel

Glencore currently groups the majority of its nickel assets into INO (Integrated nickel operations which includes its Canadian mines, concentrator and smelter and its Norwegian refinery. Below we have grouped the Fraser Morgan mine and Nickel Rim South mine into Sudbury and grouped the Katinniq, Mine 2 and Kikialik mines into Raglan. The other two operations consist of Murrin Murrin in Australia and Koniambo in New Caledonia.

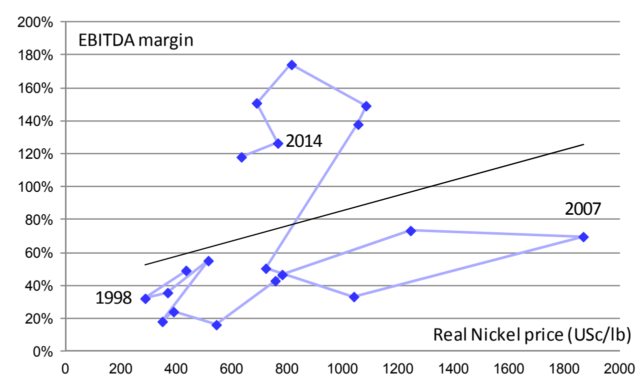
The expectations for the nickel group have been high, but earnings have been impacted by lower-than-expected nickel prices and the ongoing underperformance of the Koniambo nickel mine and ferronickel plant (well, the mining appears to be fine, it's the ferronickel plant failures that are currently hurting the plant). For this analysis, we have assumed the plant runs up to its nameplate of 30ktpa but do not include the expansion to 60ktpa.

Figure 196: Murrin Murrin (18.54% relative margin LT)



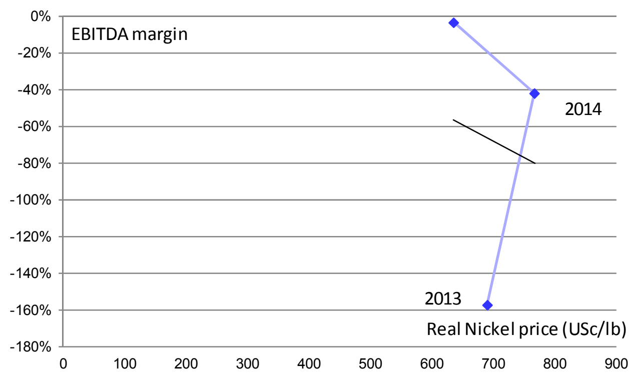
Source: Company data, Deutsche Bank estimates, datastream

Figure 197: Sudbury (68.09% relative margin LT)



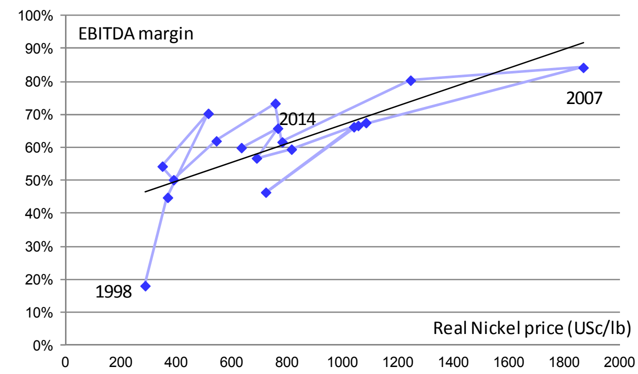
Source: Company data, Deutsche Bank estimates, datastream

Figure 198: Koniambo (-84.65% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 199: Raglan (56.64% relative margin LT)

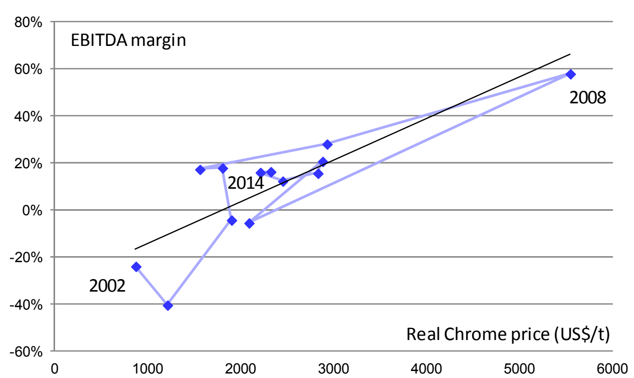


Source: Company data, Deutsche Bank estimates, datastream

Alloys

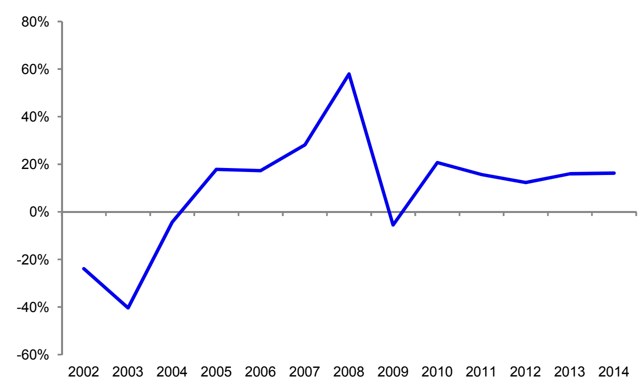
Glencore has a globally significant ferroalloy business producing ferrochrome, ferromanganese, silicon manganese, vanadium and ferrosilicon through its stake in the Glencore-Merafe Chrome venture, its manganese assets in Norway and France and the Rhovan Vanadium operation in South Africa

Figure 200: Merafe (5.3% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

Figure 201: Merafe EBITDA margins over time.



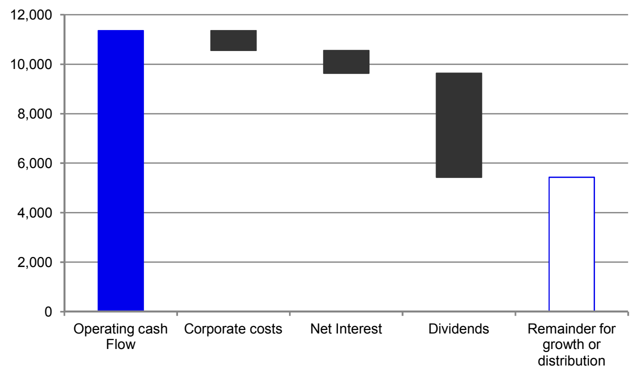
Source: Company data, Deutsche Bank estimates, datastream

Rio Tinto

On a normalised basis, Rio's current dividend of US$5.4b represents 37% of the operating cash flow (cash generated minus sustaining capex) leaving US$5.4b for additional distribution or growth as shown in the chart below.

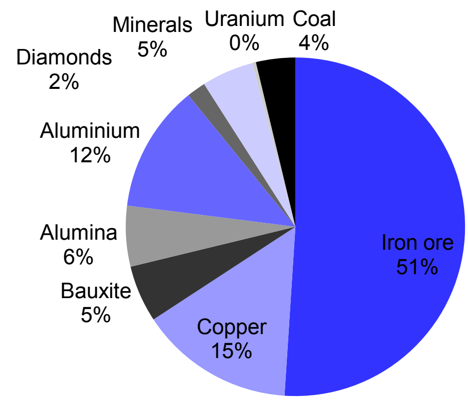
Around half of the cash is generated from iron ore on a normalised basis and close to a quarter from the combined cash flows of aluminium, alumina and bauxite.

Figure 202: Rio normalised cash flow bridge



Source: Deutsche Bank estimates/assumptions

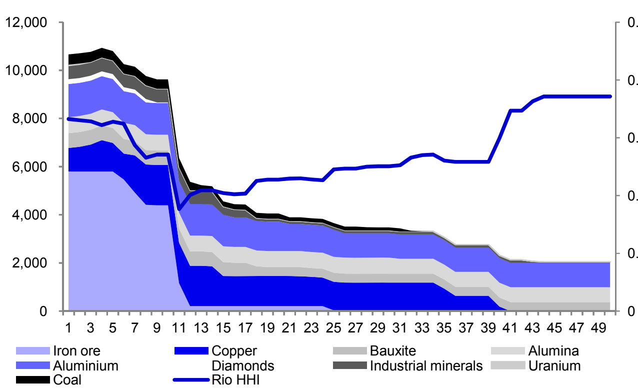
Figure 203: Rio normalised cash flow split.



Source: Deutsche Bank estimates/assumptions

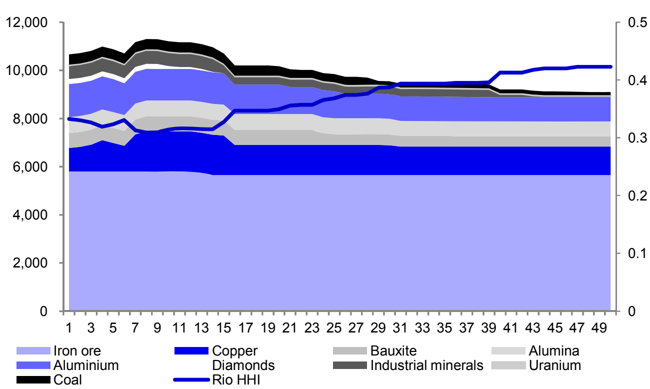
As we look at the normalised cash flows out over time we show both the reserve and resource cash flows by commodity in the charts below. Note the sharp drop off in reserve cash flows at around the 11-12 year mark; this is driven by the end of the iron ore reserve. This drop is not apparent in the resource cash flow performance. This is not surprising as iron ore deposits (like coal) are significantly more predictable than base metal deposits hence the need to convert resources to reserves more than 10 years out is not needed (or warranted from an exploration spend point of view).

Figure 204: Reserve cash flows by commodity over time



Source: Deutsche Bank

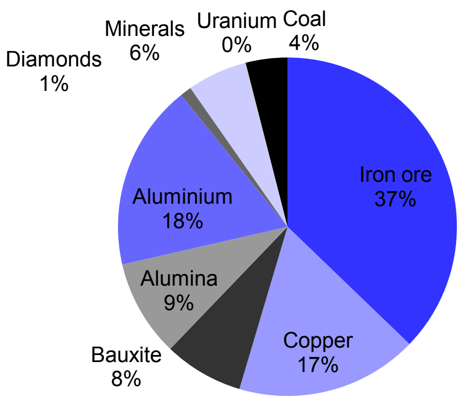
Figure 205: Resource cashflows by commodity over time



Source: Deutsche Bank

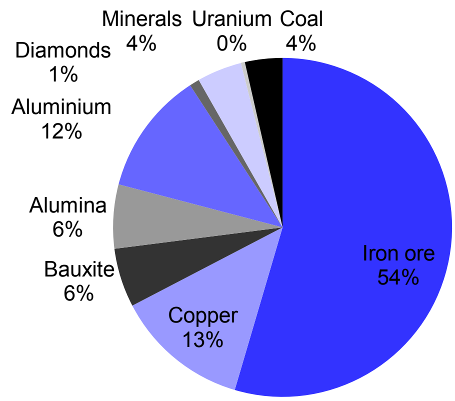
These cash flows translate to the following split of operating NPVs for Rio on a normalised basis. Iron ore contributes around a third of the reserve NPV, but half of the resource NPV (in line with the cash flows).

Figure 206: Rio normalised Reserve NPV split



Source: Deutsche Bank estimates/assumptions

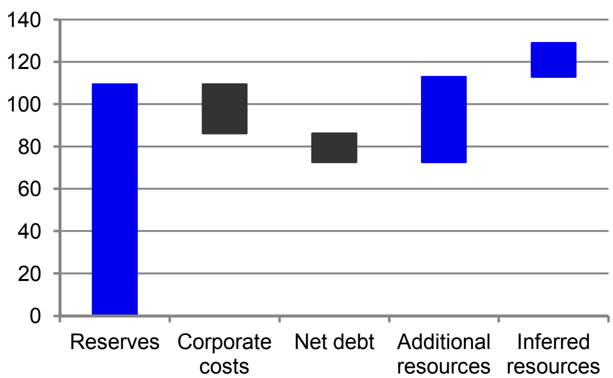
Figure 207: Rio normalised Resource NPV split



Source: Deutsche Bank estimates/assumptions

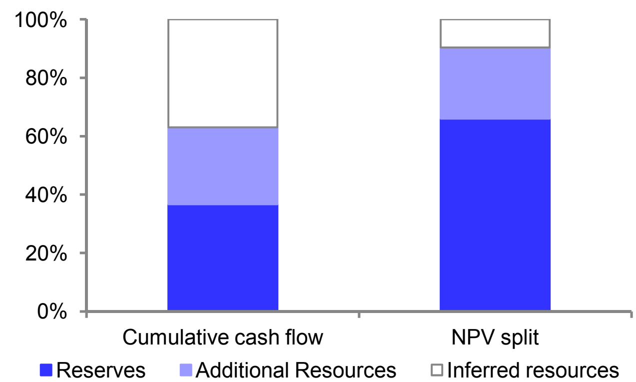
About a third of the future normalised cash flows generated by Rio sit in its reserves and this translates (after discounting) to 66% of its operating NPV.

Figure 208: Rio Normalised NPV bridge



Source: Deutsche Bank estimates/assumptions

Figure 209: Rio Normalised operating cash flow and NPV split



Source: Deutsche Bank estimates/assumptions

We detail the normalised valuation split by asset in the table below

Figure 210: Normalised cash flow data by asset for Rio Tinto (USDm).

	Steady state free cashflow	Reserve NPV	additional measured and indicated resource NPV	Inferred resource NPV
Iron ore				
Hamersley 100% owned mines	4,187	31,143	21,772	12,525
Hamersley - Channar	141	598	602	6
Hope Downs	525	2,931	4,750	896
Robe River	735	3,462	7,281	1,151
IOC	207	2,581	751	29
Copper				
Escondida	547	7,784	471	658
Kennecott Utah Copper	427	3,930	148	22
Grasberg	637	6,537	776	6
Oyu Tolgoi Open Pit	66	795	28	73
Bauxite				
CBG Sangaredi	44	416	301	0
Weipa	376	5,943	199	5
Gove	175	1,827	294	19
MRN Porto Trombetas	22	108	183	29
Alumina				
Jonquière/Vaudreil	44	598		
QAL	251	3,885		
São Luis	27	426		
Yarwun	337	5,218		
Aluminium				
Alouette	97	1,500		
Canada - seven wholly owned	769	11,923		
Bécancour	36	555		
Dunkerque	111	1,405		
ISAL	50	780		
Lochaber	7	40		
Sohar	37	580		
Bell Bay	28	454		
Boyne Island	98	1,111		
Tomago	89	861		
Tiwai Point	58	245		
Diamonds				
Argyle	47	205	178	26
Diavik	128	781	12	90
Murowa	30	222	0	51
Minerals				
US Borax and Argentina	80	1,209	0	0
Lac Tio / Fer et Titane	216	2,235	885	58
Richards Bay	228	2,093	17	0
Dampier Salt	38	613	0	0
Uranium	**0**	**0**	**0**	
Ranger/ERA	35	66	470	29
Rössing	5	56	19	3

Source: Deutsche Bank assumptions/estimates

Figure 210: Normalised cash flow data by asset for Rio Tinto (USDm). (Cont'd)

	Steady state free cashflow	Reserve NPV	additional measured and indicated resource NPV	Inferred resource NPV
Coal				
Bengalla	32	421	50	21
Hunter Valley operations	106	1,465	239	32
Mount Thorley Operations	38	119	71	228
Warkworth	23	324	29	23
Hail Creek	173	1,426	753	109
Kestrel	53	602	0	7
	11,360	**109,473**	**40,277**	**16,095**
Corporate costs	-800	-23,237		
Net Debt		-13,632		
Dividends	-4,200			
Net Interest	-928			
Total US$m	**5,432**	**72,604**	**40,277**	**16,095**

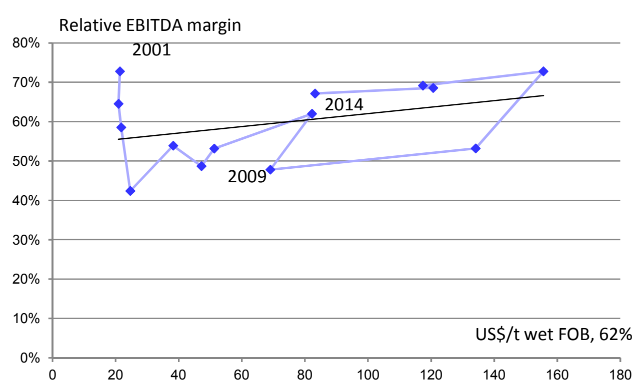
Source: Deutsche Bank assumptions/estimates

Iron ore

For the iron ore division analysis, we only include the current capacity (361Mtpa from the Pilbara on a 100% basis and 23Mtpa from IOC).

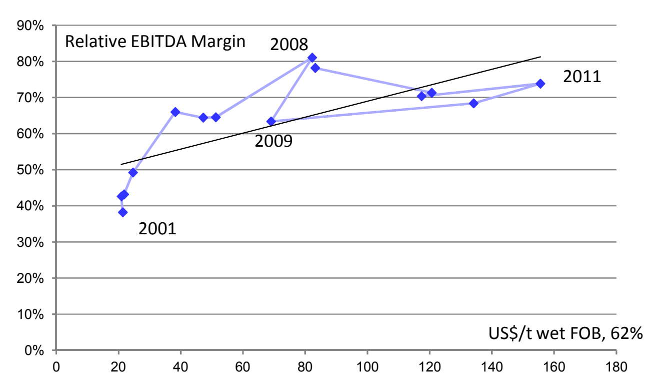
We plot a "relative EBITDA margin" for the iron ore mines as we are plotting against a single iron ore price in US$/wet tonne FOB – which is ultimately the margin that the mines make. This means that the EBITDA margins shown in the charts are elevated relative to what would have been actually reported at the sites because they sell higher grade products at a premium over and above the benchmark 62% price (e.g. lumps and pellet products). The improvement in Hamersley is clear as the margins have remained elevated in the recent price retracement.

Figure 211: Hamersley mines (58.2% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream,

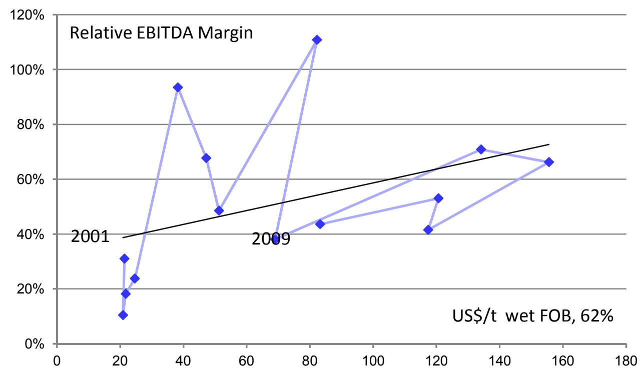
Figure 212: Robe River. (58.9% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream

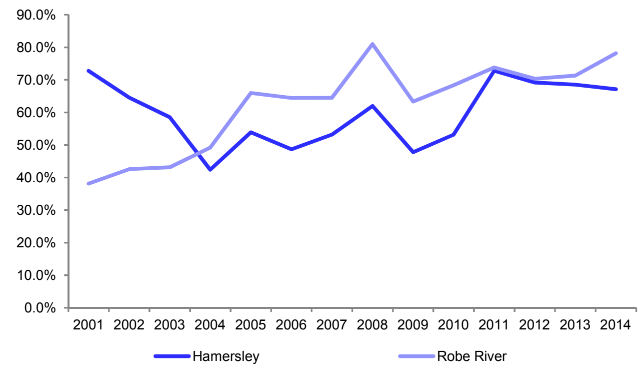
It is interesting to note that despite having a lower quality product, the Robe river margins are higher than Hamersley as shown in Figure 214. This is because Robe River charges Hamersley for the use of its rail and port infrastructure. IOC had a couple of bumper margin years as iron ore price and pellet premiums spiked but are currently struggling to compete with the Australia DSO operations on a margin basis despite producing a higher value product.

Figure 213: IOC (48.9% relative margin LT)



Source: Company data, Deutsche Bank estimates, datastream,

Figure 214: Hamersley and Robe river.



Source: Company data, Deutsche Bank estimates, datastream

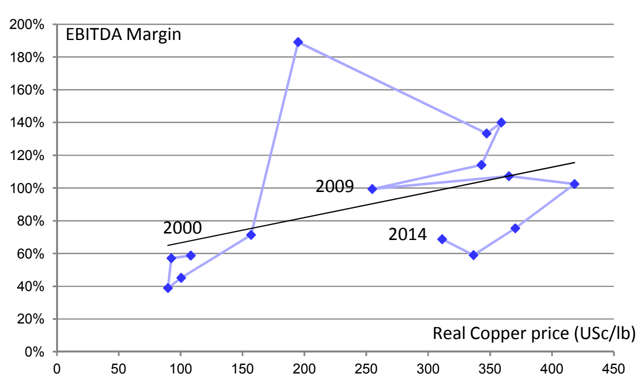
Copper

In our copper division analysis, we include the four operating mines only. In the case of Oyu Tolgoi, we only include the open pit and not the underground as this project has not received approval yet.

The benefits of the KUC by-products are clearly evident in the margin chart shown below. The mine is also producing surprisingly good margins despite the fact that it is still recovering from a significant pit wall failure.

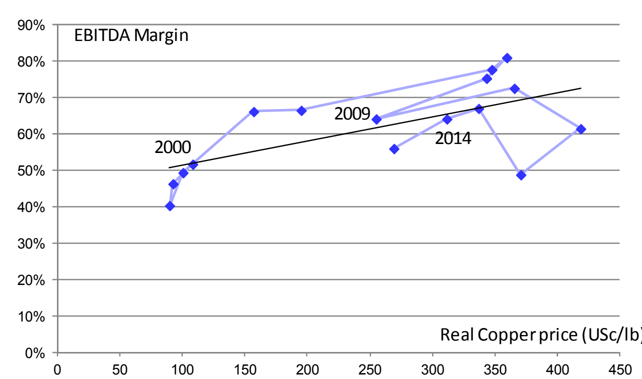
The large Escondida mine is showing the stability in margins that you would expect from a large mature operation.

Figure 215: Kennecott copper (81.5% relative margin)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie,

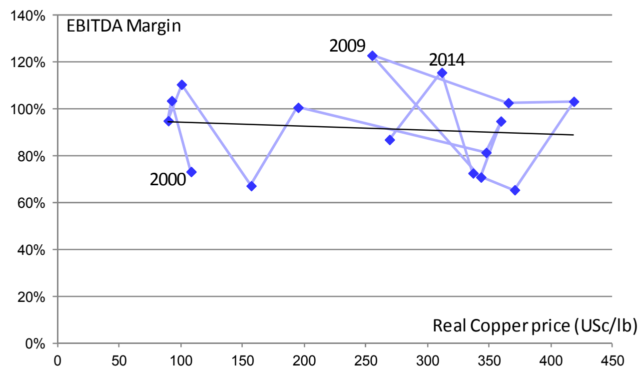
Figure 216: Escondida (60.1% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

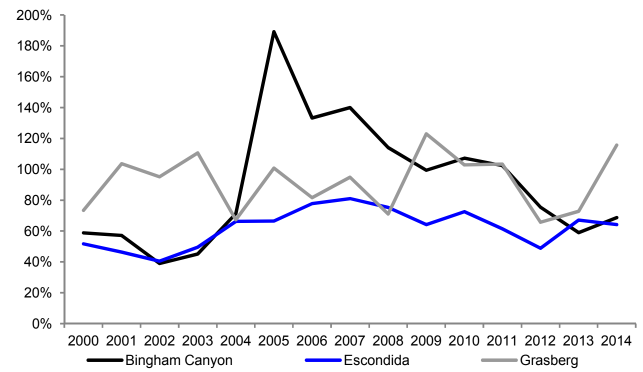
The Grasberg margins are also fairly stable and high based on the by-product credits. Note, that the chart below reflects the performance of the mine. Rio is entitled to the expansion tonnes from the mine which have been meagre over the last few years, so Rio's recent return from the operation has been negligible. However, this is appears to be correcting, and more importantly, the original mine plan runs out in 2020 and so after 2021, Rio Tinto is entitled to 40% of the entire mine production.

Figure 217: Grasberg (91.7% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 218: Copper mine margins over time



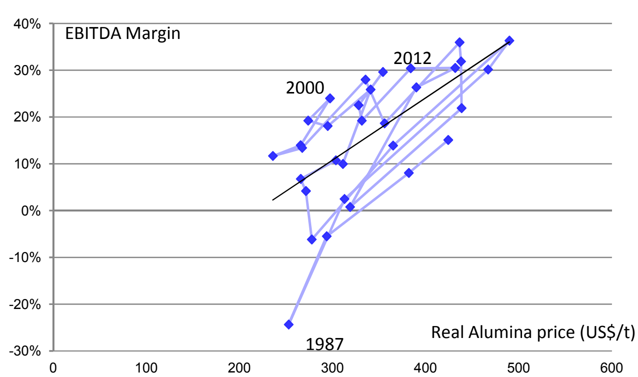
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Bauxite and Alumina

We show the margins by price over time for the alumina refineries and bauxite mines in the charts below. The alumina charts are particularly interesting as they show significant EBITDA margin variation over time relative to that variability described by other commodity assets. We believe that this is because the alumina price for many years was linked to the aluminium price and so it was distorted from its own supply and demand fundamentals by the performance of aluminium. Consequently, the natural cost corrections that we see in other commodities are not as present in Alumina.

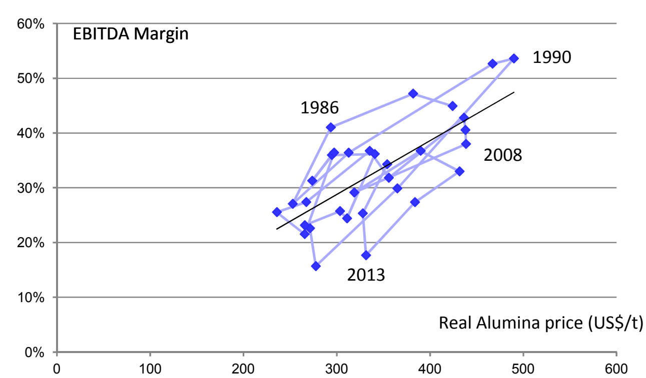
The impact of technology is also apparent with the old Vaudreuil refinery displaying significantly lower margins than the much newer Yarwun refinery.

Figure 219: Vaudreuil (16.7% relative margin LT)



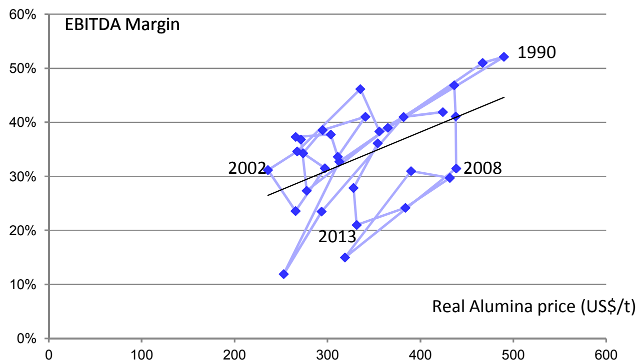
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 220: QAL (34.6% relative margin LT)



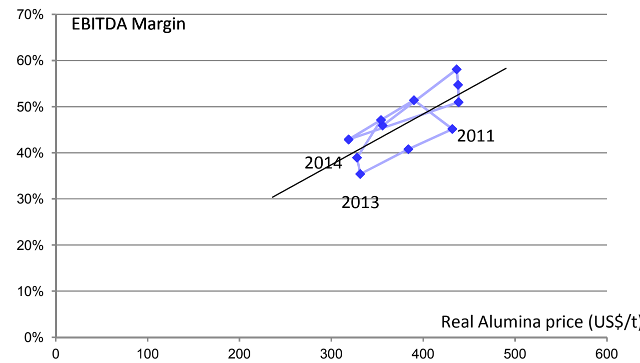
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 221: Alumar (34.4% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 222: Yarwun (43.3% relative margin LT)

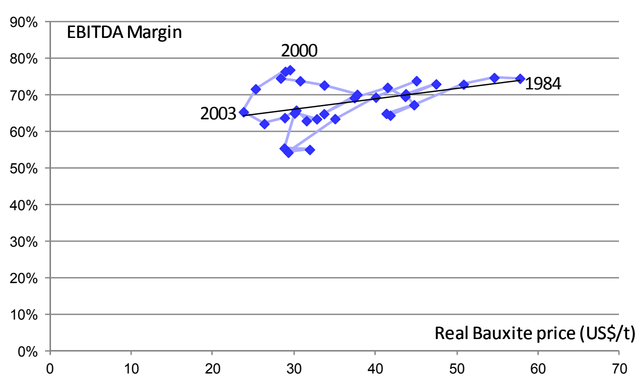


Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

By contrast, the first two bauxite mines shown in the charts below have a much more stable margin profile over time – both are Australian based assets.

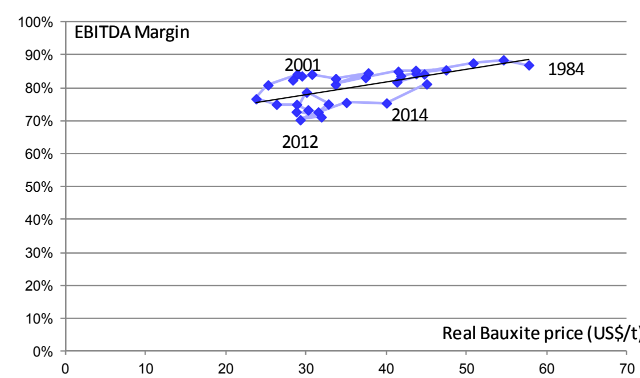
The next two mines are more volatile reflecting more difficult operating environments over time.

Figure 223: Weipa (70.1% relative margin LT)



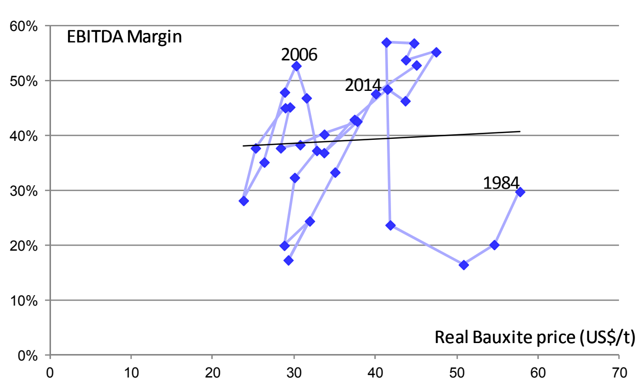
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 224: Gove (83.2% relative margin LT)



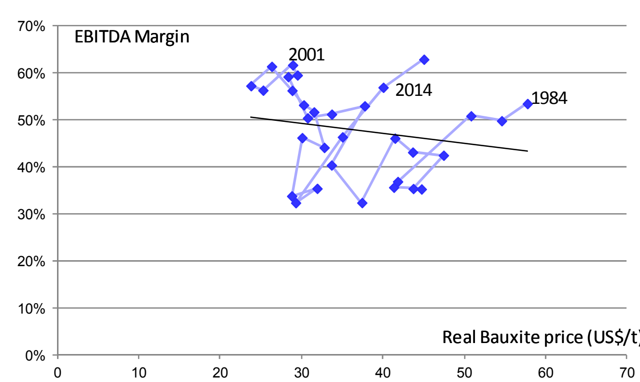
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 225: Boke (39.7% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 226: Trombetas (46.2% relative margin LT)



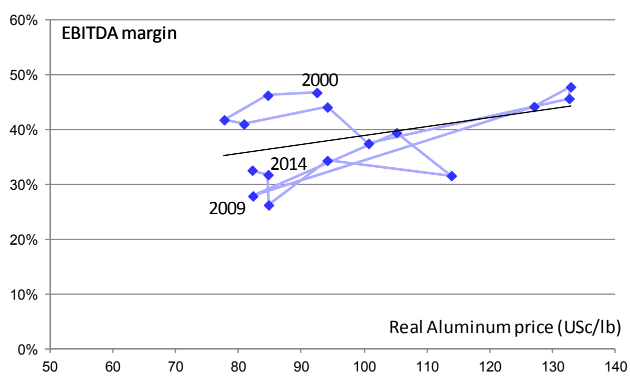
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Aluminum

Rio's aluminium smelter performance data are shown in the following charts. Note in Figure 228 where we combine the margin performance over time for the smelters that the Australasian smelters have struggled the most (and continue to struggle to perform). The reasons for the attempted sale of these assets is clear in the context of the smelter fleet.

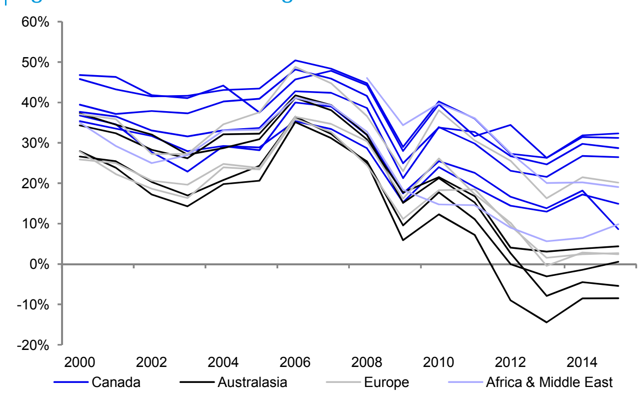
The same chart also highlights the downward trend over time of the aluminium smelters and shows clearly the structural challenge: Aluminium has a significant technology based component for its production hence as time passes, the technology improves and the incumbent smelters become increasingly less competitive than the successive generations.

Figure 227: Alma (38.2% relative margin LT)



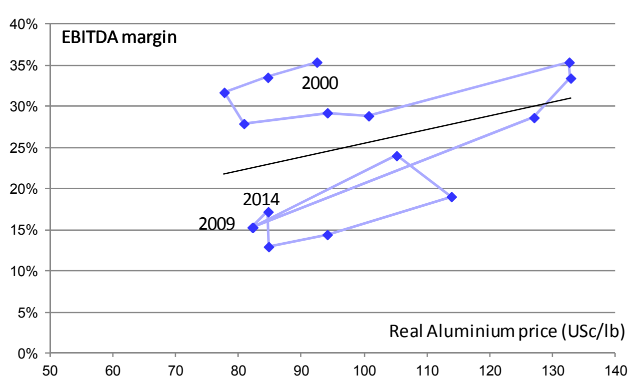
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 228: Smelter margins over time



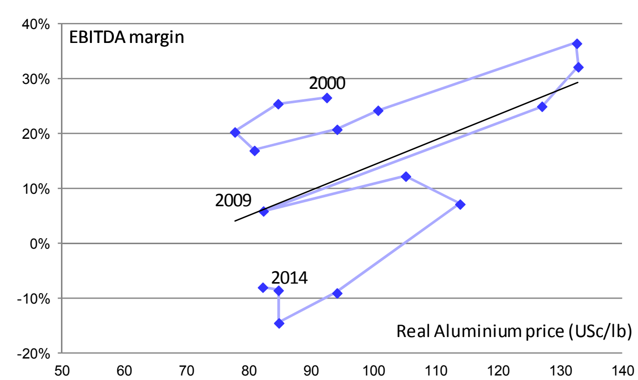
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 229: Becancour (25.2% relative margin LT)



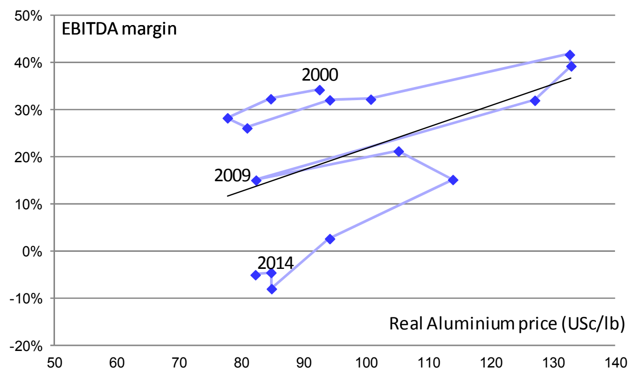
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 230: Bell Bay (12.1% relative margin LT)



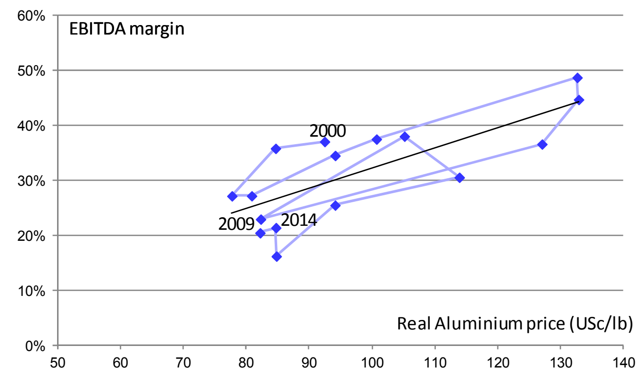
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 231: Boyne Island (20.6% relative margin LT)



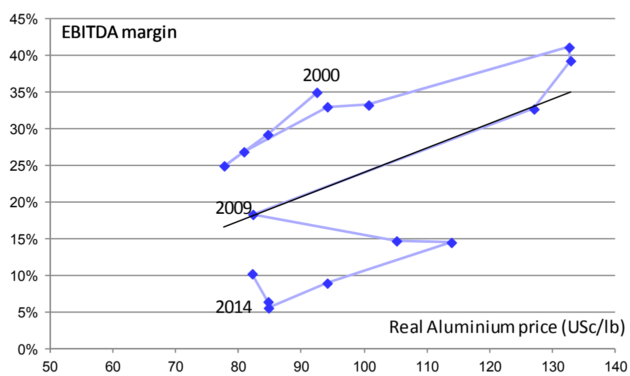
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 232: Dunkerque (31.1% relative margin LT)



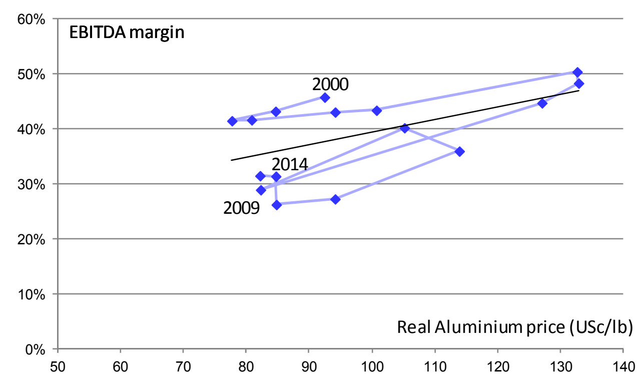
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 233: Edea (22.6% relative margin LT)



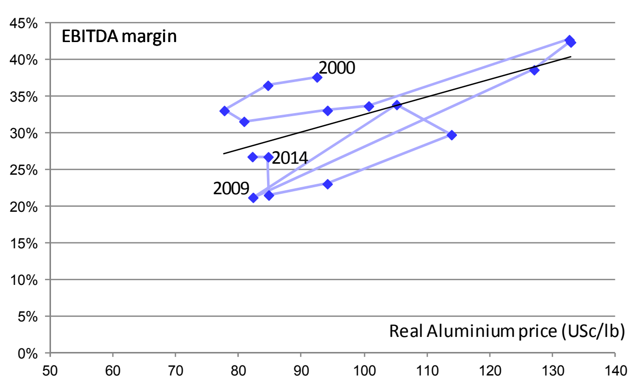
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 234: Grande Baie (38.5% relative margin LT)



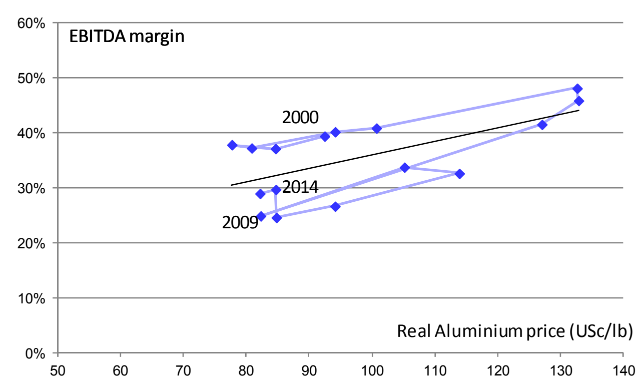
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 235: Arvida (31.6% relative margin LT)



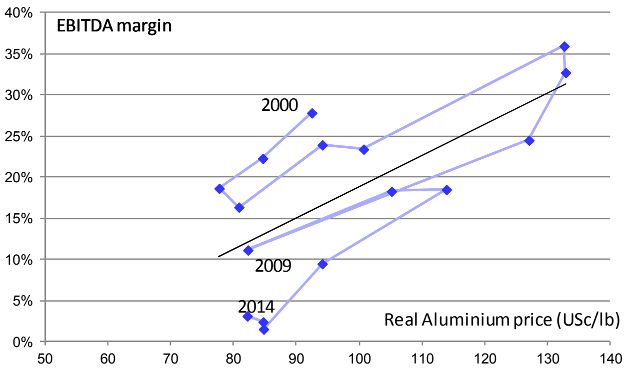
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 236: Laterriere (34.8% relative margin LT)



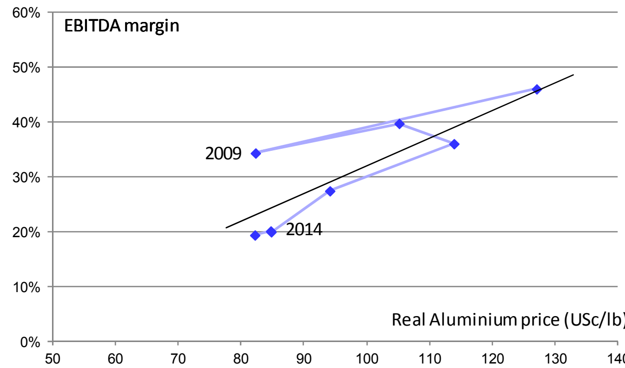
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 237: Lochaber (17.8% relative margin LT)



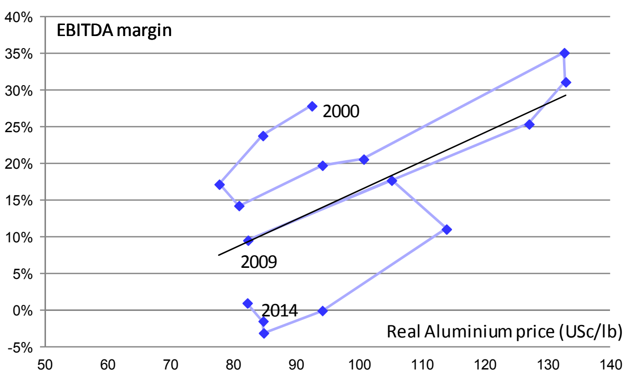
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 238: Sohar (30.1% relative margin LT)



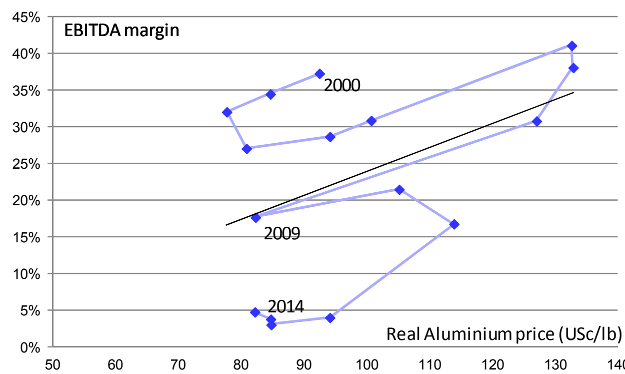
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 239: Tiwai Point (14.7% relative margin LT)



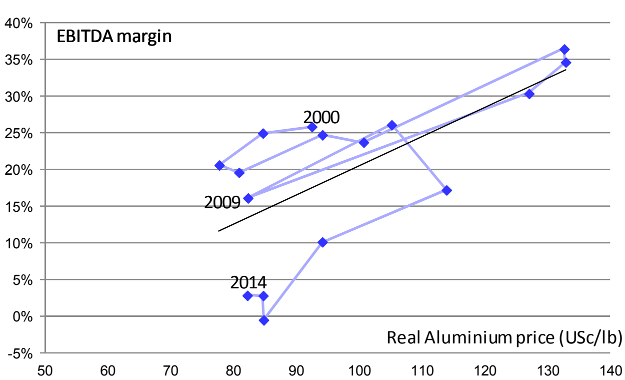
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 240: Tomago (22.4% relative margin LT)



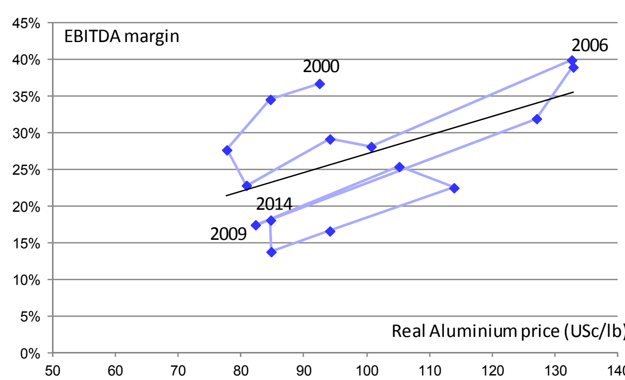
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 241: Isal (19.4% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 242: Alouette (30.9% relative margin LT)

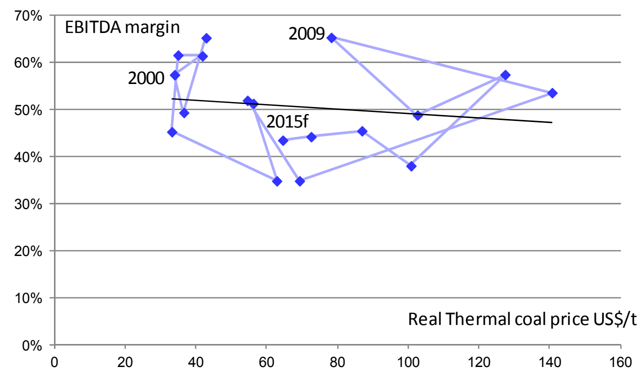


Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Coal

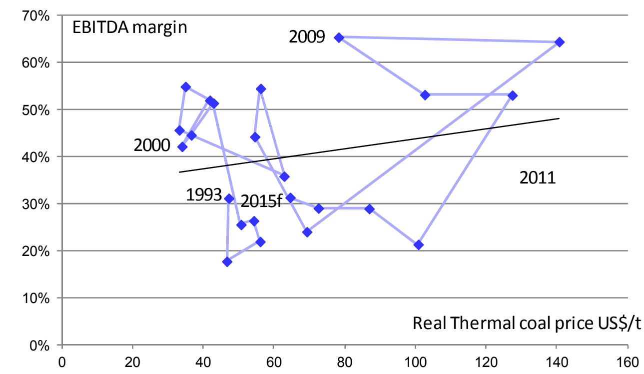
While not quite as extreme as the iron ore price, the thermal coal price has been volatile and the coking coal price has been as volatile as iron ore with a nearly 10 fold swing in prices in the period shown. The coal divisions within the big miners move by far the largest amount of material and so display clearly the margin dampening as the prices go up as the companies put on additional labour and equipment to chase the tonnes.

Figure 243: Bengalla (51.0% relative margin LT)



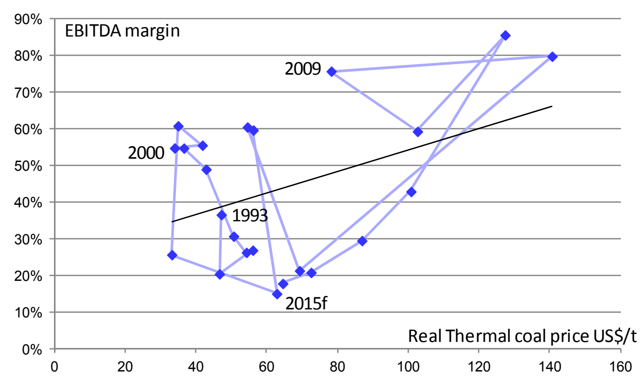
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 244: Hunter Valley (40.4% relative margin LT)



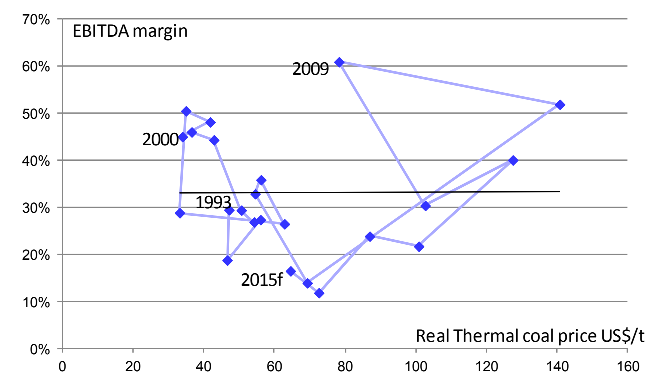
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 245: Mt Thorley (45.2% relative margin LT)



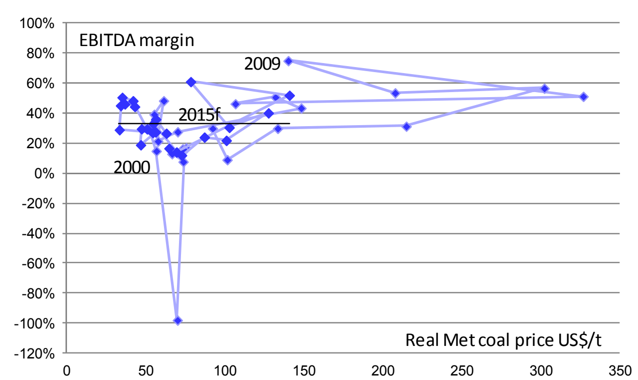
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 246: Warkworth (33.2% relative margin LT)



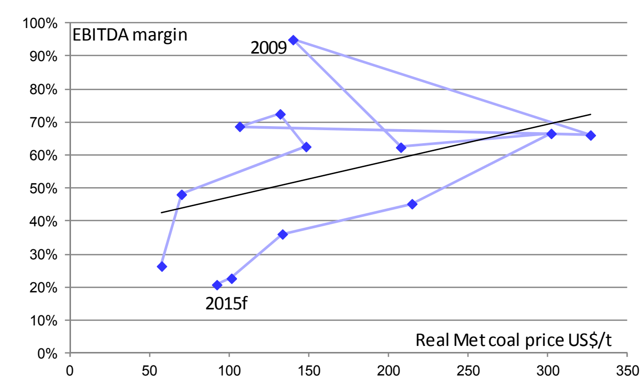
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 247: Kestrel (26.6% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 248: Hail Creek (48.2% relative margin LT)

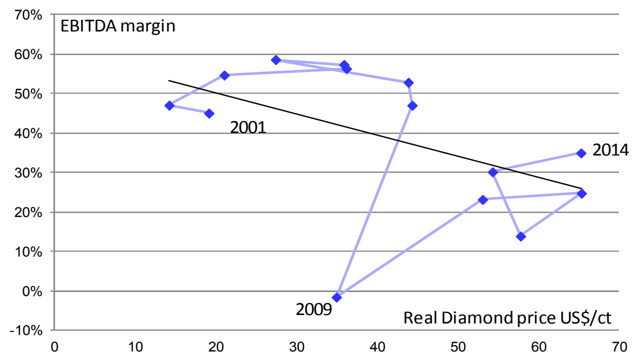


Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Diamonds

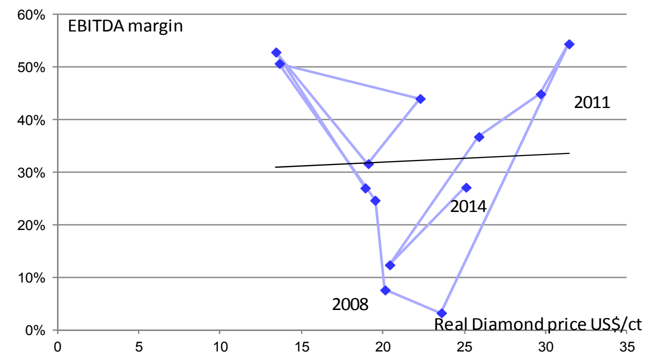
Diamond mines were more difficult to fit into the normalised model. Every diamond mine has a characteristic size and quality population distribution that will mean the achieved prices are very different – so there is no single long-run price for diamonds. Instead, we simply averaged the achieved real price for each mine and used that in the long-run cash calculation estimates.

Figure 249: Diamonds Total (39% relative margin LT)



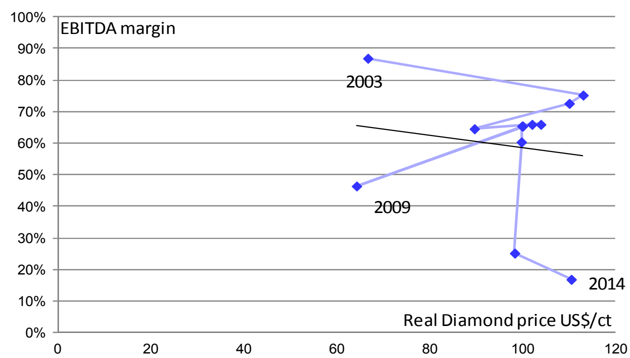
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 250: Argyle (32% relative margin LT)



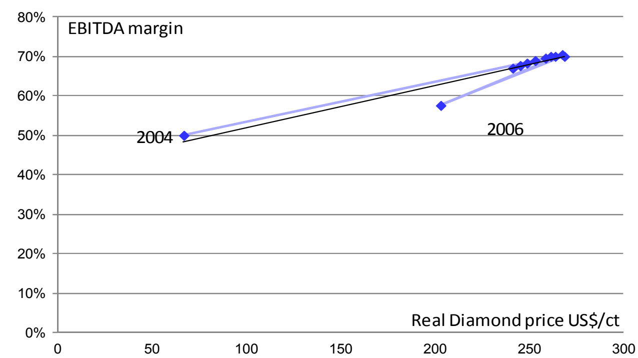
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 251: Diavik (59% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 252: Murowa (66% relative margin LT)



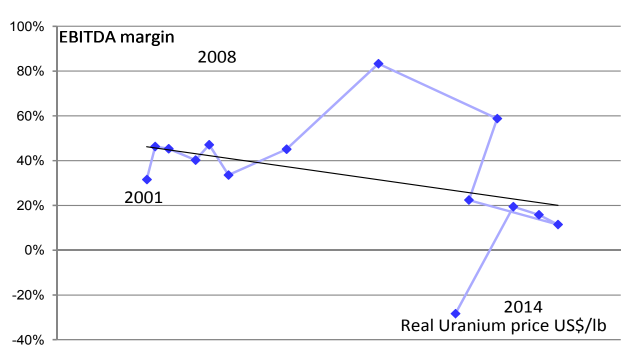
Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Minerals and Uranium

Both of Rio's uranium mines showed the unusual characteristic of generally reducing margins as the uranium price increased. Much like diamonds, we have used here the actual realised price by the mines for uranium as the U3O8 is sold under a range of long-term contracts and not at spot and the details of these contracts are not disclosed.

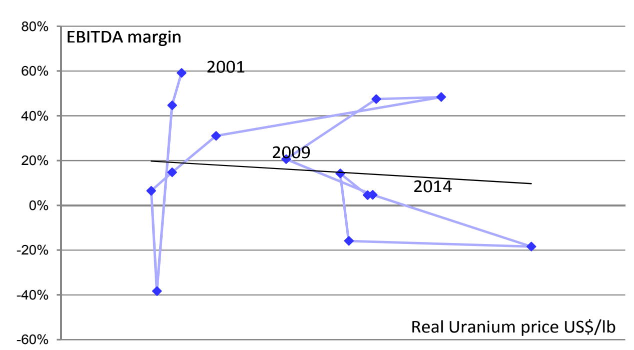
The most recent margin dip at Ranger reflects the current operational difficulties that the site is experiencing.

Figure 253: Ranger/ERA (34% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Figure 254: Rossing (16% relative margin LT)



Source: Company data, Deutsche Bank estimates LME, Datastream, Wood Mackenzie

Setting baseline commodity prices

What is a "long-run, through-the-cycle" commodity price? Initially, it depends on who you are asking – some investors like to use spot prices as the only true representation of the market while others prefer the forward curve. Certainly, both sell-side and buy-side analysts expend significant analytical time forecasting where the long-run prices for commodities may fall. The debate rages between long-term incentive price vs long-term marginal cost (both of which are moving feasts based on your long-term view of fx, inflation rates, demand and a myriad of other inputs). We perform rigorous analysis to produce our long-run forecasts; however, for the sake of conservatism (and to remove as much assumption bias as possible) we have used long-run historical averages in the analysis in the report as the normalised commodity prices.

Why are long-run prices conservative?

Commodities are non-renewable (although recycling for many is possible) and demand for them has increased steadily over the long run. The widespread use of basic economic models has meant that minerals are mined from the easiest to hardest/most costly to obtain – so generally new generations of mines are deeper, lower grade and harder to get to. Technology can help to offset these cost increases, but this has only been consistently achieved in aluminium as the charts on the following pages show.

We have used real prices back to 1900 in many cases to determine realistic historical averages. In some cases, for specific reasons, we have used shorter-term averages to provide a more reasonable normalised price. Aluminium due to the ongoing technology improvements and gold and oil due to political intervention on prices are examples of these.

A summary of the normalised prices that we have used is shown in the margin table. The table below shows how the long run prices compare to recent price performance for key commodities. Note that for most of the key commodities, the long-run average trades below the current spot which will mean valuation for those commodities will come out lower than those using spot valuations.

Figure 256: Current price vs history for key commodities.

	Unit	2015 average	spot	long run average	Spot vs long run average
Copper	Usc/lb	271	272	222	22%
Iron ore	US$/t 62% CIF China	60	63	67	-6%
Aluminium	Usc/lb	82	78	97	-20%
Gold	US$/Oz	1210	1191	754	58%
Oil	US$/bbl	52	60	52	15%
Zinc	Usc/lb	97	98	91	7%
Nickel	Usc/lb	629	588	602	-2%

Source: Deutsche Bank, datastream

We also believe that current sentiment is generally negatively biased towards commodity prices due to experience. Almost all of the commodities have printed century low prices in real terms within living investment memory. In

Figure 255: Prices assumed in the analysis.

Commodity	Unit	Long run average
Aluminium	Usc/lb	97
Copper	Usc/lb	222
Nickel	Usc/lb	603
Zinc	Usc/lb	91
Lead	Usc/lb	80
Tin	Usc/lb	733
Gold	US$/Oz	754
Silver	US$/Oz	11
Platinum	US$/Oz	851
Palladium	US$/Oz	337
Rhodium	US$/Oz	1994
Oil	US$/bbl	52
Natural gas	US$/mmbtu	5
Thermal coal	US$/t	68
Coking coal	US$/t	112
Uranium oxide	US$/lb	41
Iron ore	US$/t	67
Bauxite	US$/t	61
Alumina	US$/t	353

Source: Deutsche Bank assumptions

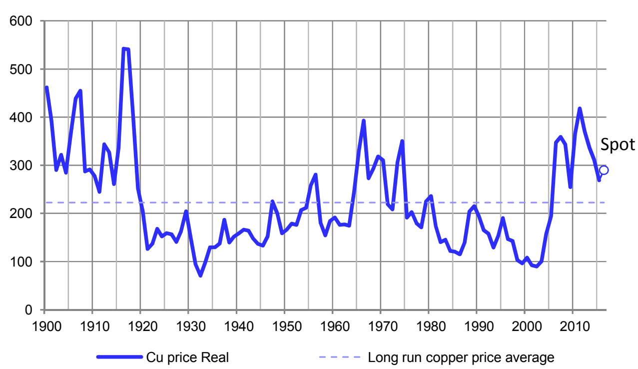
the next couple of pages we show the long term real price performance for a range of commodities. Note that the period just before the China driven boom (2000-2003) marked century lows (or close to) for almost all of the commodity prices.

The commodity performance

Base metals

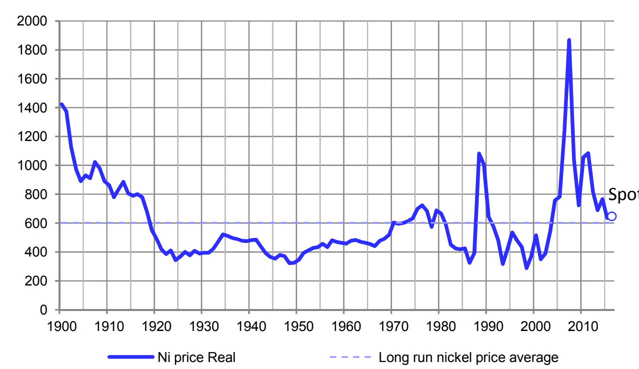
All of the base metals approached 100-year lows in the early 2000's. We describe in more detail a little later the explicit performance of some of these metals, but note initially that aluminium is the "the odd man out". It is extremely abundant, but technically difficult to extract hence the relentless price decline over time as technology improves.

Figure 257: Long run real copper price (USc/lb)



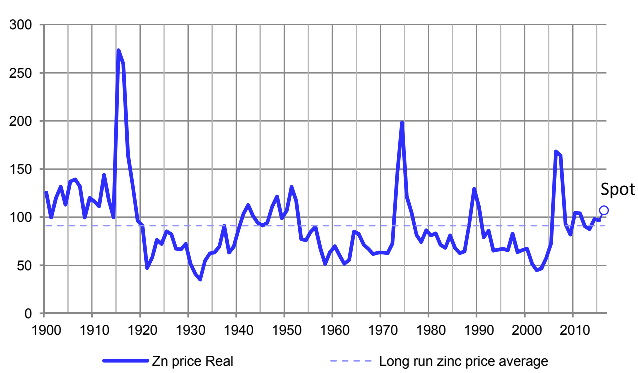
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 258: Long run real nickel price (USc/lb)



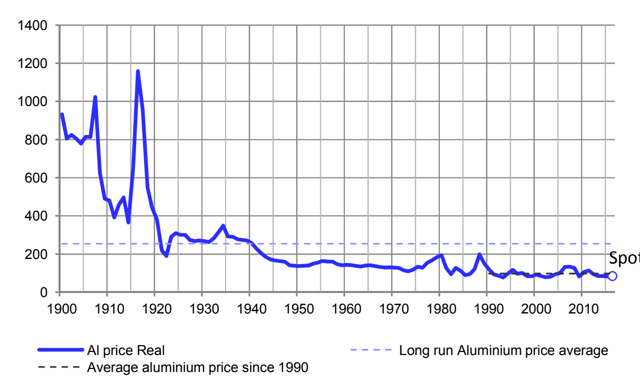
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 259: Long run real zinc price (USc/lb)



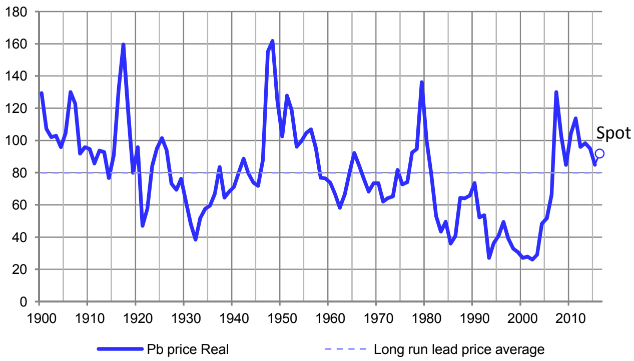
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 260: Long run real aluminium price (USc/lb)



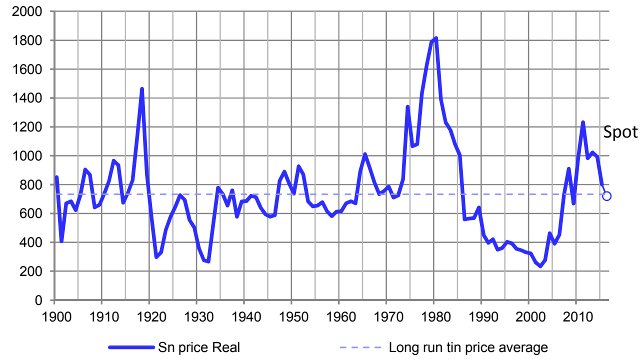
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 261: Long run real lead price (USc/lb)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 262: Long run real tin price (USc/lb)

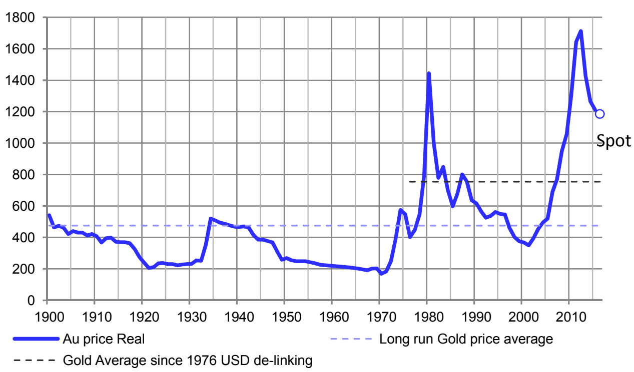


Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Precious metals

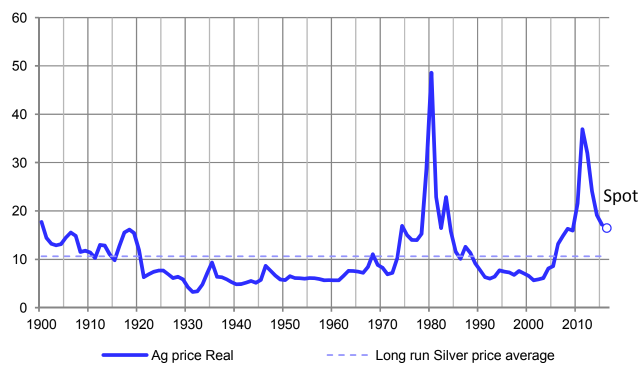
As mentioned earlier, we have used a shorter time period to produce a normalised gold price to reflect that fact that it was substantially government controlled before 1974.

Figure 263: Long run real gold price (US$/troy ounce)



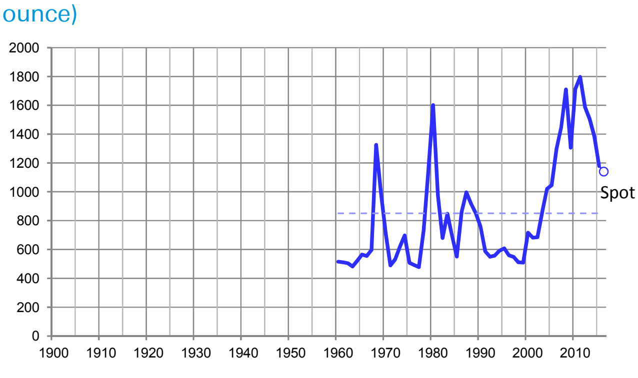
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 264: Long run real silver price (US$/troy ounce)



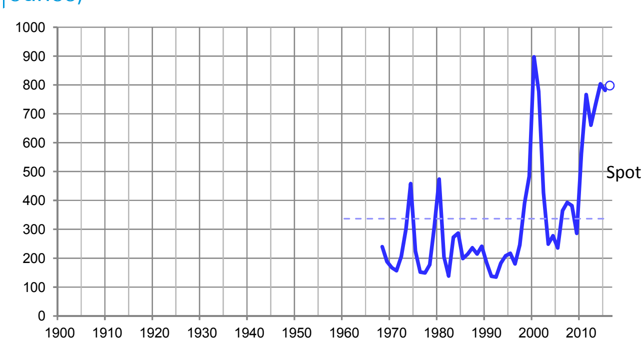
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 265: Long run real platinum price (US$/troy ounce)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 266: Long run real palladium price (US$/troy ounce)

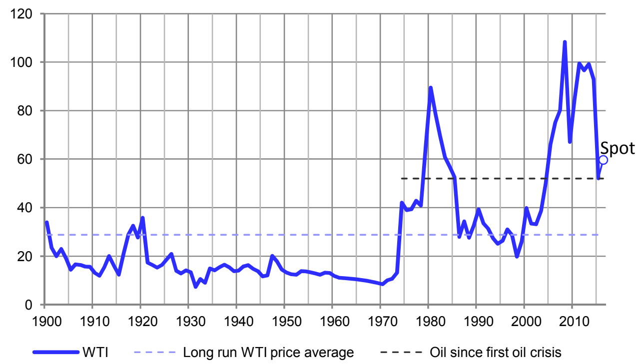


Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Energy and Bulks

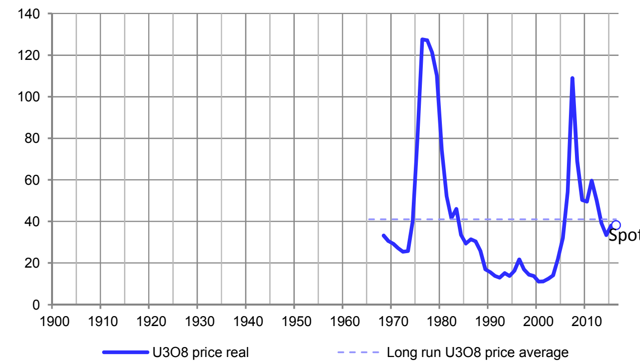
Energy commodity prices over time are shown below along with iron ore and alumina. Note, the similarity of the shape of the oil curve to that of gold on the preceding page – both remain significantly politically influenced.

Figure 267: Long run real oil price (US$/bbl)



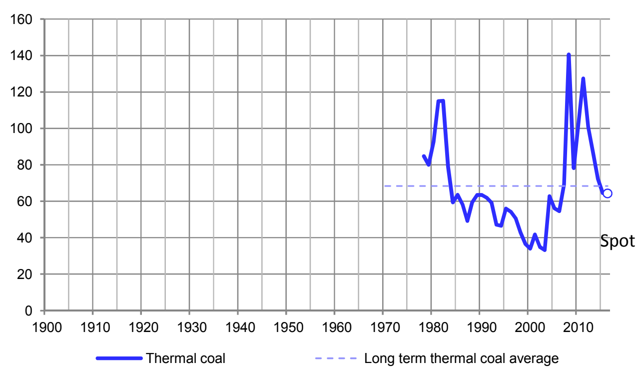
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 268: Long run real uranium price (US$/lb)



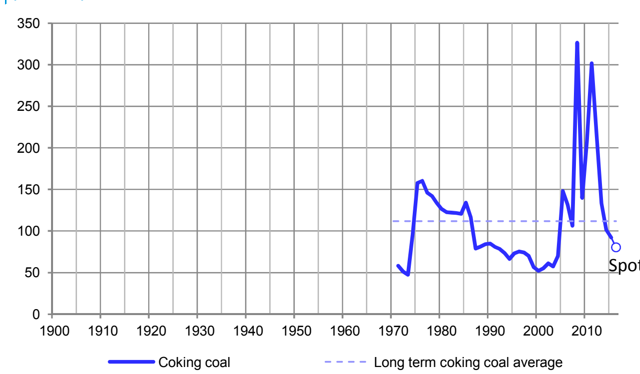
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 269: Long run real seaborne thermal coal price (US$/t)



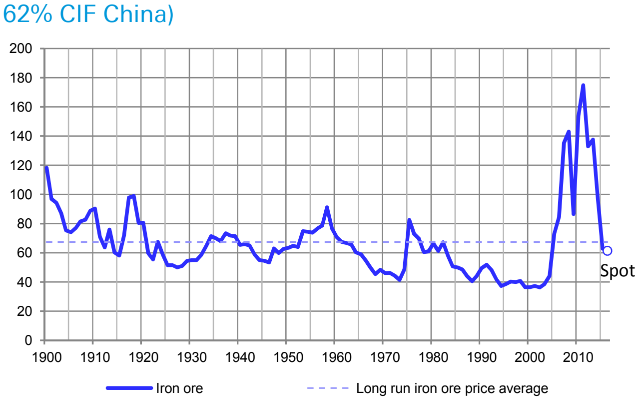
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 270: Long run real seaborne coking coal price (US$/t)



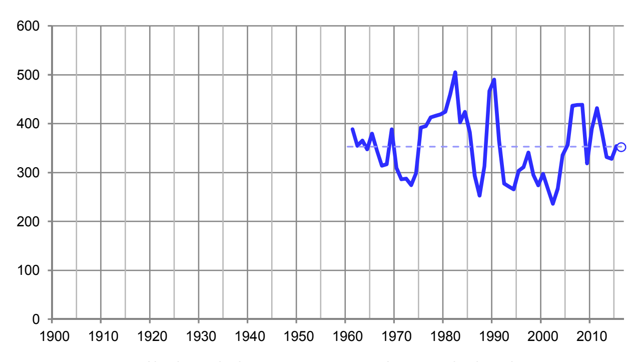
Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 271: Long run real seaborne iron price (US$/t dry 62% CIF China)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

Figure 272: Long run real alumina price (US$/t)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates

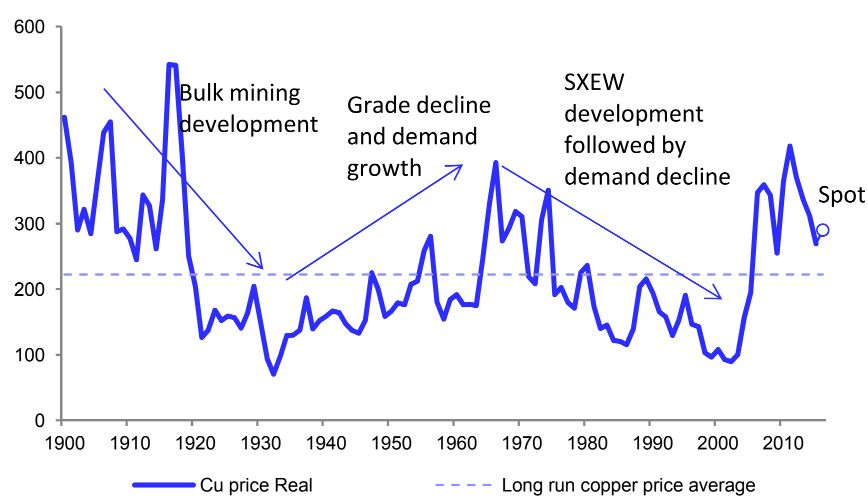
Copper

Copper usage is ubiquitous given its relative abundance, high electrical and heat conducting and lower oxidation rate characteristics. As copper occurs in discrete ore bodies, unevenly distributed across the planet, international markets for its trade are very active and had driven it to be called "Doctor copper" by the markets as its price performance was used to indicate the health of the global economy and as a bellwether for the industrial complex as a whole.

Since the turn of last century, the copper price has averaged US$2.22/lb in real terms with an annual average high of US$5.42/lb and low of US$0.70/lb. while there have been many mini cycles, there are a number of longer-term trends that have influenced the copper price as we have highlighted in the chart below. A number of the key drivers include:

- The development of bulk mining techniques and the move from underground to large open pit mining at the turn of the century lowered the cost of production (and hence the price) through to the mid 30's.
- This was then followed by a general 40-year upward price move as the grades steadily declined and global demand picked up.
- In the 60's, the use of acid leaching on oxides began to be industrialized and led to the lowering of the copper price (along with metal demand curtailment into the 80's and 90's

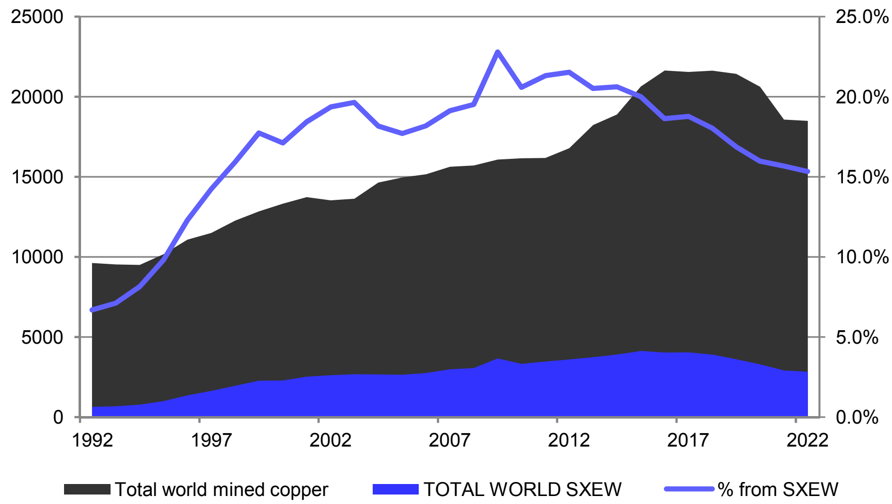
Figure 273: Long run real copper price (USc/lb)



Source: Deutsche Bank

The use of SXEW is in decline in our view as shown in the chart below. We forecast copper from SXEW to peak this year, but its percentage of the total peaked in 2009. Note the sharp ramp up from the early 90's – of the incremental mined copper from 1992 to 2009, half (47%) came from SXEW. The process relies on oxide ores, which are near the surface (as the oxygen can get to it) and, consequently, these are more readily exploitable and exhaustable. Basically, we believe that the additional cost benefit to the average copper extraction cost provided by SXEW is coming to an end.

Figure 274: Roll-over in SXEW derived copper.



Source: Deutsche Bank estimates/assumptions/forecasts, Wood Mackenzie

Many of the large oxide ore bodies are nearing depletion (e.g. Spence) and will have to transition to the underlying sulphide ore. The processing of this sulphide ore will typically require a concentrator, and this often requires a desalination plant, especially in Chile. Furthermore, many of the large sulphide ore bodies are now also nearing depletion (e.g. Chuquicamata and Grasberg), and require bulk underground mining methods such as block caving to extend the mine life. We think copper is one metal that will be subject to cost push inflation.

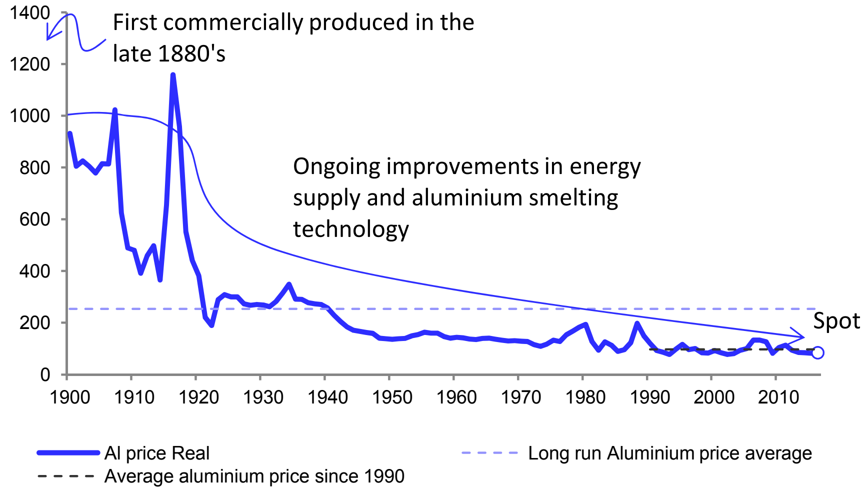
Aluminium

Aluminium is a light, strong, relatively corrosive resistant metal with fairly good conducting characteristics making it ideal for packaging, aerospace, long distance electricity transmission, construction and transport. It is also the most abundant metal in the earth's crust (next to silicon).

However, it has proven difficult to extract until relatively recently as it requires large amounts of energy to separate the aluminium from the oxygen in the naturally occurring aluminium oxide (alumina). Consequently, the metal was historically very expensive. As technology has improved and energy production has become more efficient and abundant, the cost of aluminium production has continued to slide as shown in the 100 year chart below.

This makes smelting a tough business to be in longer term, with the raw material relatively easy to get hold of, the competitive advantage comes from the technology used and the price of power negotiated – both of these tend to deteriorate of time meaning new entrants are almost always lower on the cost curve than the majority of the incumbents... i.e. often smelters slowly go out of business.

Figure 275: Long-run real Aluminium price (USc/lb)

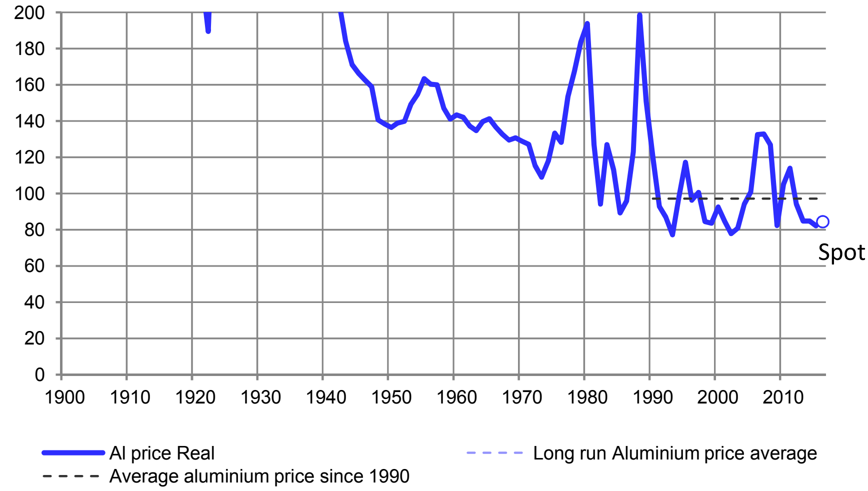


Source: Datastream,, LME, ,ABARE, ,USGS, Deutsche Bank estimates/assumptions

The chart below shows the same data, but we have dropped the scale to show more detail over the recent period. As the industry has a large technical component, production was historically dominated by a number of key players who had invested heavily in the development of technology and then guarded it jealously (Alcoa, Alcan, Norsk Hydro, Comalco, Reynolds. Aluminium smelters also need large amounts of consistent, low cost, stable electricity and so production was limited to those countries that could provide this.

The collapse of the iron curtain in the late eighties, China's more recent pursuit of its own aluminium industry and more regions with stable low cost electricity has made the product more global. It has now also limited the amount of technology development spend by the western aluminium producers as Chinese and Russian technologies have been made available. The consolidation of China's thermal coal mines into a much more efficient industry with economies of scale, the re-pricing of energy in line with the lower oil price, and the move to captive power generation by many of the new Chinese aluminium companies means that China no longer occupies the top end of the aluminium cost curve. Furthermore, there are now six competing technology providers in the country, putting China as a country in a very competitive position on the global aluminium stage. We think China will become an aluminium supplier to the rest of the world for two to three decades. Consequently, we have averaged the real aluminium price since 1990 to produce a more realistic, through the cycle price of US$97/lb representing the ongoing performance of the industry.

Figure 276: Long-run real Aluminium price (USc/lb)



Source: Datastream,LME,ABARE,USGS,Deutsche Bank estimates/assumptions

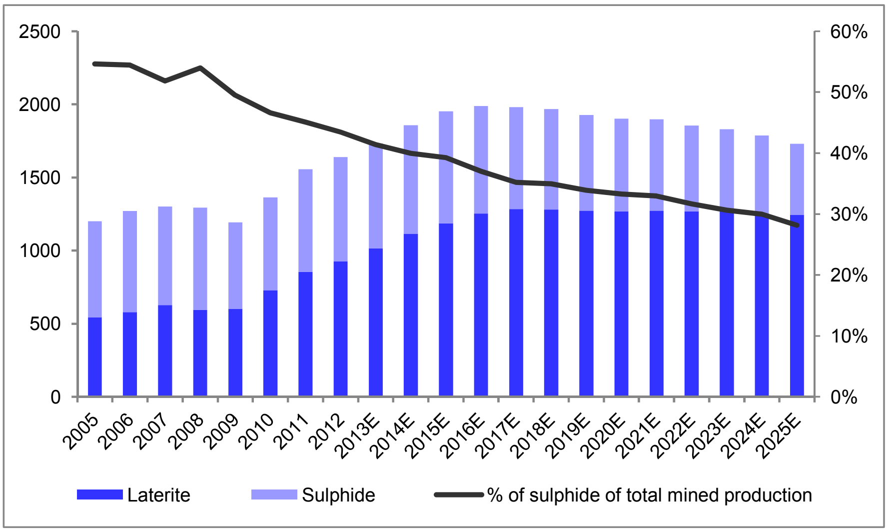
Nickel

Nickel is used as an alloying agent in steel to improve corrosion resistance, metal workability, and strength. Nickel's main use is in Austenitic stainless steel which accounts for c.70% of consumption. Stainless steel is used in consumer durable applications such as domestic appliances and in architectural applications when aesthetics are a key feature. Nickel use in aerospace applications (super alloys in jet engines) has increased over the past decade. Nickel is more of developed economy metal and is used far less in structural applications compared to carbon steel.

Nickel ore is also reasonably abundant in the earth, and is found in two main geological sources; Sulphide and Laterite (oxide) ore. Sulphide ore deposits are 0.5 – 0.7% grade, and often occur with other metals such as copper and PGM's. The main sulphide production centres are in Russia, Canada's Sudbury basin, China and Western Australia. Nickel is extracted from sulphide ore via conventional open pit or underground mining, followed by milling, flotation, smelting and refining. The existing production base is now "mature" and existing ore bodies need to be exploited at depth. Laterite ore is far more abundant, but is energy intensive to process and has no by-product credits. Nickel is extracted from laterite ores using one of two main methods; 1) High-pressure acid leach (HPAL); leaching of high-iron, low magnesium limonite ore followed by precipitation and refining to produce nickel cathode or briquette. 2) Direct smelting of low-iron, high-magnesium saprolite ore to produce ferronickel (iron matte) with a nickel content of 15-20%.

Due to its challenging and energy intensive process requirements, the nickel industry has always attracted new technologies which promise to significantly reduce the extraction cost of nickel in the plentiful laterite ore bodies. The newest innovation is an Australian company called Direct Nickel, which promises "superior resource utilization" by being able to treat both limonite and saprolite layers, through the use of nitric acid in an atmospheric (ie no high temperatures and pressures) leach process. History has not been kind to technology innovators (or perhaps more correctly the investors in new technology) in the nickel industry. The HPAL process was developed in the early 90's with Anaconda nickel, but took far longer to optimise and be profitable than was initially estimated. However, laterite ores comprise over 70% of global nickel resources and are likely to remain the bedrock of nickel production over the course of the next few decades.

Figure 277: Nickel production forecasts (2012-2025), laterites replacing sulphides

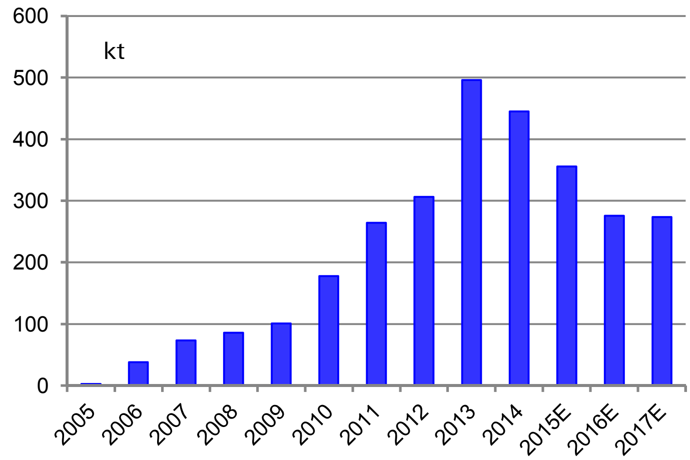


Source: Wood Mackenzie

In response to the rising nickel price in 2007, a "third" laterite processing form started to accelerate. China started importing low grade ores, to produce Nickel Pig Iron (NPI). This low grade ferronickel is the product of processing the low quality ores, sourced mainly from Indonesia (more than 1.5% Ni) and the Philippines (less than 1.5% Ni), through blast furnace (BF) or electric arc furnace (EAF) technologies. Initially the Chinese facilities were polluting and high cost blast furnace operations, but the industry has moved rapidly up the technology curve, with the main production coming from fairly advanced rotary kiln electric arc furnace operations (RKEF).

The ramp up of nickel pig iron production in China was exponential in the second half of last decade. NPI production increased from virtually zero in 2005 to c.80kt in 2008 (6% of global production). Peak NPI production was 500kt in 2013, before the Indonesian ore ban in 2014, amounting to c.27% of global nickel amount.

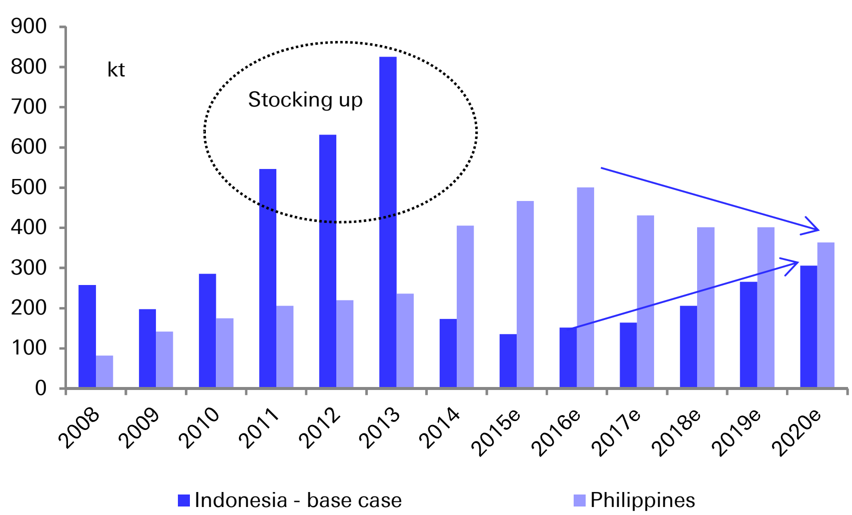
Figure 278: Chinese NPI production since 2005 including DB forecasts



Source: Wood Mackenzie, Deutsche Bank

The Indonesian ore ban in 2014 was a "supply shock" as the country provided c.20% of the industry's mined supply. The rationale behind the ban was to extract more value form the countries natural resources. NPI captures c.95% of the value of nickel, whereas Nickel ore only captures c.35 - 40% of the value. However, China imported significant ore ahead of the ban, which in combination with a rise in Philippine production has sustained production for a lot longer than anticipated. We forecast Philippine ore exports to decline as ore reserves deplete, but the rise in Philippine exports does highlight the relative abundance of nickel laterite ore.

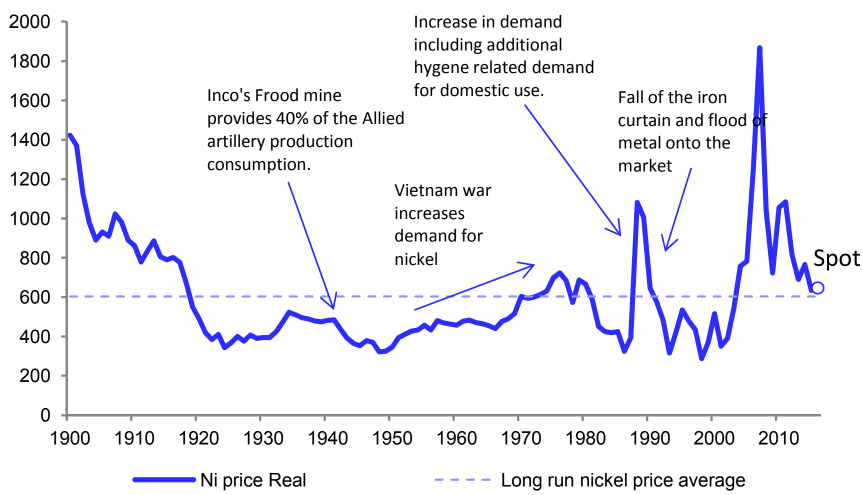
Figure 279: Indonesian and Philippine mined nickel production



Source: Deutsche Bank, Wood Mackenzie

The combination of strong demand growth, declining sulphide ore availability and the structural cost push from the Indonesian ore ban should result in a nickel price higher than the low's of the 1950's and early 2000's.

Figure 280: Long-run real Nickel price (USc/lb)



Source: Datastream,, LME, ,ABARE, ,USGS, Deutsche Bank estimates/assumptions

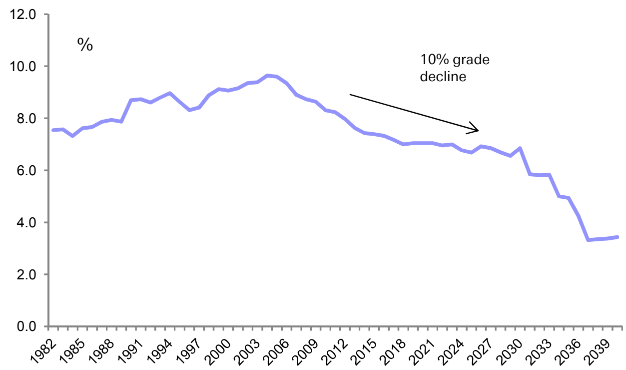
Zinc

The primary end use of zinc has been in construction and infrastructure, although transportation is now becoming a larger component of end demand. Its main use is as an alloying agent with copper, aluminium and magnesium, and a coating on steel in a process known as galvanising, imparting good corrosion resistance. Galvanizing accounts for c.60% of global zinc demand, followed by die-casting (14%) and brass (10%). Global zinc intensity of use started declining post the 1970's oil shocks as the global vehicle sales mix moved to smaller more fuel efficient cars and light-weighting led to steel losing market share. China's period of urbanisation and industrialisation reversed this trend and intensity of use has increased once more. We expect a peak by the end of the decade before the pace of urbanisation and industrialisation in China slows. The current push to light-weight vehicles in Europe and the US, as a result of tougher CO2 emission standards also represents a headwind for zinc demand.

Zinc ore bodies are well defined and tend to have relatively finite mine lives. This is in contrast to copper porphyry ore bodies which have more of a "halo". The increase in grades (up 28% between 1982 and the peak in 2004) during the 1980s and 1990s is a reflection of the opening up of Latin America and the start-up of some of the larger zinc mines currently in operation today. The growth in Chinese production from the early part of the 2000s has seen grades decline by 23%, with a further 10% decline in grades (production-weighted basis) between 2014 and 2025. We also expect the ratio of underground mines to increase ever so slightly versus open pit mines, which will add some further structural cost pressure.

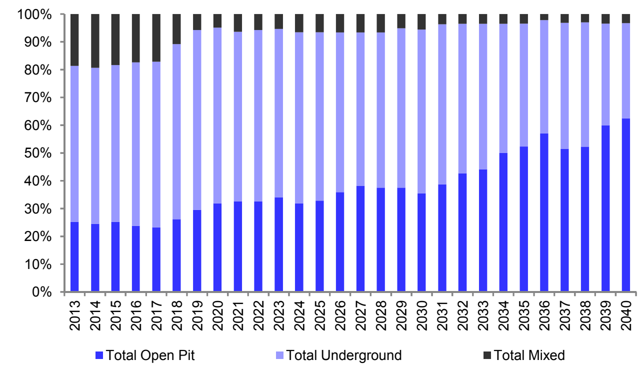
Smelting capacity, which is fairly energy intensive, tends to be located in China and the developed world. There is likely to be modest upward pressure on energy tariffs in these locations, with environmental pressures adding to both capital and operating costs. Offsetting this cost pressure is the likelihood that custom smelters are likely to have less bargaining power given the relative scarcity of concentrate.

Figure 281: Zinc head grade evolution



Source: Wood Mackenzie

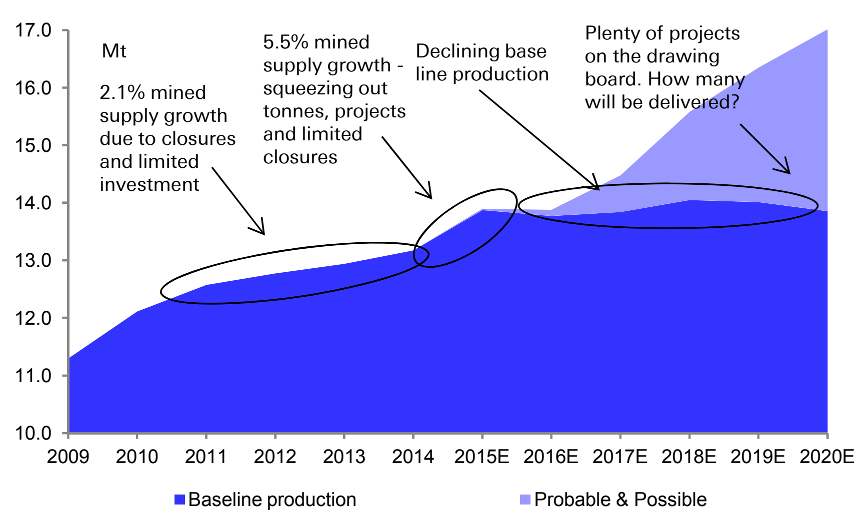
Figure 282: Ratio of open pit to underground operations in Zinc



Source: Wood Mackenzie

Due to the relatively small scale of zinc deposits, the major mining companies have tended to avoid large investments in zinc mines, and as a result many of the development projects are in the hands of junior mining companies with lower funding and fewer resources. Glencore and Vedanta are two of the larger mining companies that own zinc businesses. Vedanta's ownership of Hindustan Zinc gives it control of the world's largest zinc mine Rampura Agucha, which is currently transitioning to an underground operation. Glencore's participation in the zinc industry is via Xstrata which owned the relatively large scale operations of Mount Isa and MacArthur River. The point being that both these businesses have scale. BHPB's participation in zinc has tended to be mine-specific, in particular, the large scale and more importantly poly-metallic mines of Antamina and Cannington. As a result of zinc's status as an "orphan" metal, many of the large mines deplete over the next few years, starting with Century in 2016. Although these closures were well flagged, and supply has responded, the supply response only replaces the depletion. Any demand growth will have to be met by an under-developed and under-funded project pipeline.

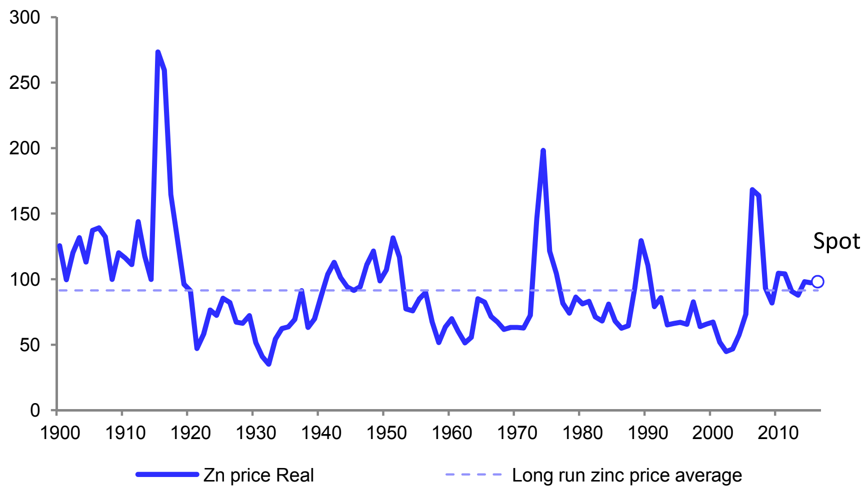
Figure 283: Zinc mined supply: Baseline, Probable and Possible



Source: Deutsche Bank, Wood Mackenzie

The long-run average real zinc price is 91c/lb, which is not too far away from spot. This price is however slightly lower than the long-term incentive price of 105c/lb which factors in the declining quality of ore bodies.

Figure 284: Long run real zinc price (USc/lb)



Source: Datastream,, LME, ,ABARE, ,USGS, Deutsche Bank estimates/assumptions

Oil

Petroleum, or crude oil, is a complex mixture of various hydrocarbons found in the upper layers of the Earth's crust. In the 1800s, crude oil was sometimes referred to as 'rock oil,' which in the form of kerosene displaced whale oil as a fuel for lamp lighting. Today the commercial applications of refined oil products are more varied including transport fuel, electricity generation, asphalt, wax, tar, lubricants, solvents, fertiliser, pesticides, synthetic rubber, petcoke, and other petrochemicals for the production of plastics, detergents, and antifreeze. Crude oil is one of the most significant commodities in terms of world expenditures, reaching a peak of 7.2% of world GDP in 1981, 5.0% of world GDP in 2008, and now having fallen back to 2.4% this year.

The earliest commercial resources of crude oil were discovered as seeps where oil naturally emerged from the ground. Onshore wells drilled in the mid-1800s were quickly followed by offshore wells drilled in the late 1800s. Today, methods of extraction have expanded to include ultra deepwater (>1500m) offshore oil and bitumen from oil sands.

The production of oil from US onshore tight oil basins has been the most significant new segment of extraction by incremental volume in recent years. In this context, 'tight' refers to the low permeability of the deposits, meaning that hydrocarbons do not naturally flow towards the wellhead. Therefore techniques of stimulation are required, primarily the fracturing of the rock formation under fluid pressure, the use of proppant to hold open fractures, and horizontal drilling to expose more of the formation to a single wellbore. Beyond this, producers have achieved increases in efficiency and reductions in cost by employing pad drilling, highly mobile drilling rigs, well down-spacing, and slickwater completions.

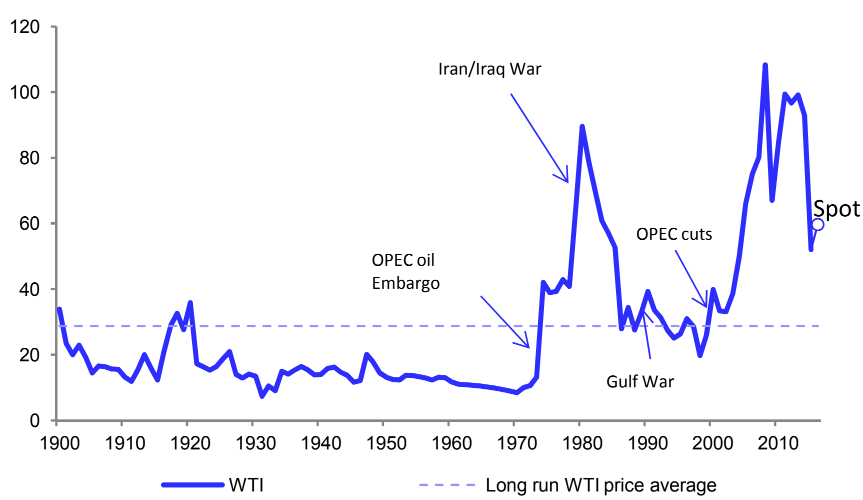
According to EIA estimates, US onshore tight oil production increased from 2.2 mmb/d in 2012 to 4.2 mmb/d in 2014, making the US the largest producer by total liquids volume in 2014 at 11.8 mmb/d, surpassing Russia at 10.9 mmb/d and Saudi Arabia at 11.4 mmb/d.

Production from ultra deepwater wells rose to 1.3 mmb/d in 2014 from 40 kb/d in 2000 and Canadian oil sands production increased to 2.2 mmb/d in 2014 from 135 kb/d in 2000. Together with tight oil, these three new segments of production now account for 8.2% of world production. These extraction methods are more costly, resulting in near quadrupling of finding and development costs from 2003 to 2012, and a wide dispersion of production breakeven costs from Saudi Arabia at USD7/bbl and Qatar at USD8/bbl to Canadian oil sands at USD67/bbl and Mexico at USD75/bbl.

Much of the volatility in oil prices can be attributed to the low stocks-to-consumption ratio and the relative inelasticity of oil demand in the short term, which in turn is a result of a large installed base of fixed assets which have no practical substitute fuel. Oil inventories in OECD countries stand at 88 days of consumption when considering the total of crude oil and refined product inventories. In this context, the role of OPEC is of great importance as it possesses the only significant spare capacity in the world, estimated at 2.55 mmb/d today, near the middle of the observed range of 0-6 mmb/d since 2000.

Although the Organisation of Petroleum Exporting Countries (OPEC) was created to obtain higher prices for crude oil, more recently it has been seen as a swing supplier, modulating production in response to market conditions to achieve a fair price for both producers and consumers. OPEC actions were instrumental in matching supply to demand over the 2008-2011 period as they cut quotas and production by nearly 5 mmb/d in late 2008 to early 2009, and raised quotas in 2011 as prices surpassed USD100/bbl once again. OPEC actions have not exclusively been driven by economics, however, as shown by the 1973 example when quotas were reduced and an embargo enforced against the US in response to American aid to Israel. Today, OPEC production represents 40% of the world total.

Figure 285: Long-run real oil price (US$/bbl)



Source: Deutsche Bank

Iron ore

Iron ore is one of the main constituents for steel production, along with metallurgical (coking) coal and steel scrap. Steel is arguably the key material for industrialization and urbanization, especially in a country's early stage of economic development. Steel's most important end use is in cars, as a support material in construction, power lines, pipelines and containers.

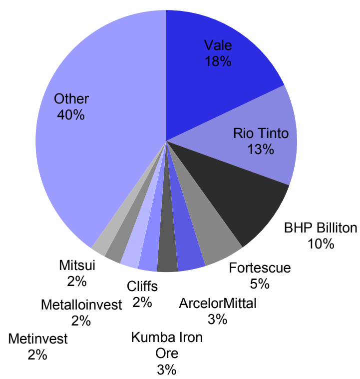
For the most part, iron ore mining is a relatively simple business, characterized by large open cut mines, with relatively low strip ratios and shallow pit walls, and very little processing required. Logistics in the form of rail and port is however a key component, with the most successful operators owning and controlling these logistics components.

Historically, iron ore was not traded via the seaborne market; most countries had enough material to meet their own needs and the price was domestic (varied by country). The Japanese growth spurt in the 60's and 70's changed the market, as Japan did not have enough of its own resources. Japan started signing deals with Australian producers to underpin iron ore projects, and the seaborne market started in earnest. When Australian industrial strikes rendered iron ore supply too unreliable, Japan helped support a fledgling Brazilian iron ore industry. The pricing mechanism was set to FOB (so the Brazilian producers received the same price despite being much further away) in order to help the Brazilian producers compete with the Australian miners.

The emergence of Chinese import demand caught the iron ore market by surprise, and the Chinese preference for spot pricing over an annual contract put pressure on the benchmark system. While there are still some annual pricing contracts in existence, they are now relatively rare. The benchmark system has phased out over time, but in our opinion, this system ceased to exist on the 23rd June 2008 when Rio Tinto announced a +80% settlement with Baosteel after Vale had settled +65%-71% with Baosteel in Feb'08. This was followed in 2009 by steel mills reneging on the price and volume terms of contracts and no official price agreement with Chinese steel makers.

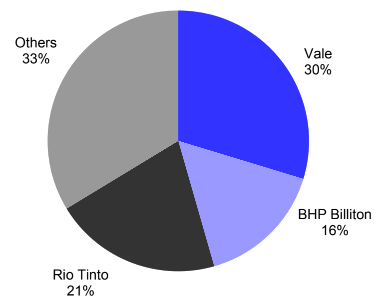
There are over 2bt of iron ore produced annually of which 52% is exported. Given the emergence of the Chinese raw material import market, it is not surprising that the Asian region has dominated the seaborne import demand of around 1.15Mtpa (2013E), with China, Japan, and South Korea all significant sinks for iron ore. Europe is the other important importer of iron ore. Supply to these regions has had to come from deposits that are relatively close to the coast and has been dominated over the past five years by the current incumbents that have had the advantage of having infrastructure (rail and ports) in place. Despite large high quality ore reserves, Brazil has lost some market share to Australia in recent years, due to a combination of increased environmental scrutiny, which has delayed approvals, and a lack of logistics infrastructure.

Figure 286: Top 10 Iron ore producing companies



Source: AME, Deutsche Bank

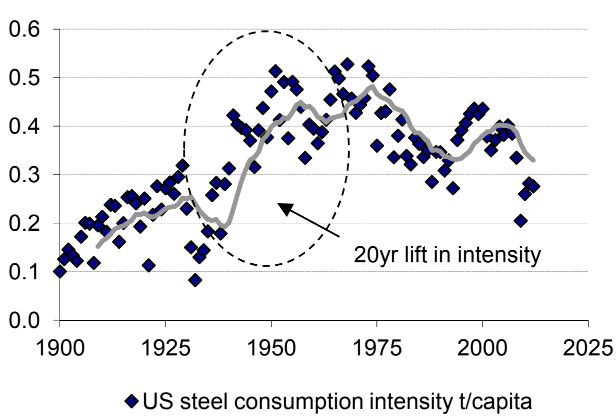
Figure 287: The top three dominate the seaborne market



Source: AME, Deutsche Bank

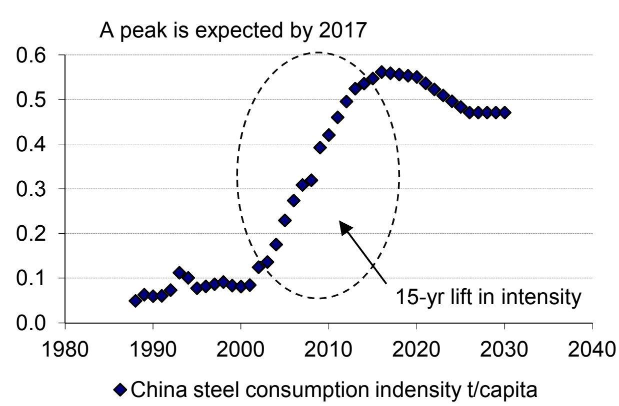
China's prodigious steel consumption growth (currently 58% of global demand) has driven the growth in the iron ore market, both the seaborne and the domestic Chinese markets. Steel alongside cement is one of the most intensively consumed materials, when an economy is on the early part of its development trajectory, driven by the build-out of urban accommodation and industrial infrastructure. In order to model China's growth trajectory in terms of steel consumption per capita, we turn to the USA, with broadly similar characteristics, population, land mass, natural resource endowment etc. The US steel consumption increased from 0.1t/capita during the Great Depression to a peak of 0.55t/capita in the early 50's – a roughly 20 year uplift in intensity. When applying both "stock" and "flow" concepts to China's steel consumption we estimate that the likely peak will be at the end of the decade, equating to a production of c.900Mt.

Figure 288: US steel consumption intensity per capita



Source: USGS, AISI, US Census Bureau, IISI, Deutsche Bank

Figure 289: China's steel consumption intensity



Source: USGS, AISI, US Census Bureau, China customs statistics, IISI, Deutsche Bank

We forecast iron ore demand to follow a similar trend to steel demand, peaking by the end of the decade. The slowdown in iron ore demand is slightly more pronounced in our forecasts due to the increase of scrap generation and hence consumption in China toward the end of the decade.

Many of the large producers have invested significant capital in infrastructure and new mines over the past few years. These investments are delivering more tonnes into the market and will continue to do so over the next few years. Given our outlook of flat iron ore demand in the face of sharply rising supply growth, we continue to hold the view that the market needs significant cuts from many of the high cost producers. We estimate that the big iron ore projects are likely to deliver a cumulative output of 310Mt over the next three years or roughly 100Mt per annum. The big lumps of output come from Rio in 2015E (Nammuldi, Hope Downs and Paraburdoo) and Vale in 2017E (S11D). This implies that 210Mt of supply cuts are needed over the next three years to ensure that there is not a significant build-up of inventories. However, we estimate that 2014 was already oversupplied by c.45Mt, which implied that c.250Mt of supply cuts are required over the next three years.

The major iron ore producers have delivered on the project ramp-up schedules over the course of 2014.

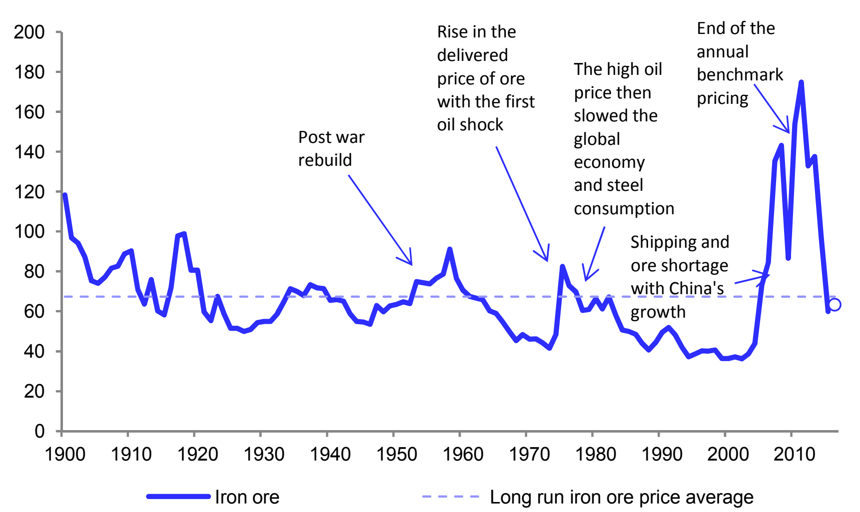
Figure 290: Estimating the required supply cuts

Mt	2015E	2016E	2017E	Cumulative
Demand growth	-3.7	63.7	39.6	99.7
Vale	16.0	14.1	**49.4**	79.5
Rio	**57.9**	18.3	11.0	87.2
BHPB	16.8	21.7	10.7	49.2
FMG	4.0	9.4	3.8	17.2
Minas Rio (Anglo)	11.9	12.1	1.2	25.2
Roy Hill (Hancock Prospecting)	5.0	20.0	27.0	52.0
Big project supply growth	**111.6**	**95.6**	**103.1**	**310.3**
Excess supply	**115.3**	**31.9**	**63.5**	**210.7**

Source: Deutsche Bank estimates

The long-run real average iron ore price is USD67/t, slightly above the current spot price. We think this is a fair price, and although short-term pricing will have to reflect the industry adjustment to slower demand growth, the industry will need to replace depleting reserves.

Figure 291: : Long run real iron ore price – 62% delivered to China (USD/t)

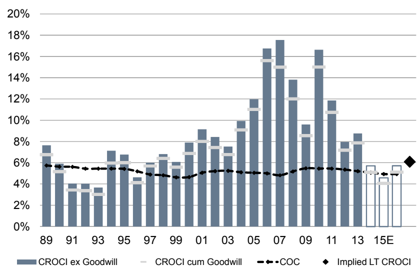


Source: Datastream,, LME, ,ABARE, ,USGS, Deutsche Bank estimates/assumptions

CROCI Valuation – Not expensive.

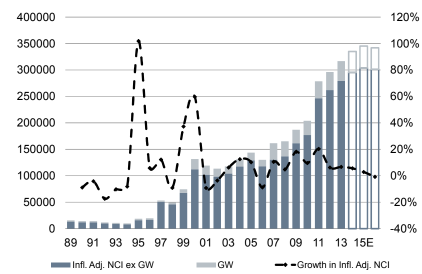
Below we show the CROCI (Cash Return on Capital Invested) outcome for the European miners. With the European market running very strongly and trading above its fair value, the CROCI outcome for the miners looks relatively robust with the miners trading in line with return expectations (Figure 292). With the stabilising of commodity prices and cut back in capex, it is not surprising to see growth stalling (Figure 293). While the sector suffered a significant drop in cash flow margin in 2012 (Figure 295), it has been steadily increasing since then.

Figure 292: CROCI Cum and ex goodwill & implied CROCI



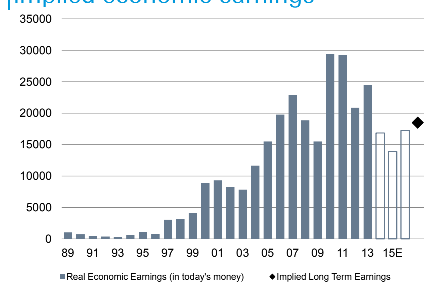
Source: Company data, Deutsche Bank CROCI Team

Figure 293: Net capital invested



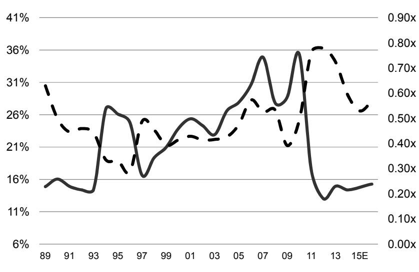
Source: Company data, Deutsche Bank CROCI Team

Figure 294: Economic earnings & implied economic earnings



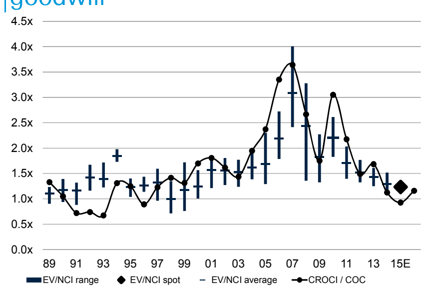
Source: Company data, Deutsche Bank CROCI Team

Figure 295: CROCI drivers



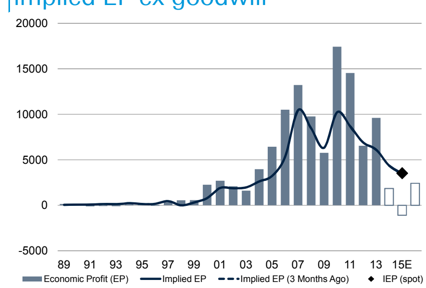
Source: Company data, Deutsche Bank CROCI Team

Figure 296: Value & returns ex goodwill



Source: Company data, Deutsche Bank CROCI Team

Figure 297: Economic Profit & implied EP ex goodwill



Source: Company data, Deutsche Bank CROCI Team

Model updated:31 March 2015

Running the numbers

Europe

United Kingdom

Metals & Mining

Anglo American

Reuters: AAL.L Bloomberg: AAL LN

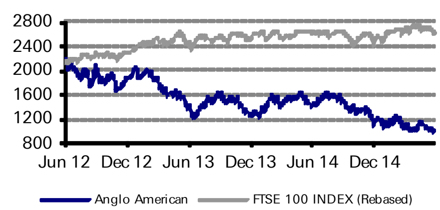
Buy

Price (15 Jun 15)	GBP 994.40
Target Price	GBP 1,830.00
52 Week range	GBP 985.40 - 1,648.00
Market Cap (m)	GBPm 12,798
	USDm 19,892

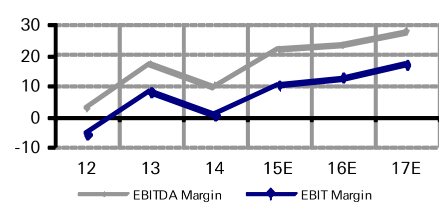
Company Profile

Anglo American plc is a globally diversified mining company. It has interests in diamonds, platinum, met coal, thermal coal, copper, nickel, iron ore and industrial minerals. The Group has operations and developments in Africa, Europe, Australia, and South and North America. The company first listed in London in 1999, and has been disposing of non-core assets to create a more focused mining group. Anglo's diamond and platinum assets differentiate it from the other diversified miners.

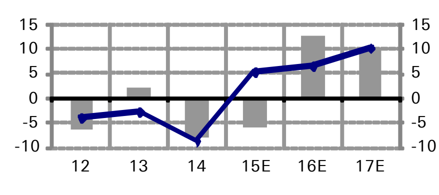
Price Performance



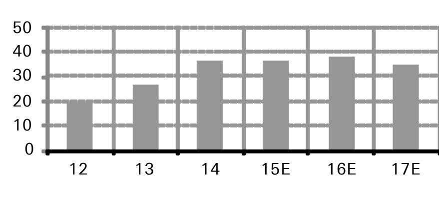
Margin Trends



Growth & Profitability



Solvency



Anna Mulholland, CFA
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Fiscal year end 31-Dec	2012	2013	2014	2015E	2016E	2017E
Financial Summary						
DB EPS (USD)	2.27	2.08	1.73	1.10	1.38	2.27
Reported EPS (USD)	-1.17	-0.75	-1.96	1.10	1.38	2.27
DPS (USD)	0.85	0.85	0.85	0.85	0.85	1.50
BVPS (USD)	30.0	24.7	20.6	20.8	21.3	22.4
Weighted average shares (m)	1,254	1,281	1,284	1,287	1,287	1,287
Average market cap (USDm)	42,590	31,653	30,608	19,892	19,892	19,892
Enterprise value (USDm)	54,383	44,609	45,139	34,821	36,143	36,062
Valuation Metrics						
P/E (DB) (x)	15.0	11.9	13.8	14.1	11.2	6.8
P/E (Reported) (x)	nm	nm	nm	14.1	11.2	6.8
P/BV (x)	1.02	0.88	0.91	0.74	0.73	0.69
FCF Yield (%)	nm	0.3	nm	nm	2.0	11.4
Dividend Yield (%)	2.5	3.4	3.6	5.5	5.5	9.7
EV/Sales (x)	1.9	1.5	1.7	1.4	1.3	1.1
EV/EBITDA (x)	70.3	8.8	16.5	6.2	5.3	4.1
EV/EBIT (x)	nm	18.5	327.1	12.9	9.8	6.6
Income Statement (USDm)						
Sales revenue	28,680	29,342	27,073	25,440	28,716	31,641
Gross profit	774	5,045	2,729	5,612	6,783	8,821
EBITDA	774	5,045	2,729	5,612	6,783	8,821
Depreciation	2,374	2,638	2,591	2,920	3,085	3,322
Amortisation	0	0	0	0	0	0
EBIT	-1,600	2,407	138	2,692	3,698	5,499
Net interest income(expense)	418	271	242	160	112	72
Associates/affiliates	421	168	208	118	67	91
Exceptionals/extraordinaries	1,396	-469	-385	0	0	0
Other pre-tax income/(expense)	-806	-677	-462	-506	-682	-695
Profit before tax	-171	1,700	-259	2,464	3,195	4,967
Income tax expense	393	1,274	1,265	580	800	1,301
Minorities	906	1,387	989	476	626	758
Other post-tax income/(expense)	0	0	0	0	0	0
Net profit	-1,470	-961	-2,513	1,409	1,768	2,908
DB adjustments (including dilution)	4,330	3,634	4,730	0	0	0
DB Net profit	2,860	2,673	2,217	1,409	1,768	2,908
Cash Flow (USDm)						
Cash flow from operations	4,787	6,078	5,435	5,203	5,027	6,874
Net Capex	-5,541	-5,985	-5,903	-5,405	-4,635	-4,601
Free cash flow	-754	93	-468	-202	392	2,273
Equity raised/(bought back)	24	14	-97	6	6	6
Dividends paid	-2,237	-2,237	-1,922	-1,344	-1,413	-1,840
Net inc/(dec) in borrowings	5,834	1,043	1,825	-1,672	-1,141	-2,618
Other investing/financing cash flows	-5,678	-148	-179	1,328	0	0
Net cash flow	-2,811	-1,235	-841	-1,884	-2,156	-2,180
Change in working capital	*0*	*0*	*0*	*0*	*0*	*0*
Balance Sheet (USDm)						
Cash and other liquid assets	9,094	7,704	6,748	4,864	2,708	528
Tangible fixed assets	45,089	41,505	38,475	39,632	41,182	42,461
Goodwill/intangible assets	4,571	4,083	3,912	3,912	3,912	3,912
Associates/investments	6,291	7,548	7,520	7,428	7,442	7,497
Other assets	14,324	10,325	9,355	7,771	8,784	9,007
Total assets	79,369	71,165	66,010	63,607	64,028	63,405
Interest bearing debt	17,754	17,848	18,535	16,863	15,722	13,104
Other liabilities	17,828	15,953	15,298	14,020	14,595	14,758
Total liabilities	35,582	33,801	33,833	30,883	30,317	27,862
Shareholders' equity	37,657	31,671	26,417	26,738	27,418	28,892
Minorities	6,130	5,693	5,760	5,986	6,293	6,651
Total shareholders' equity	43,787	37,364	32,177	32,724	33,711	35,543
Net debt	*8,660*	*10,144*	*11,787*	*11,999*	*13,014*	*12,576*
Key Company Metrics						
Sales growth (%)	-6.2	2.3	-7.7	-6.0	12.9	10.2
DB EPS growth (%)	-53.2	-8.4	-17.0	-36.4	25.5	64.4
EBITDA Margin (%)	2.7	17.2	10.1	22.1	23.6	27.9
EBIT Margin (%)	-5.6	8.2	0.5	10.6	12.9	17.4
Payout ratio (%)	nm	nm	nm	77.6	61.9	66.2
ROE (%)	-3.8	-2.8	-8.7	5.3	6.5	10.3
Capex/sales (%)	19.6	20.9	22.1	21.2	16.1	14.5
Capex/depreciation (x)	2.4	2.3	2.3	1.9	1.5	1.4
Net debt/equity (%)	19.8	27.1	36.6	36.7	38.6	35.4
Net interest cover (x)	nm	nm	nm	nm	nm	nm

Source: Company data, Deutsche Bank estimates

Model updated:01 June 2015

Running the numbers

Europe

United Kingdom

Metals & Mining

BHP Billiton Plc

Reuters: BLT.L Bloomberg: BLT LN

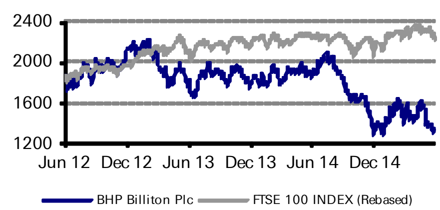
Hold

Price (15 Jun 15)	GBP 1,320.50
Target Price	GBP 1,660.00
52 Week range	GBP 1,276.00 - 2,096.00
Market Cap (m)	GBPm 70,266
	USDm 109,218

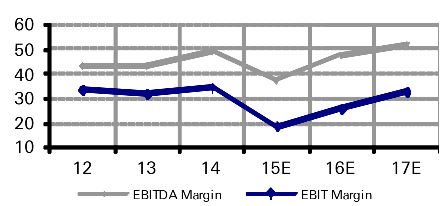
Company Profile

BHP Billiton Plc is an international resources company. The company's principal business lines are mineral and petroleum production, including coal (thermal and coking), iron ore, aluminium, manganese, nickel, copper concentrate and cathode, diamonds, and oil & gas (conventional and unconventional, LNG).

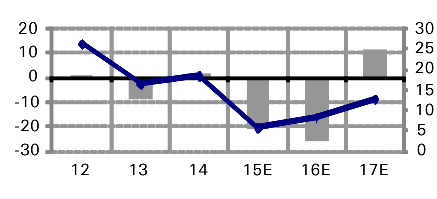
Price Performance



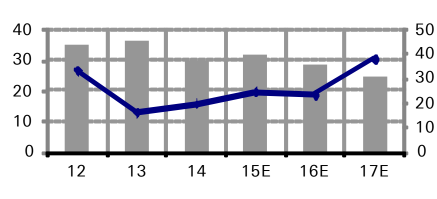
Margin Trends



Growth & Profitability



Solvency



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Fiscal year end 30-Jun	2012	2013	2014	2015E	2016E	2017E
Financial Summary						
DB EPS (USD)	3.20	2.29	2.52	1.53	1.08	1.63
Reported EPS (USD)	3.02	2.10	2.59	0.81	1.08	1.63
DPS (USD)	1.12	1.16	1.21	1.24	1.24	1.25
BVPS (USD)	12.4	13.3	14.9	12.9	12.8	12.7
Weighted average shares (m)	5,323	5,321	5,321	5,321	5,321	5,321
Average market cap (USDm)	166,322	163,671	162,159	109,218	109,218	109,218
Enterprise value (USDm)	187,938	193,925	191,748	138,194	136,764	135,310
Valuation Metrics						
P/E (DB) (x)	9.8	13.4	12.1	13.5	19.0	12.6
P/E (Reported) (x)	10.3	14.6	11.8	25.4	19.0	12.6
P/BV (x)	2.29	1.93	2.17	1.59	1.61	1.62
FCF Yield (%)	3.7	0.2	6.3	7.3	9.5	10.4
Dividend Yield (%)	3.6	3.8	4.0	6.0	6.0	6.1
EV/Sales (x)	2.6	2.9	2.9	2.6	3.5	3.1
EV/EBITDA (x)	6.1	6.8	5.8	6.9	7.2	5.9
EV/EBIT (x)	7.7	9.2	8.2	13.8	13.4	9.3
Income Statement (USDm)						
Sales revenue	72,226	65,953	67,206	53,400	39,587	44,114
Gross profit	30,113	24,433	31,385	19,598	18,935	22,819
EBITDA	31,011	28,380	32,909	20,009	18,935	22,819
Depreciation	6,531	7,378	9,498	9,986	8,753	8,296
Amortisation	0	0	0	0	0	0
EBIT	24,480	21,002	23,411	10,023	10,182	14,523
Net interest income(expense)	-730	-1,276	-1,176	-404	-430	-380
Associates/affiliates	0	0	0	0	0	0
Exceptionals/extraordinaries	0	0	0	0	0	0
Other pre-tax income/(expense)	0	0	0	-109	-268	-273
Profit before tax	23,750	19,726	22,235	9,510	9,484	13,870
Income tax expense	7,490	6,906	7,012	4,051	3,034	4,439
Minorities	115	1,597	1,392	1,139	682	727
Other post-tax income/(expense)	0	0	0	0	0	0
Net profit	16,145	11,223	13,831	4,321	5,768	8,705
DB adjustments (including dilution)	972	985	-384	3,824	0	0
DB Net profit	17,117	12,208	13,447	8,145	5,768	8,705
Cash Flow (USDm)						
Cash flow from operations	24,384	20,154	25,364	19,107	18,466	18,263
Net Capex	-18,226	-19,905	-15,067	-11,145	-8,074	-6,877
Free cash flow	6,158	249	10,297	7,962	10,393	11,386
Equity raised/(bought back)	-62	21	0	0	0	0
Dividends paid	-5,877	-6,167	-6,387	-6,519	-6,619	-6,673
Net inc/(dec) in borrowings	8,827	7,157	-910	-6,046	-1,000	-3,000
Other investing/financing cash flows	-14,349	-364	126	-1,485	-1,310	-1,835
Net cash flow	-5,303	896	3,126	-6,087	1,464	-122
Change in working capital	*-76*	*-7,514*	*655*	*383*	*2,000*	*-1,275*
Balance Sheet (USDm)						
Cash and other liquid assets	4,781	5,677	8,803	2,716	4,179	4,058
Tangible fixed assets	95,247	100,565	108,787	96,503	95,824	94,405
Goodwill/intangible assets	5,112	5,496	5,439	5,138	5,184	5,264
Associates/investments	3,148	1,880	2,436	1,708	1,708	1,708
Other assets	20,985	25,560	25,948	18,008	15,538	16,309
Total assets	129,273	139,178	151,413	124,073	122,434	121,743
Interest bearing debt	28,330	33,187	34,589	26,859	25,859	22,859
Other liabilities	33,858	30,700	31,442	21,947	21,021	22,532
Total liabilities	62,188	63,887	66,031	48,806	46,880	45,391
Shareholders' equity	65,870	70,667	79,143	68,726	67,980	67,354
Minorities	1,215	4,624	6,239	6,541	7,574	8,998
Total shareholders' equity	67,085	75,291	85,382	75,266	75,554	76,352
Net debt	*23,549*	*27,510*	*25,786*	*24,143*	*21,680*	*18,801*
Key Company Metrics						
Sales growth (%)	0.7	-8.7	1.9	-20.5	-25.9	11.4
DB EPS growth (%)	-18.2	-28.6	10.2	-39.4	-29.2	50.9
EBITDA Margin (%)	42.9	43.0	49.0	37.5	47.8	51.7
EBIT Margin (%)	33.9	31.8	34.8	18.8	25.7	32.9
Payout ratio (%)	36.9	55.0	46.6	152.7	114.4	76.4
ROE (%)	26.3	16.4	18.5	5.8	8.4	12.9
Capex/sales (%)	25.5	33.7	23.8	21.4	20.4	15.6
Capex/depreciation (x)	2.8	3.0	1.7	1.1	0.9	0.8
Net debt/equity (%)	35.1	36.5	30.2	32.1	28.7	24.6
Net interest cover (x)	33.5	16.5	19.9	24.8	23.7	38.3

Source: Company data, Deutsche Bank estimates

Model updated:05 May 2015

Running the numbers

Europe

United Kingdom

Metals & Mining

Glencore

Reuters: GLEN.L Bloomberg: GLEN LN

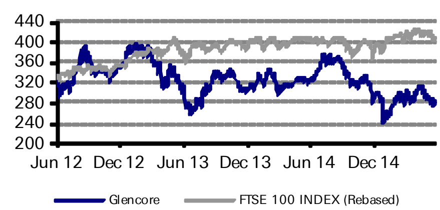
Hold

Price (15 Jun 15)	GBP 278.25
Target Price	GBP 333.00
52 Week range	GBP 240.60 - 377.50
Market Cap (m)	GBPm 36,130
	USDm 56,158

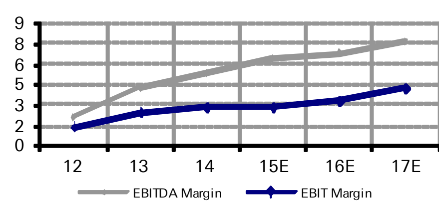
Company Profile

Glencore is one of the world's leading integrated producers and marketers of commodities, covering metals and minerals, energy and agricultural commodities. The company has worldwide activities in production, sourcing, processing, refining, transporting, storage and financing of commodities. The recent merger with Xstrata has significantly increased its mining output and moved it from a trading dominated to mining dominated company.

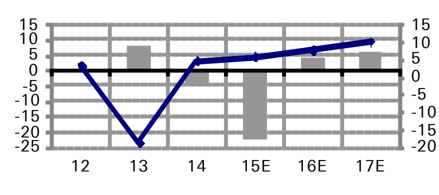
Price Performance



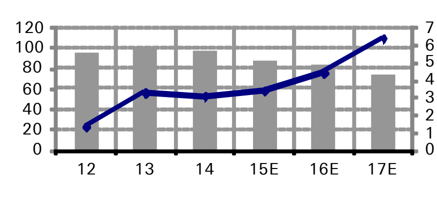
Margin Trends



Growth & Profitability



Solvency



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Fiscal year end 31-Dec	2012	2013	2014	2015E	2016E	2017E
Financial Summary						
DB EPS (USD)	0.07	0.32	0.33	0.22	0.29	0.41
Reported EPS (USD)	0.14	-0.65	0.18	0.22	0.29	0.41
DPS (USD)	0.16	0.17	0.18	0.18	0.18	0.19
BVPS (USD)	4.4	3.7	3.7	3.7	3.8	4.0
Weighted average shares (m)	7,011	11,141	13,099	12,985	12,985	12,985
Average market cap (USDm)	40,987	57,866	71,207	56,158	56,158	56,158
Enterprise value (USDm)	51,412	92,485	107,112	87,848	87,134	83,395
Valuation Metrics						
P/E (DB) (x)	80.7	16.1	16.7	19.7	14.7	10.7
P/E (Reported) (x)	43.3	nm	31.0	19.7	14.7	10.7
P/BV (x)	1.30	1.41	1.28	1.18	1.15	1.09
FCF Yield (%)	3.4	nm	nm	11.5	5.2	10.4
Dividend Yield (%)	2.7	3.2	3.3	4.2	4.3	4.4
EV/Sales (x)	0.2	0.4	0.5	0.5	0.5	0.4
EV/EBITDA (x)	11.5	9.4	9.1	8.0	7.1	5.7
EV/EBIT (x)	17.1	16.0	16.8	17.9	14.4	10.2
Income Statement (USDm)						
Sales revenue	214,436	232,694	221,073	171,579	179,233	190,946
Gross profit	5,474	9,825	11,825	10,993	12,253	14,605
EBITDA	4,477	9,825	11,825	10,993	12,253	14,605
Depreciation	1,473	4,049	5,448	6,089	6,204	6,453
Amortisation	0	0	0	0	0	0
EBIT	3,004	5,776	6,377	4,904	6,050	8,152
Net interest income(expense)	-2,184	-1,751	-2,050	-1,452	-1,375	-1,272
Associates/affiliates	367	0	0	0	0	0
Exceptionals/extraordinaries	0	-11,068	-74	0	0	0
Other pre-tax income/(expense)	-111	-1	0	0	0	0
Profit before tax	1,076	-7,044	4,253	3,452	4,675	6,880
Income tax expense	-76	254	1,809	460	793	1,313
Minorities	148	104	136	136	55	287
Other post-tax income/(expense)	0	0	0	0	0	0
Net profit	1,004	-7,402	2,308	2,856	3,827	5,281
DB adjustments (including dilution)	-466	11,068	1,977	0	0	0
DB Net profit	538	3,666	4,285	2,856	3,827	5,281
Cash Flow (USDm)						
Cash flow from operations	4,381	9,184	8,136	12,391	8,121	10,229
Net Capex	-3,005	-9,329	-8,854	-5,921	-5,205	-4,399
Free cash flow	1,376	-145	-718	6,470	2,916	5,830
Equity raised/(bought back)	0	10	-767	-263	0	0
Dividends paid	-1,066	-2,062	-2,244	-2,390	-2,433	-2,497
Net inc/(dec) in borrowings	6,123	558	-559	-3,504	-4,217	-4,302
Other investing/financing cash flows	-4,956	1,706	4,263	399	231	406
Net cash flow	1,477	67	-25	711	-3,503	-563
Change in working capital	*727*	*2,599*	*-703*	*3,256*	*-1,713*	*-1,142*
Balance Sheet (USDm)						
Cash and other liquid assets	2,782	2,849	2,824	3,535	32	-531
Tangible fixed assets	23,238	67,233	70,110	69,942	68,943	66,889
Goodwill/intangible assets	2,664	9,158	8,866	8,866	8,866	8,866
Associates/investments	25,353	21,073	16,902	16,902	16,902	16,902
Other assets	51,500	53,799	53,503	43,773	47,510	50,166
Total assets	105,537	154,112	152,205	143,018	142,253	142,293
Interest bearing debt	35,526	55,173	52,693	49,189	44,972	40,670
Other liabilities	35,711	47,008	48,032	42,058	44,331	45,846
Total liabilities	71,237	102,181	100,725	91,247	89,303	86,516
Shareholders' equity	31,266	48,563	48,542	48,833	50,012	52,838
Minorities	3,034	3,368	2,938	2,938	2,938	2,938
Total shareholders' equity	34,300	51,931	51,480	51,771	52,950	55,776
Net debt	*32,744*	*52,324*	*49,869*	*45,654*	*44,940*	*41,201*
Key Company Metrics						
Sales growth (%)	nm	8.5	-5.0	-22.4	4.5	6.5
DB EPS growth (%)	na	345.9	0.9	-32.8	34.0	38.0
EBITDA Margin (%)	2.1	4.2	5.3	6.4	6.8	7.6
EBIT Margin (%)	1.4	2.5	2.9	2.9	3.4	4.3
Payout ratio (%)	111.0	nm	102.2	82.9	62.7	47.0
ROE (%)	3.3	-18.5	4.8	5.9	7.7	10.3
Capex/sales (%)	1.5	4.1	4.1	3.5	2.9	2.3
Capex/depreciation (x)	2.1	2.4	1.7	1.0	0.8	0.7
Net debt/equity (%)	95.5	100.8	96.9	88.2	84.9	73.9
Net interest cover (x)	1.4	3.3	3.1	3.4	4.4	6.4

Source: Company data, Deutsche Bank estimates

Model updated:19 May 2015

Running the numbers

Europe

United Kingdom

Metals & Mining

Rio Tinto

Reuters: RIO.L Bloomberg: RIO LN

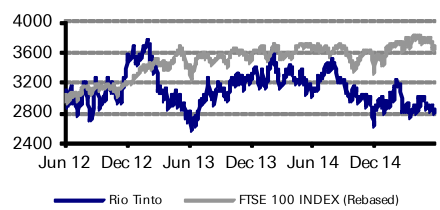
Buy

Price (15 Jun 15)	GBP 2,806.50
Target Price	GBP 4,200.00
52 Week range	GBP 2,616.50 - 3,515.00
Market Cap (m)	GBPm 51,111
	USDm 79,444

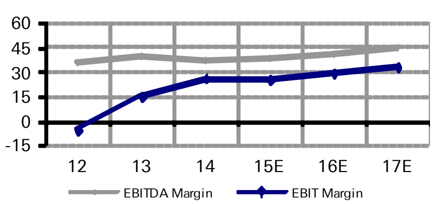
Company Profile

Rio Tinto is a global diversified mining company with interests in aluminum, borax, coal, copper, diamonds, gold, iron ore, titanium dioxide feedstock, uranium and zinc. Its key mining operations are located in Australia, New Zealand, South Africa, South America, the United States, Europe, and Canada. Rio Tinto's management structure is based primarily on six principal global products businesses Aluminium, Diamonds, Copper, Energy (coal and uranium), Industrial Minerals, and Iron Ore supported by worldwide exploration and technology groups.

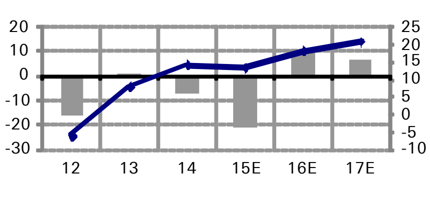
Price Performance



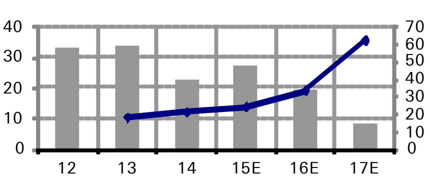
Margin Trends



Growth & Profitability



Solvency



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Fiscal year end 31-Dec	2012	2013	2014	2015E	2016E	2017E
Financial Summary						
DB EPS (USD)	5.01	5.50	5.02	3.23	4.30	5.43
Reported EPS (USD)	-1.61	1.97	3.52	3.23	4.30	5.43
DPS (USD)	1.67	1.92	2.15	2.28	2.39	2.54
BVPS (USD)	25.3	24.8	25.0	22.7	24.6	27.5
Weighted average shares (m)	1,852	1,852	1,853	1,821	1,810	1,810
Average market cap (USDm)	94,549	91,212	97,549	79,444	79,444	79,444
Enterprise value (USDm)	117,000	110,477	111,964	95,162	92,151	86,903
Valuation Metrics						
P/E (DB) (x)	10.2	9.0	10.5	13.5	10.1	8.0
P/E (Reported) (x)	nm	25.0	14.9	13.5	10.1	8.0
P/BV (x)	2.25	2.27	1.88	1.92	1.77	1.59
FCF Yield (%)	nm	2.6	6.5	6.3	9.3	12.3
Dividend Yield (%)	3.3	3.9	4.1	5.2	5.5	5.8
EV/Sales (x)	2.3	2.2	2.3	2.5	2.2	2.0
EV/EBITDA (x)	6.4	5.5	6.3	6.6	5.3	4.3
EV/EBIT (x)	nm	14.0	8.9	9.7	7.5	5.8
Income Statement (USDm)						
Sales revenue	50,967	51,171	47,664	37,623	41,762	44,514
Gross profit	17,872	19,858	18,614	14,362	17,538	20,296
EBITDA	18,275	20,234	17,893	14,514	17,429	20,312
Depreciation	4,441	4,791	4,860	4,746	5,062	5,281
Amortisation	16,410	7,531	473	0	0	0
EBIT	-2,576	7,912	12,560	9,768	12,367	15,031
Net interest income(expense)	-160	-425	-585	-398	-367	-242
Associates/affiliates	0	0	0	0	0	0
Exceptionals/extraordinaries	-7	0	0	0	0	0
Other pre-tax income/(expense)	168	-3,982	-2,423	-360	-360	-360
Profit before tax	-2,568	3,505	9,552	9,010	11,641	14,429
Income tax expense	429	2,426	3,053	2,793	3,609	4,473
Minorities	-14	-2,586	-28	331	248	136
Other post-tax income/(expense)	0	0	0	0	0	0
Net profit	-2,990	3,665	6,527	5,886	7,784	9,820
DB adjustments (including dilution)	12,293	6,552	2,778	0	0	0
DB Net profit	9,303	10,217	9,305	5,886	7,784	9,820
Cash Flow (USDm)						
Cash flow from operations	9,368	15,078	14,286	11,572	12,798	15,182
Net Capex	-17,575	-12,720	-7,990	-6,543	-5,434	-5,444
Free cash flow	-8,207	2,358	6,296	5,029	7,365	9,738
Equity raised/(bought back)	1,474	0	0	-1,989	0	0
Dividends paid	-3,038	-3,322	-3,710	-4,177	-4,230	-4,423
Net inc/(dec) in borrowings	7,888	2,122	-3,034	-3,259	-1,193	-1,740
Other investing/financing cash flows	-666	1,756	2,639	0	0	0
Net cash flow	-2,549	2,914	2,191	-4,396	1,941	3,576
Change in working capital	*401*	*557*	*1,519*	*559*	*-367*	*-367*
Balance Sheet (USDm)						
Cash and other liquid assets	7,082	10,216	12,423	8,027	9,968	13,544
Tangible fixed assets	75,131	70,827	68,693	65,615	65,986	66,149
Goodwill/intangible assets	9,402	6,770	7,108	6,748	6,388	6,028
Associates/investments	7,966	6,406	6,389	6,389	6,389	6,389
Other assets	17,992	16,806	13,214	12,305	13,015	13,368
Total assets	117,573	111,025	107,827	99,083	101,746	105,478
Interest bearing debt	26,343	28,271	24,918	21,659	20,466	18,726
Other liabilities	32,915	29,425	28,315	27,808	28,145	28,318
Total liabilities	59,258	57,696	53,233	49,467	48,611	47,044
Shareholders' equity	46,865	45,886	46,285	41,142	44,536	49,768
Minorities	11,156	7,616	8,309	8,475	8,598	8,666
Total shareholders' equity	58,021	53,502	54,594	49,616	53,135	58,434
Net debt	*19,261*	*18,055*	*12,495*	*13,632*	*10,498*	*5,182*
Key Company Metrics						
Sales growth (%)	-15.8	0.4	-6.9	-21.1	11.0	6.6
DB EPS growth (%)	-37.9	9.8	-8.7	-35.6	33.1	26.1
EBITDA Margin (%)	35.9	39.5	37.5	38.6	41.7	45.6
EBIT Margin (%)	-5.1	15.5	26.4	26.0	29.6	33.8
Payout ratio (%)	nm	97.0	61.1	70.4	55.5	46.9
ROE (%)	-6.0	7.9	14.2	13.5	18.2	20.8
Capex/sales (%)	34.5	25.3	17.1	17.4	13.0	12.2
Capex/depreciation (x)	4.0	2.7	1.7	1.4	1.1	1.0
Net debt/equity (%)	33.2	33.7	22.9	27.5	19.8	8.9
Net interest cover (x)	nm	18.6	21.5	24.5	33.7	62.1

Source: Company data, Deutsche Bank estimates

Valuation and Risks.

Rio Tinto

We value Rio Tinto using discounted cash flow analysis of each of its assets. Our target is in line with our valuation using life of mine cashflows (9.3% WACC, CoE 10.5%, CoD 3.6%, RFR 3.0%, ERP 6%, beta 1.25), as the rapidly improving balance sheet re-opens significant growth opportunities.

Key risks to our view include movements in iron ore, copper, coal and aluminium prices away from those that we currently forecast. Earnings for the group are strongly biased to iron ore and copper (c. 90% of operating earnings) therefore production levels, prices for those commodities are an important consideration. Specifically, for the aluminium division risks include reduced Chinese demand for bauxite, alumina and aluminium, delays to expansion projects and weakness in prices.

Anglo American

We value Anglo on a sum of the parts basis, using DCF-derived NPV valuations for each division. We use a WACC of 8.7% (cost of equity of 10%, cost of debt post-tax of 3.2%, applying a tax rate of 30% and assuming a LT gearing target of 20%). To derive our TP we apply a NPV multiple of 0.85x, to reflect historical management performance relative to the broader sector over time. We value Anglo's Nickel and "Other Mining" asset at 1x. We assume the majority of these are for sale as part of Anglo's announced planned disposal programme.

Downside risks include stronger-than-expected operating currencies (Rand, A$) and lower commodity prices than we forecast, in particular PGMs, copper and iron ore. More specific risks include further cost increases or delays at Minas Rio, the implementation risks of the plan to exit high cost Platinum mines and delays to project approvals.

BHP Billiton

We value BHP using life-of-mine cash flows with a WACC of 9.3% (COE 10.6% - Rf 3%, Rp 6.0%; CoD 3.5% on a D/E of 15%; Beta of 1.26). Our price target is set in line with our NPV, which assumes a long-term AUDUSD of 0.80, long-term Brent oil of US$80/bbl, WTI oil of US$76/bbl, US natural gas of US$4.3/mmbtu, iron ore fines of US$80/t (CIF Asia), coking coal of US$150/t, copper US$3.22/lb (all real). We use a GBP/USD rate of 1.60.

Key risks include variance in commodity prices and exchange rates vs. our estimates. Downside risks include delivery risk on longer-dated growth projects such as Jansen potash, petroleum growth projects (both US Onshore and the GoM), Spence Hypogene and Olympic Dam. A continued medium-term slowdown in Chinese steel demand may result in lower iron ore and coking coal demand and therefore lower bulk commodity prices. Sustained higher US onshore oil volumes could limit upside in both the oil price and US nat gas price - limiting drilling, volumes and earnings from the Permian oil field dry gas fields. Upside risks include weaker currencies, and higher oil, copper and iron ore prices from recovering demand, and supply cuts due to low prices or supply constraints (especially in copper).

Glencore

We value Glencore using discounted cash flow analysis on its life of asset cash flows. We use a WACC of 8.6% (CoD 4%, Gearing target 20%, Tax rate 20% and RFR 3%) Our price target is set at our valuation in line with the sector.

Weaker/stronger commodity prices or operating currencies than expected are key risks to our earnings and valuation forecasts. Key stock-specific downside risks: Some of Glencore's key growth assets are in less politically stable regions, such as the Democratic Republic of Congo (DRC) and Equatorial Guinea, which introduces a higher degree of sovereign risk. Of the large miners, we view Glencore as the most likely to undertake further M&A in the near term-transactions are usually viewed sceptically by the market in the first instance and could lead to price underperformance. Positive risks to share price include additional capital returns by the company

General Sector risks

China as the largest consumer of many commodities and a large producer of a number of commodities as well remains the key risk for the sector in general. Reported Chinese growth numbers below expectations will impact equity sector selection and in particular deter investors from investing in cyclical miners. Significantly different growth from China (up or down) than expected will also impact commodity demand, which could drive significantly different commodity prices than expected.

While debt levels in the large European miners are at manageable levels, this is not true of a number of smaller listed miners, particularly in the US where balance sheets are looking particularly stressed for some. Actions by these miners to raise capital to correct their distressed balance sheets could impact the sentiment towards the sector in general.

Supplementary information

A summary of the JORC code for Reserve and resource definition.

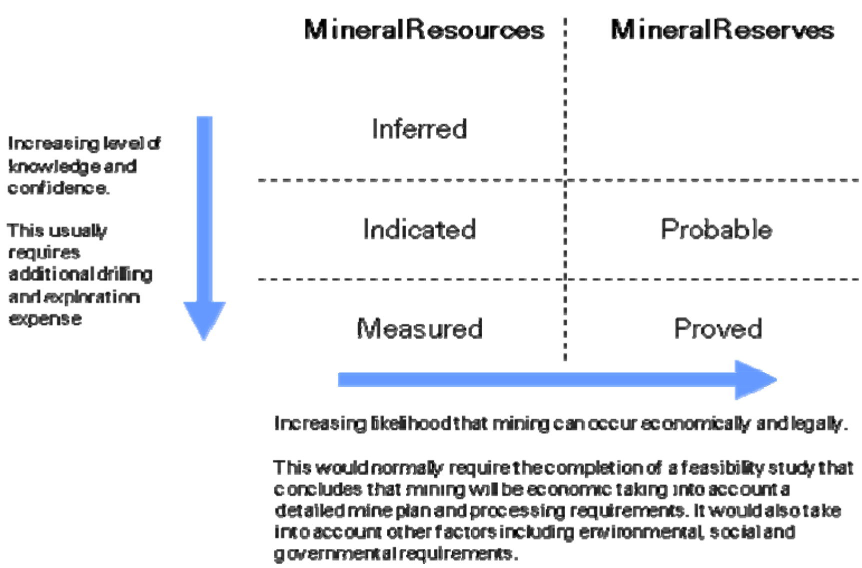
JORC (Joint Ore Reserves Committee) is a committee sponsored by the Australian mining industry and it maintains the "Code for Reporting of Mineral Resources and Ore Reserves" or the JORC code which is a set of guidelines to be used to classify mineralization in terms of certainty and economics. The JORC code has had wide acceptance in the global mining industry as the benchmark for the statement of resources on reserves.

The code classifies mineral ore bodies into two main groups; Resources and Reserves with Reserves being the highest category and is a measure of feasibility (e.g. can the ore in the resource be economically and legally mined). Within each of these two groups the code defines a number of categories that indicate the level of confidence that the owner has about the stated contained ore. There are 3 Resource categories; Inferred, Indicated and Measured and 2 Reserve categories; Probable and Proved.

Note that this is a code not a prescription, movement between categories is made by the manager (or representative) of the resource base and signed off by a "competent person" with relevant experience.

A diagrammatic description of the categories is shown below

Figure 298: Depiction of the JORC code resource categories



Source: Deutsche Bank

Some more definitions

Below we have included some more detail on ore-body definitions within this are some definitions taken directly from the JORC code and are shown in italics.

Mineralistion

Mineralisation is a term used in the industry that simply means a region of ground that contains a higher concentration of a desired element than is normally the case. It may simply have been that an outcrop has been found and analyzed, i.e. you know something is there, but not how much or whether it can be mined economically.

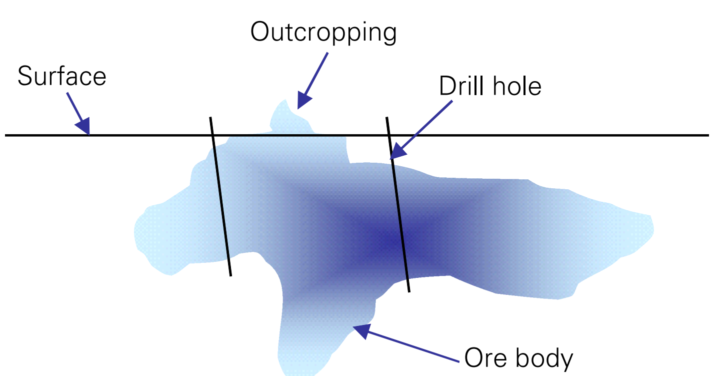
Inferred Resources

Is the lowest category of ore body definition in the JORC code, an inferred mineral resource is defined as:

An 'Inferred Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.

Basically some mineralization has been found and some preliminary work carried out to find the size and grade of the ore body. A competent person then makes a judgment based on their experience about the continuity of the ore body and its likely behaviour and then estimates the amount of ore that there might be. Conceptually we show in the schematic below that a competent person might infer a resource base between a few drill holes – in this case it would potentially underestimate the complete size of the resource because not enough work has yet been done to find the limits – if this looks promising than the company will approve spending for more exploration to increase the level of confidence regarding the size and make-up of the ore-body.

Figure 299: An orebody with work to produce an inferred resource



Source: Deutsche Bank

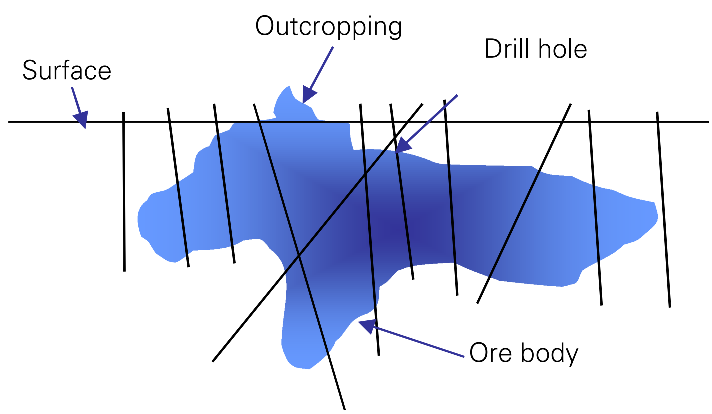
Indicated Resouces

Is the middle category of ore body resource definition in the JORC code, an indicated mineral resource is defined as;

An 'Indicated Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

What this means is the company has now completed more exploration and analysis work on the ore body (usually drilling) and now has a pretty good idea about the size and shape of the ore body and reasonable confidence about the changes in grade through the ore body

Figure 300: More exploration is required to upgrade to an Indicated Resource



Source: Deutsche Bank

Measured Resources

Is the highest category of ore body resource definition in the JORC code, a measured mineral resource is defined as:

A 'Measured Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity.

Finally, the company has performed enough exploration to be very confident about what it has in the ground and spending more money on exploration is not going to yield much more certainty – it's time to make a decision on whether to mine or not and this will come down to economics and a conversion to reserves…

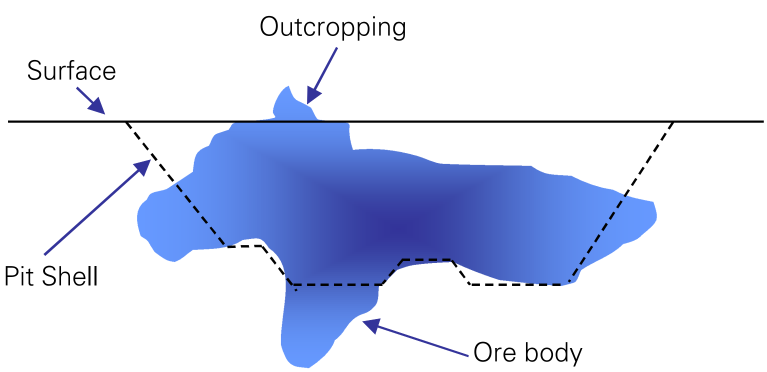
Reserves

Moving the definition of all or parts of an ore body into the reserve group means that the company believes it has met or can meet all regulatory requirements in order to start mining and has completed a feasibility study on the extraction of the ore including processing that indicates that the ore can be extracted economically. The JORC code definition is;

An 'Ore Reserve' is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified. Ore Reserves are sub-divided in order of increasing confidence into Probable Ore Reserves and Proved Ore Reserves.

The studies will have to include a mine plan for the extraction of the ore – in our diagrammatic ore body repeated below, we have determined that open pit is the most economic method for extraction and shown the planned pit on the diagram – note the reserve is always less than the resource as it is not possible to extract all of the ore economically…some is usually left behind.

Figure 301: Reserves are those parts of the resource base that can be mined legally and economically.



Source: Deutsche Bank

Probable and Proved Reserves

The split between proved and probable reserves is usually determined by whether the initial resource was indicated or measured the JORC definitions are:

A 'Probable Ore Reserve' is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

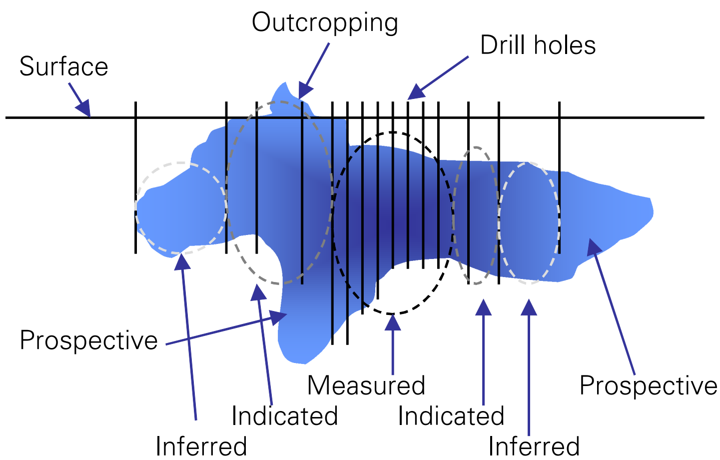
A 'Proved Ore Reserve' is the economically mineable part of a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

As the economics of a mine are heavily dependent on the assumptions of the commodity price used, the size of the reserves can change substantially if the company changes its assumptions on the price profile of the commodity that it is mining – this is particularly true of mines approaching the end of their lives. The economics also depend on the assumptions of technology used for mining. For long life mines, there are often technology improvements through the life of the mine that reduce mining cost making uneconomic ore economic and increasing the size of the ore body.

A word on the realities of the definition

Exploration and drilling are expensive and time consuming – so a company will not normally drill out an entire ore body to the Measured Resource stage, nor complete full conversion to reserves. In reality, a mining company will spend enough money on exploration and studies to justify a mine with returns to meet its requirements and then start mining. Further resource and reserve definition will then continue throughout the life of the mine, which is why reserves often last longer than expected (mine life is longer) and there is always an exploration budget for near mine exploration. In the diagram below, we have shown how the resource may be delineated in our example ore-body.

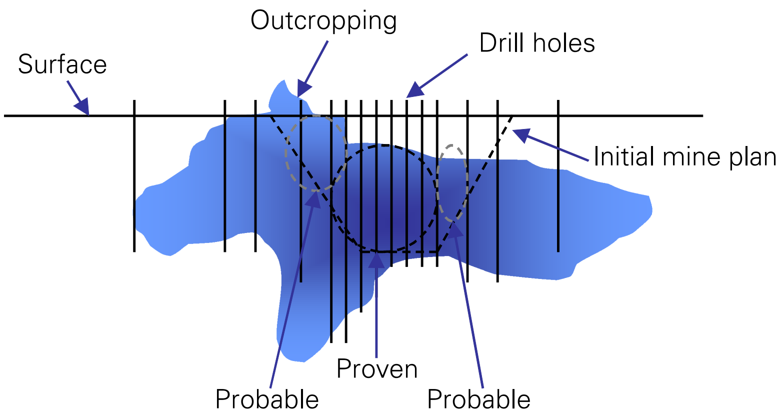
Figure 302: Schematic of the initial resource definition for our example ore body.



Source: Deutsche Bank

In the figure below we show the move to reserve base. As can be seen, it is very likely that the reserves will increase as the company continues near mine exploration.

Figure 303: Schematic of the initial Reserve definition for our example ore body



Source: Deutsche Bank

Appendix 1

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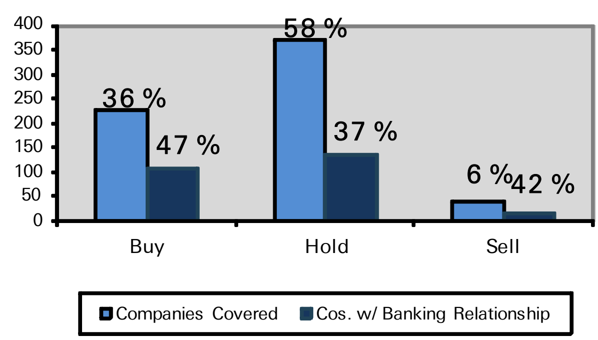
Equity rating dispersion and banking relationships



European Universe

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