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Metals & Mining (Citi)
CEEMEA | South Africa

Metals & Mining

Superior Assets the Licence to Competitive Advantage in Mining

- Industry Overview

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- **Quality triumphs in tougher times** — We maintain our Neutral stance on South African diversified miners with no Buy recommendations. It seems miners can no longer depend on rising commodity prices for earnings growth and value creation. In a flat to declining commodity price environment, we prefer quality miners over "leveraged" miners. We rank SA listed diversified miners' resource quality based on 1) 2012 profit margins 2) capex hunger and 3) resource life. BHP Billiton's resource quality ranks best. Kumba is second despite its relatively short life, due to superior margins and low capital intensity. Anglo American ranks worst due to lower margins and higher capital intensity than peers.

- **Scarce Tier 1 Assets Provide the Only Sustainable Barrier to Entry** — Mining is highly capital-intensive, which often provides a temporary barrier to entry. However, this barrier is usually overcome during bull markets, which sometimes leads to overcapacity. Commodity products offer no pricing power, so miners depend on asset quality to drive **superior operating cash flows** over **longer periods of time**.

- **Superior operating cash flow** — We rank dollar per unit margins. We believe dollar per unit is a better indicator of operating cash flow than margin %, because accounting policies sometimes distort the ratio. Some companies report net turnover after certain costs (boosting % margins), while others report gross turnover. Superior operating cash flows result from:
  - **Stable geographies** – investment friendly, availability of skills, infrastructure etc;
  - **Quality ore bodies** – large, high grade, low cost, expandable assets;
  - **Mining simplicity** - infrastructure, labour intensity, depth etc.
  - **Scale benefits** drive superior productivity;
  - **Diversification** – should result in more stable cash flows through the cycle.

- **Long life assets result in superior internal rate of return** — Internal rate of return is driven by cash flow and time. The longer a project can deliver positive cash flows, the more valuable it becomes.

- **Increasing Scarcity should enhance Competitive Advantage over time** — We believe the highest quality ore bodies, with the lowest extraction and logistics costs, have already been developed and are owned by existing companies. Mining inflation of 16% p.a. over the past five years has made new projects very expensive. Long-term margins could benefit from 1) increasing geological scarcity of high grade, large scale resources, 2) increasing competitiveness of existing large-scale, low-cost mines in a steepening cost curve environment and 3) incentive pricing for new expensive projects.

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Quality Preferred Over Leverage

We maintain a Neutral stance on diversified miners. We are at the tail end of arguably the biggest commodity boom of the century. In the absence of a continued commodity price "pull", we see the sector moving sideways at best and prefer miners that generate economic value through quality assets, capital and operational efficiency and productivity growth.

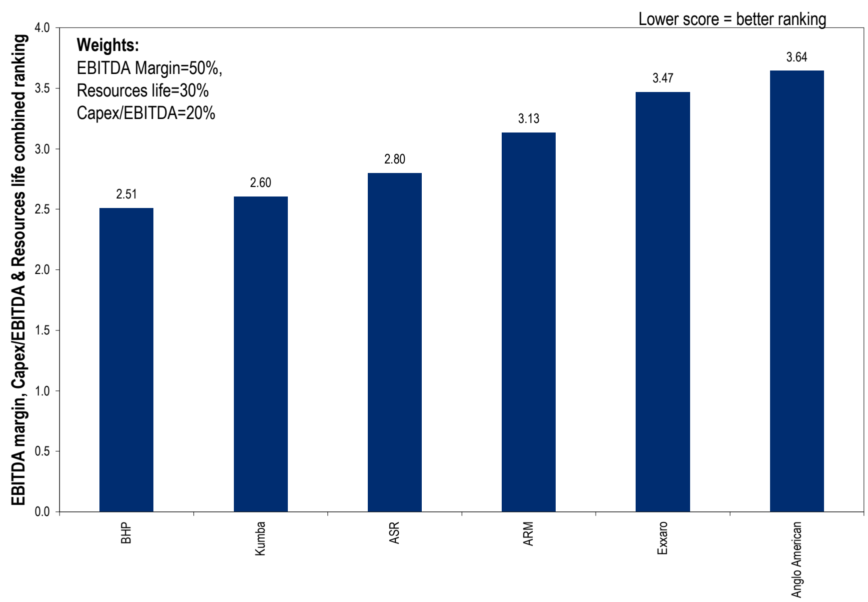
In this report, we analyse resource quality. Refer to our 25 June 2012 report "Searching for Outperformance in the Super-Cycle Sunset" for analysis of miners' efficiency and productivity.

BHP Billiton's resource quality ranks best in our analysis of EBITDA margins, capital intensity and resources life (Figure 1). Kumba is second despite its relatively short life, due to its superior margins and low capital intensity. Assore (third) ranks well on manganese resources life and low capital intensity, but 2012 margins were under pressure. Exxaro has the longest thermal coal resource life, but low average 2012 coal margins let it down.

Anglo American ranks worst among this sample because of its relatively low EBITDA margins during 2012 and its capital intensity.

Lower numbers reflect more favourable rankings

Figure 1. Miners' rank based on EBITDA margin, capital intensity and resources life



Source: Citi Research

Methodology:

We rank miners' copper, iron ore, manganese, nickel and coal assets based on:

- divisional 2012 EBITDA margins (Figure 3)
- divisional resource life (Figure 4)
- Capital intensity measured as 2012 Capex/EBITDA (Figure 6).

In all our rankings, number 1 is best and higher numbers are worse. We take the straight average of divisional rankings to come up with company rankings on margins and resource life.

We then weigh the three measures above as follows:

- Average EBITDA margins – 50%
- Average resource life – 30%
- Capital intensity – 20%

We do not take other divisions than those mentioned into account, so companies may be penalized if their high margin, long life divisions are excluded from this analysis.

Companies mentioned in this report

Figure 2 ranks companies by total expected one-year return.

Figure 2. Companies ranked by total one-year return*

Company	RIC	Unit	1-Yr target price	Current price*	1-Yr target capital return	1-Yr fwd dividend yield	Total 1-Yr return	12-mnth fwd PE	Rec.
Acquarius	AQP.L	Pence	**92**	50	84.0%	-3.1%	**80.9%**	34.1x	**BUY**
Lonmin	LMI.L	GBP	**4**	3	46.6%	-1.4%	**45.2%**	32.5x	**BUY**
Vale	VALE.N	USD	**22**	17	29.4%	6.8%	**36.2%**	8.2x	**BUY**
Fortescue	FMG.AX	ZAR	**5**	4	34.2%	1.7%	**36.0%**	7.2x	**BUY**
Rio Tinto	RIO.L	GBP	**40**	31	31.1%	3.7%	**34.9%**	7.7x	**BUY**
Impala	IMPJ.J	ZAR	**170**	135	25.9%	1.8%	**27.7%**	17.4x	**BUY**
BHP Billiton	BLT.L	GBP	**23**	19	19.2%	4.3%	**23.5%**	10.6x	**NEUTRAL**
Iluka	ILU.AX	ZAR	**11**	9	19.6%	2.8%	**22.4%**	25.1x	**BUY**
Anglo American	AGLJ.J	ZAR	**290**	244	18.8%	3.3%	**22.0%**	10.0x	**NEUTRAL**
Gold Fields	GFIJ.J	ZAR	**82**	71	14.8%	1.4%	**16.3%**	12.1x	**SELL**
ARM	ARIJ.J	ZAR	**210**	189	11.3%	3.2%	**14.5%**	13.6x	**NEUTRAL**
AngloGold	ANGJ.J	ZAR	**250**	221	13.0%	1.1%	**14.1%**	10.3x	**NEUTRAL**
Sasol	SOLJ.J	ZAR	**455**	419	8.6%	4.7%	**13.3%**	9.6x	**NEUTRAL**
Exxaro	EXXJ.J	ZAR	**180**	164	9.6%	3.0%	**12.6%**	10.1x	**NEUTRAL**
ExxonMobil	XOM.N	ZAR	**97**	89	9.0%	2.6%	**11.6%**	12.0x	**BUY**
Anglo Platinum	AMSJ.J	ZAR	**440**	404	9.0%	0.6%	**9.5%**	45.7x	**SELL**
RD Shell Class A	RDSa.L	ZAR	**22**	21	3.3%	5.1%	**8.4%**	8.2x	**NEUTRAL**
Woolworths	WHLJ.J	ZAR	**74**	71	4.4%	3.3%	**7.6%**	17.7x	**BUY**
Harmony	HARJ.J	ZAR	**62**	58	6.7%	0.9%	**7.6%**	15.0x	**NEUTRAL**
Kumba Iron Ore	KIOJ.J	ZAR	**470**	482	-2.4%	8.3%	**5.9%**	10.7x	**SELL**
Northam	NHMJ.J	ZAR	**41**	39	4.3%	0.5%	**4.8%**	17.9x	**NEUTRAL**
SABMiller	SAB.L	ZAR	**35**	34	0.6%	1.9%	**2.5%**	19.6x	**BUY**
RB Plats	RBPJ.J	ZAR	**55**	54	1.9%	0.0%	**1.9%**	31.9x	**NEUTRAL**
BP	BP.L	ZAR	**4**	5	-5.4%	4.8%	**-0.6%**	7.7x	**NEUTRAL**
Assore	ASRJ.J	ZAR	**270**	341	-20.9%	2.4%	**-18.5%**	12.7x	**SELL**
Average					**15.1%**	**2.6%**	**17.6%**	**17.7x**	

Source: dataCentral, Citi Research * Priced on 26 March 2013

Key drivers of shareholder returns going forward

Our analysis suggests that miners with the following characteristics could outperform over the coming decade:

…a number of important characteristics

- **Attractive industries** — Companies should focus on industries with strong fundamentals. High-margin businesses share a number of important characteristics: geographically scarce commodities (copper, coking coal, platinum), steep cost curve (iron ore, copper), strong trend demand growth (Chinese infrastructure related like iron ore), low barriers to exit (in contrast to steel, aluminium sectors), substantial capital investment (platinum, iron ore) and consolidated industry structure (diamonds, iron ore, coking coal, platinum and manganese).

- **Efficient capital allocation** — Shareholder returns are always determined by the price paid for assets. It is very difficult to recover from value destructive acquisitions or projects. Miners with expandable assets are less likely to make value destructive investments. At this stage in the cycle we would **prefer acquisitive growth** of quality producing companies trading **below replacement cost** over expensive projects which carry execution risk. Companies with attractive dividend yields are likely to continue outperforming.

- **Sustainable margin advantage through quality assets -** assets should be competitively positioned to maximise returns trough the cycle
  - **Stable geographies** – Lower risk of resource nationalism, availability of skills, infrastructure etc.
  - **Quality ore bodies** – large, long life, high grade, low cost, expandable assets.
  - **Mining simplicity** 1) proximity to infrastructure, 2) low labour intensity/ high degree of mechanisation 3) ease of extraction (depth) 4) opencast trumps underground, 5) low upfront capex 6) ease of metallurgical recoveries.
  - **Scale benefits drive superior productivity.**
  - **Diversification** – a well diversified portfolio (across geographies and commodities) of quality assets should result in more stable cash flows through the cycle.

To offset increasing mining complexity

- **Discipline and performance culture** — Strong management is required to consistently drive **productivity and efficiency improvements** to offset industry challenges like increasing mining complexity and grade decline. Revenue should be maximised for each unit of cost. Safety performance has an increasing impact on miners' productivity and bottom line. Refer to our 25 June 2012 report "Searching for Outperformance in the Super-Cycle Sunset" for analysis of miners' efficiency and productivity.

- **Cost of capital** — Interest rates are at historic lows. We believe miners should make more use of cheap debt to fund growth. This could significantly reduce miners' cost of capital and boost value. It would also likely lead to more attractive dividend yields.

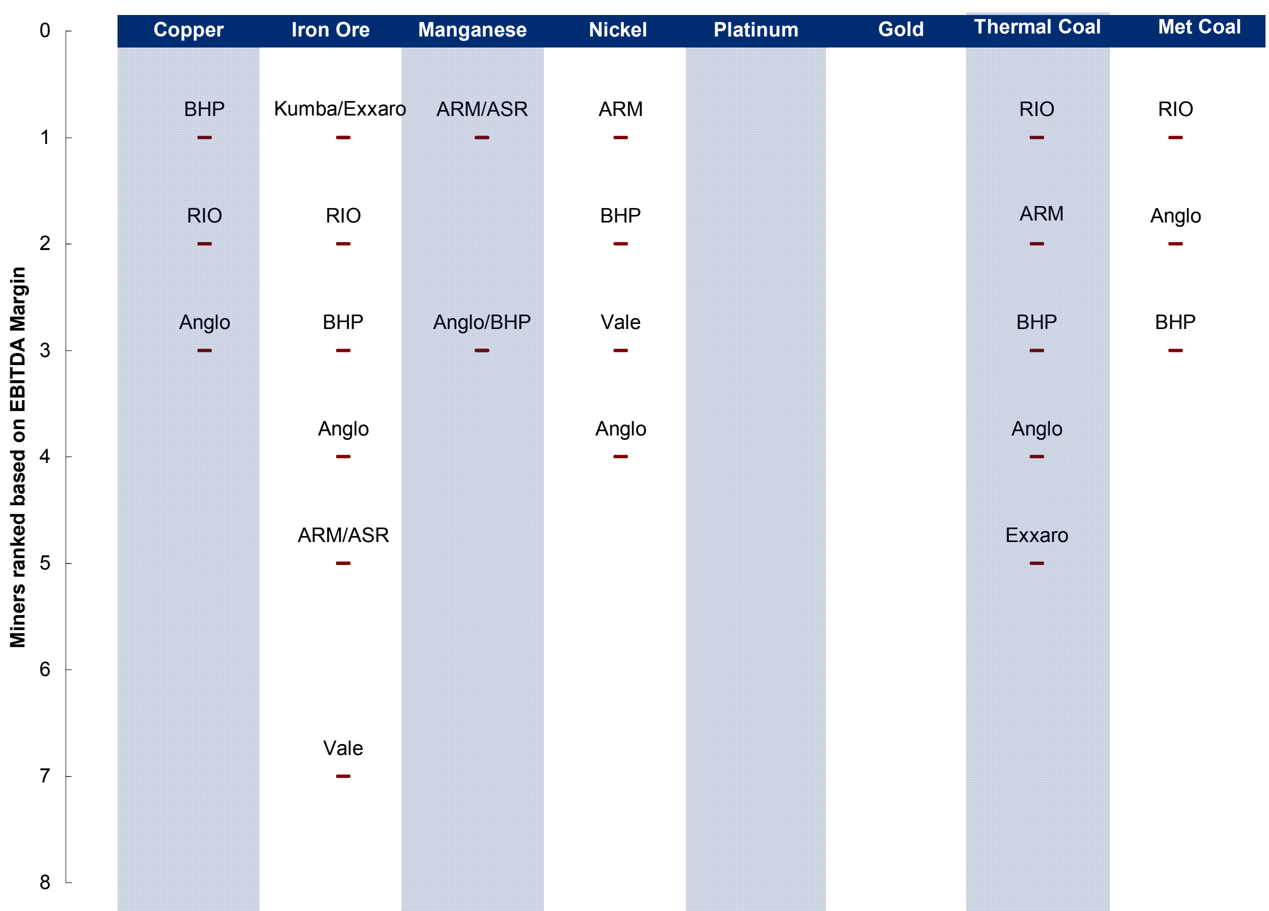
Miners ranked by divisional EBITDA margins

We rank dollar per unit margins. Refer to Figure 7 to Figure 16 for more detail. Dollar per unit is a better indicator of operating cash flow than margin %, because accounting policies sometimes distort the ratio. Some companies report net turnover after certain costs (boosting % margins), while others report gross turnover. Superior operating cash flows result from:

– **Quality ore bodies** – large, high grade, low cost, expandable assets;
– **Mining simplicity** - proximity to infrastructure, low labour intensity/high degree of mechanisation, low upfront capex, easy metallurgical recoveries;
– **Scale benefits** drive superior productivity;

We include Rio Tinto and Vale in the analysis for comparative purposes only, but these miners are excluded from the final ranking on page 3.

Figure 3. Miners ranked based on EBITDA margin

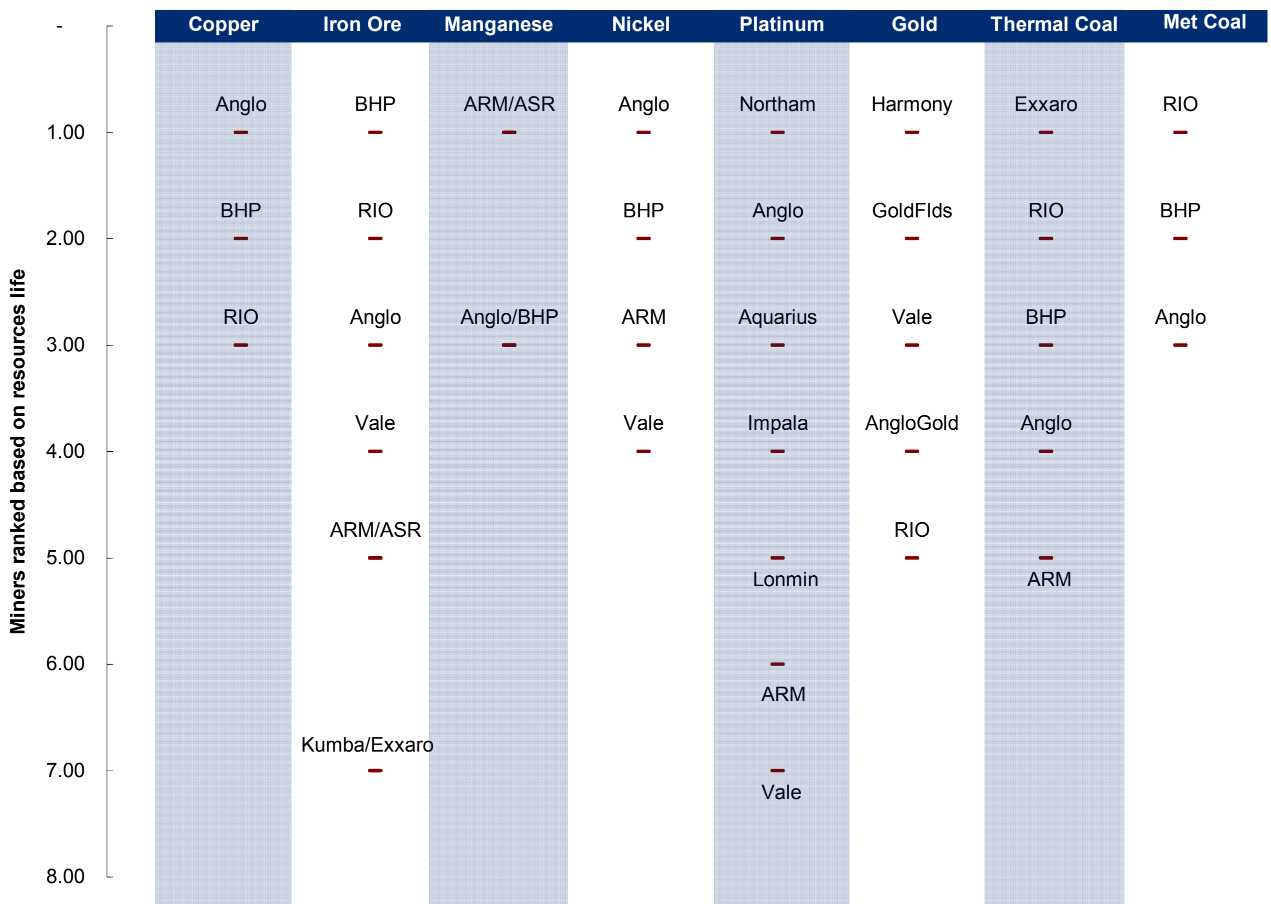


Source: Company reports, Citi Research

Miners ranked by divisional resource life

Refer to Figure 7 to Figure 16 for more detail on divisional resource life.

Figure 4. Miners ranked based on resources life

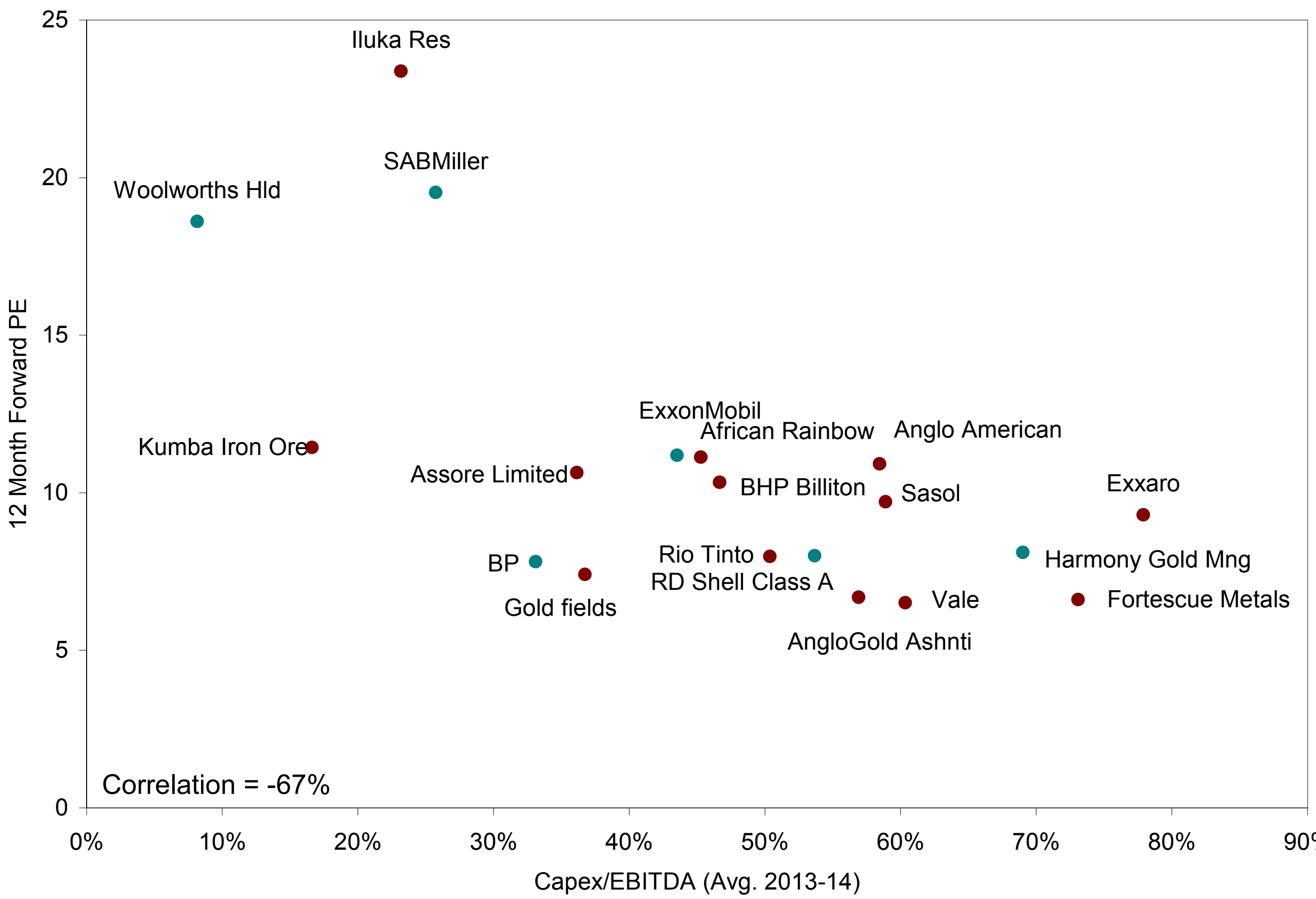


Source: Company reports, Citi Research

Miners ranked by capital intensity

Mining company PE ratings reflect their inability to translate sales into free cash flow. Figure 5 shows that companies spending larger proportions of EBITDA on capex generally attract lower valuations. Capital expenditure consumes the lion's share of miners' operating cash flow and often results in disappointing volume growth as reserve depletion, grade decline and increasing mining complexity at existing operations offset new projects. Companies justify large capital expenditures through promises of volume growth as opposed to value growth. Volume growth often comes at the expense of dividends and in some cases project returns undershoot costs of capital.

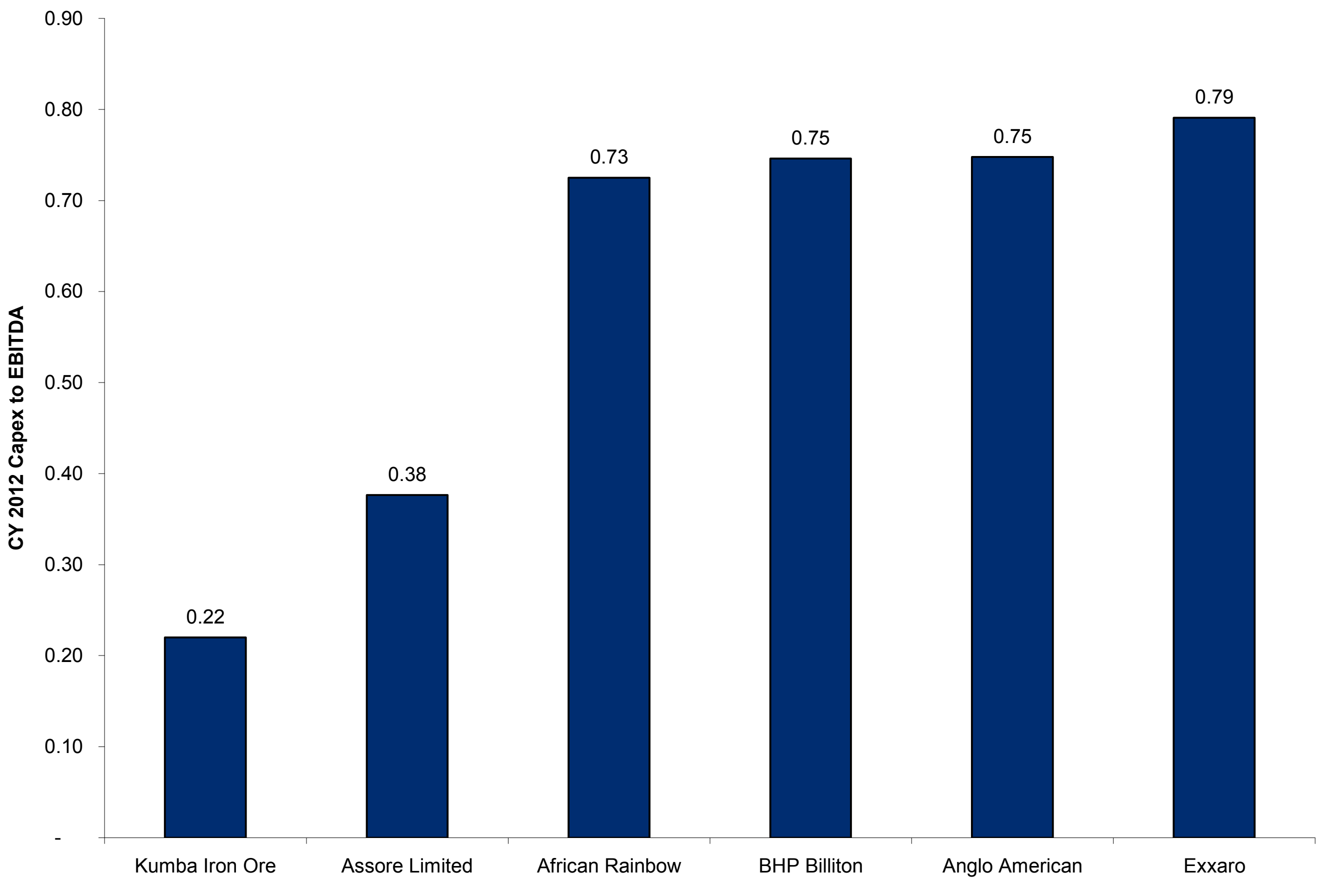
Figure 5. Capex/EBITDA and consensus 12 month forward PE multiples



Source: Citi Research, DataStream

Figure 6 ranks miners by 2012 Capex to EBITDA. Exxaro is most capital intensive, while Kumba is most capital efficient.

Figure 6. Miners ranked by CY 2012 capital intensity (Capex/EBITDA)



Source: Company reports, Citi Research

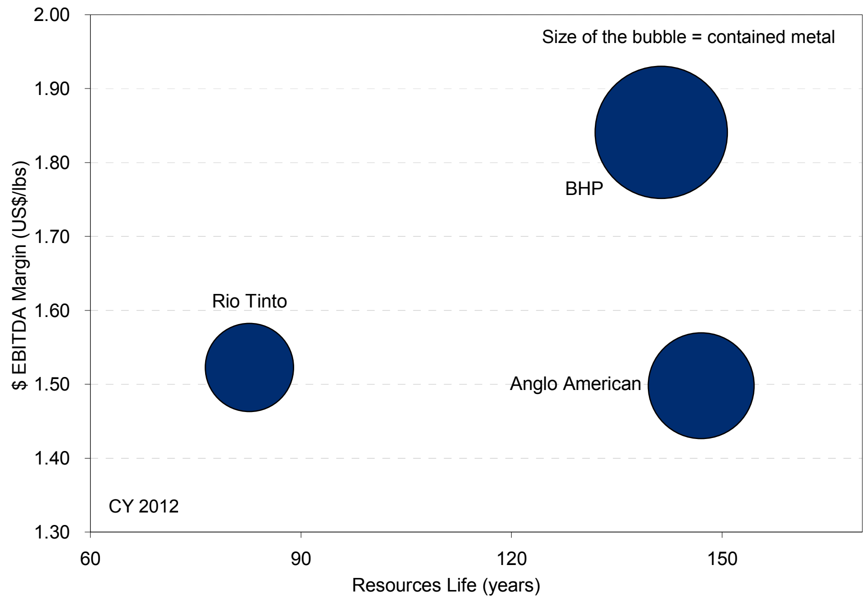
Copper assets

During calendar year 2012 BHP Billiton generated superior copper margins of $1.84/lb, followed by Rio Tinto ($1.52/lb).

Anglo American's copper division was plagued by production issues at Collahuasi and Los Bronces, resulting in unit cost pressure. Anglo's margins were limited to $1.50/lb.

All three of these miners have very long resource lives. Anglo is marginally ahead of BHP Billiton at 147 years at current production rates.

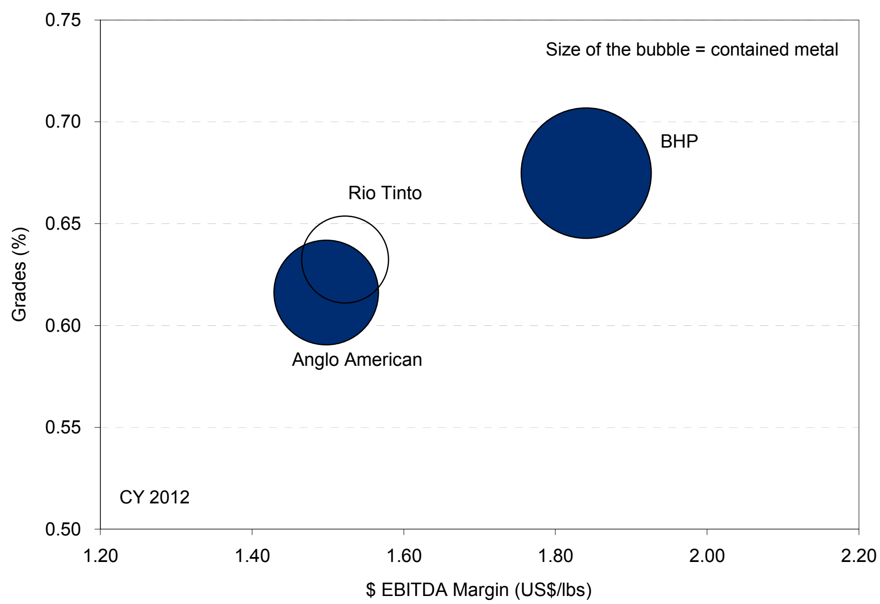
Figure 7. Copper EBITDA per tonne and resources life



Source: Company reports, Citi Research

Figure 8 compares margins and average copper grades.

Figure 8. Copper grades - EBITDA margin



Source: Company reports, Citi Research

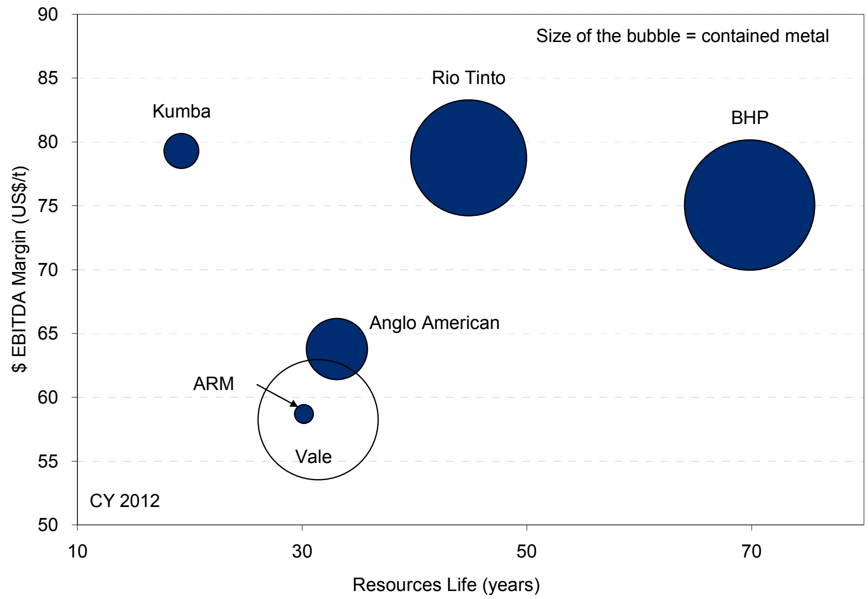
Iron ore assets

Kumba Iron Ore achieved the highest EBITDA margin of $ 79.27 per export tonne during 2012, but it has the shortest resource life of 20 years.

BHP Billiton and Rio Tinto have the longest resource lives of 70 years and 45 years respectively and achieved attractive margins of $75/tonne and $78/tonne during 2012.

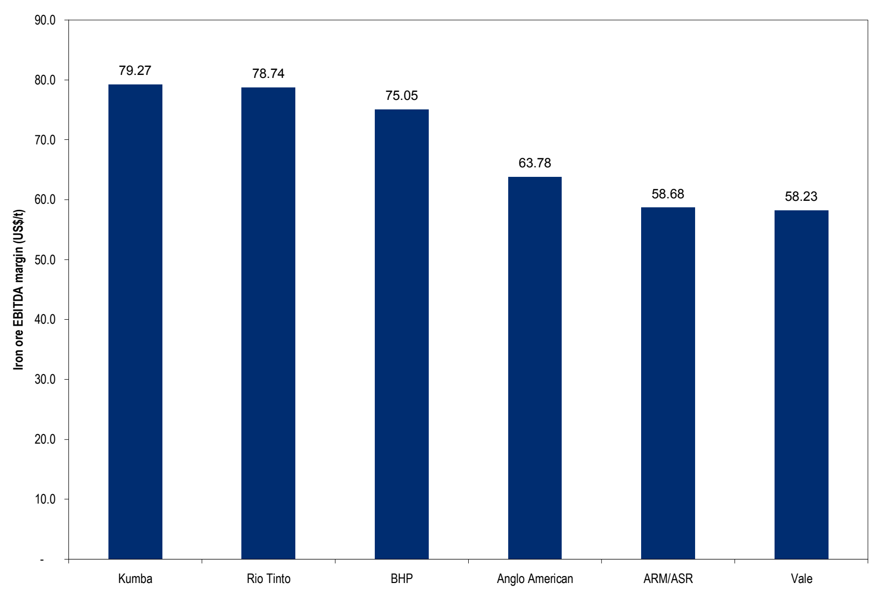
Vale's margins are impacted by higher freight costs to China.

Figure 9. Iron ore EBITDA per tonne and resources life



Source: Company reports, Citi Research

Figure 10. Iron ore 2012 EBITDA margins per tonne

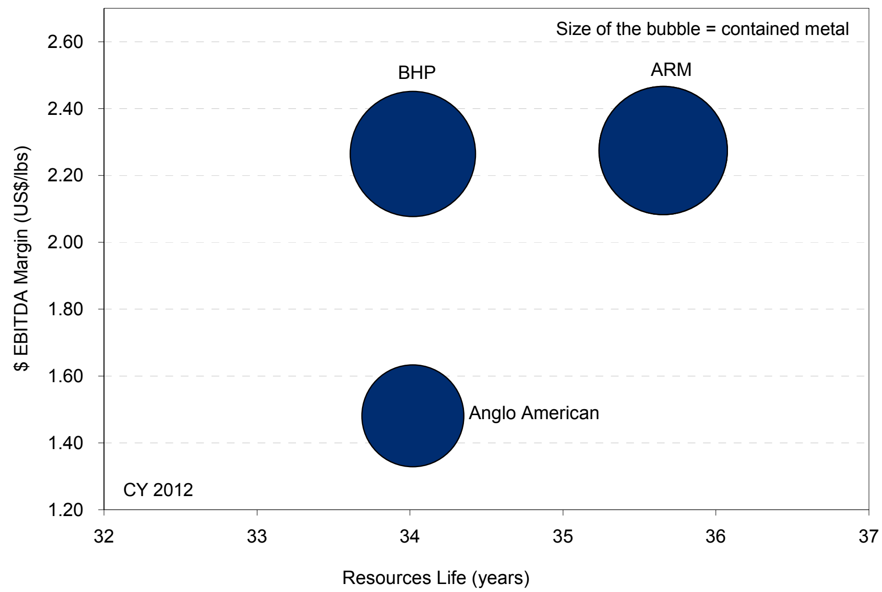


Source: Company Reports and Citi Research Estimates

Manganese Assets

Assmang (ARM/Assore) has the longest manganese resource life, and achieved slightly better 2012 EBITDA margins ($2.27/lb) than BHP's Samancor ($2.26/lb).

Figure 11. Manganese EBITDA per manganese ore equivalent tonne and resources life

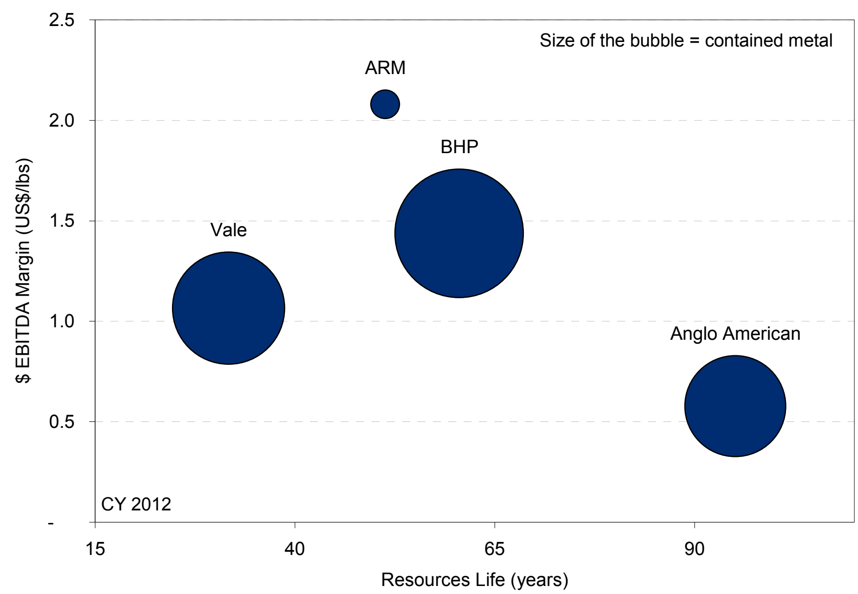


Source: Company reports, Citi Research

Nickel assets

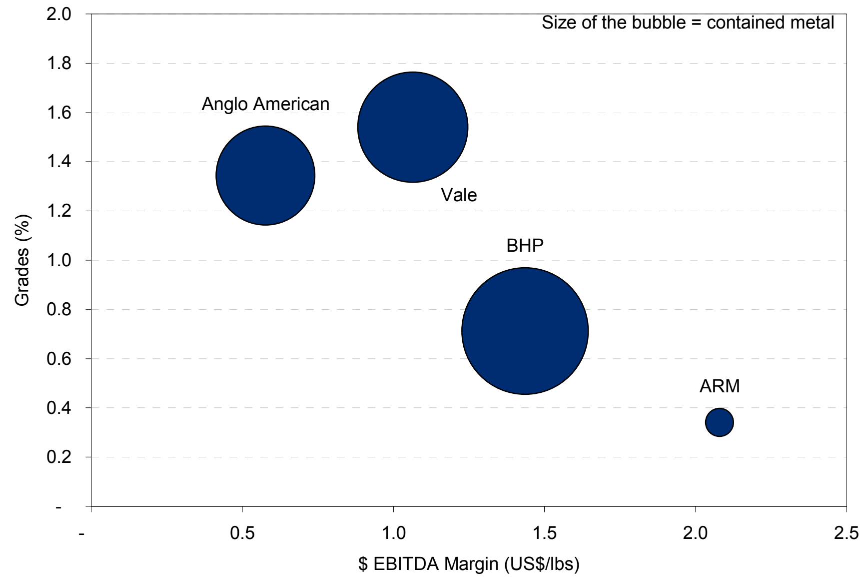
ARM achieved superior Nickel margins at Nkomati due to a strong operational recovery during 2012 and by-product credits.

Figure 12. Nickel EBITDA margin - resources life



Source: Company reports, Citi Research

Figure 13. Nickel grades - EBITDA margin

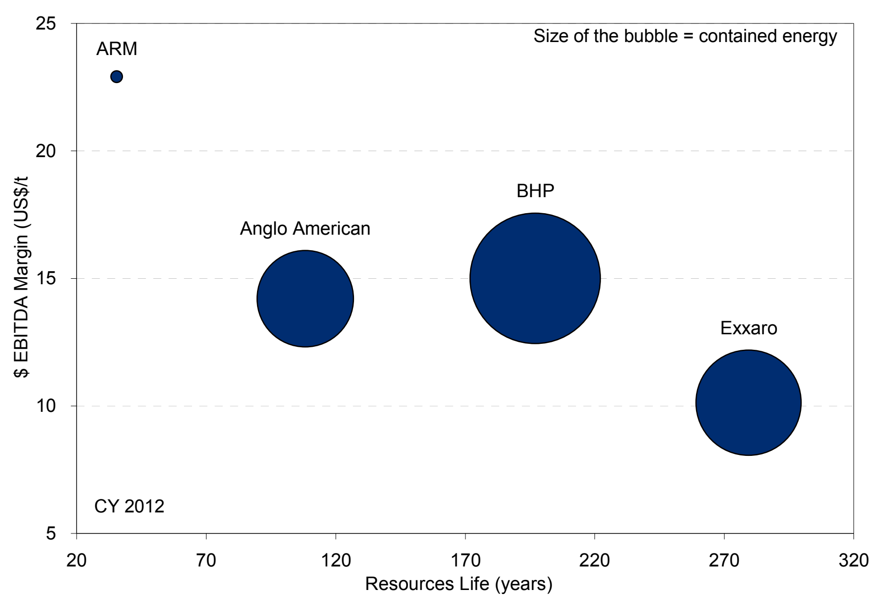


Source: Company reports, Citi Research

Thermal coal assets

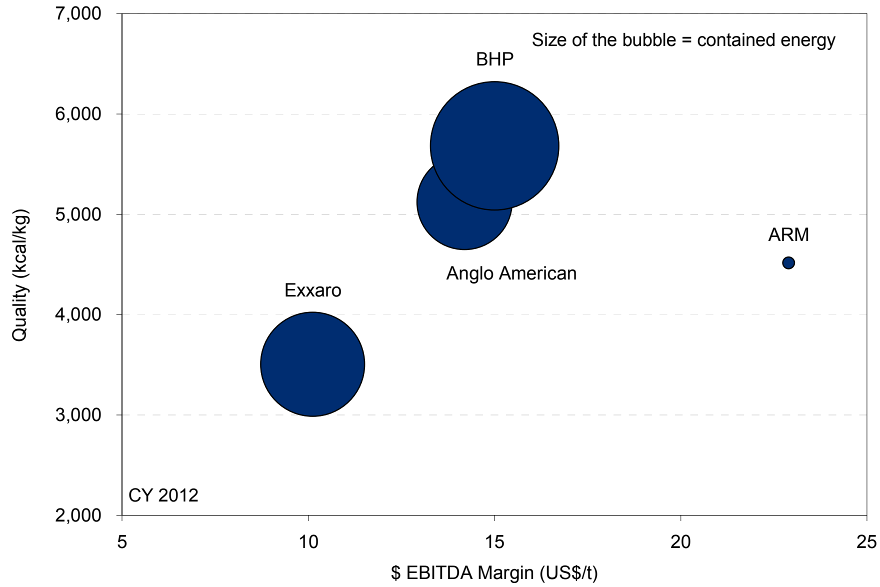
Exxaro's thermal coal division has the longest theoretical life at current production rates, but it achieves the lowest margins per tonne given its large contribution from low margin Eskom sales.

Figure 14. Thermal Coal EBITDA margin - resources life



Source: Company reports, Citi Research

Figure 15. Thermal Coal quality- EBITDA margin



Source: Company reports, Citi Research

Metallurgical coal assets

All three major miners have long coking coal resource lives.

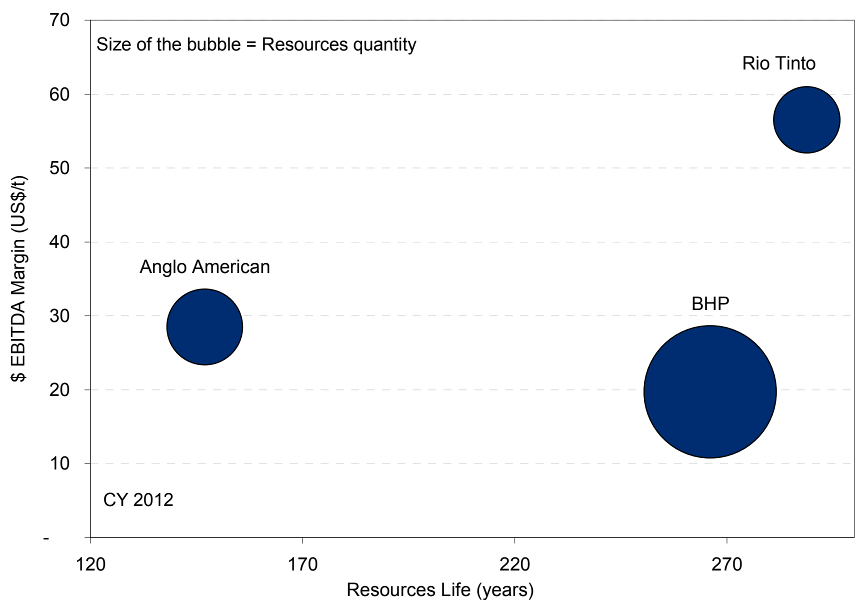
Australian coking coal producers experienced significant cost pressures over the past three years due to operational issues including flooding and strikes.

Rio Tinto realised superior margins during 2012.

BHP's margins were impacted by cost pressures and strikes.

Anglo American's 2012 margins were impacted by lower quality product mix and cost pressure.

Figure 16. Met Coal EBITDA margin – resources life



Source: Company reports, Citi Research

Financial summary per calendar year

Figure 17. Miners' earnings, dividend and financial ratio snapshot per calendar year*

	Calendar year	2009	2010	2011	2012	2013F	2014F	2015F	2016F	2017F
Anglo American	EBITDA margin	29%	37%	38%	27%	29%	30%	31%	31%	31%
	EBIT margin	21%	30%	32%	19%	21%	22%	22%	22%	22%
	ROCE	13%	21%	23%	10%	13%	13%	13%	12%	12%
	Earnings per share (US$)	**2.10**	**3.96**	**4.85**	**2.24**	**2.54**	**2.89**	**3.02**	**3.02**	**3.02**
	Earnings growth	*-51%*	*89%*	*23%*	*-54%*	*13%*	*13%*	*5%*	*0%*	*0%*
	PE multiple at $26	*12.42*	*6.58*	*5.37*	*11.61*	*10.24*	*9.03*	*8.64*	*8.64*	*8.64*
	Dividend per share (US$)	0.00	0.65	0.74	0.85	0.98	1.13	1.30	1.30	1.30
	Dividend yield at $26	0.0%	2.5%	2.8%	3.3%	3.8%	4.3%	5.0%	5.0%	5.0%
BHP Billiton	EBITDA margin	44%	49%	49%	45%	44%	47%	48%	48%	48%
	EBIT margin	36%	42%	41%	35%	33%	35%	36%	36%	36%
	ROCE	31%	48%	46%	23%	24%	26%	27%	26%	29%
	Earnings per share (US$)	**2.08**	**3.14**	**3.64**	**2.80**	**2.64**	**3.14**	**3.52**	**3.52**	**3.52**
	Earnings growth	*-11%*	*51%*	*16%*	*-23%*	*-6%*	*19%*	*12%*	*0%*	*0%*
	PE multiple at $29	*14.03*	*9.29*	*8.02*	*10.44*	*11.08*	*9.29*	*8.29*	*8.29*	*8.29*
	Dividend per share (US$)	0.85	0.94	1.07	1.15	1.21	1.30	1.40	1.40	1.40
	Dividend yield at $29	2.9%	3.2%	3.6%	3.9%	4.1%	4.5%	4.8%	4.8%	4.8%
African Rainbow Minerals	EBITDA margin	40%	41%	40%	36%	34%	35%	35%	35%	35%
	EBIT margin	32%	32%	33%	27%	24%	25%	26%	26%	26%
	ROCE	7%	26%	28%	17%	20%	20%	23%	22%	24%
	Earnings per share (ZAR)	**9.37**	**11.90**	**15.92**	**14.77**	**13.75**	**16.30**	**18.83**	**18.83**	**18.83**
	Earnings growth	*-36%*	*27%*	*34%*	*-7%*	*-7%*	*19%*	*16%*	*0%*	*0%*
	PE multiple at R184	*19.63*	*15.46*	*11.56*	*12.46*	*13.38*	*11.29*	*9.77*	*9.77*	*9.77*
	Dividend per share (ZAR)	1.88	3.26	4.63	5.13	5.75	6.50	7.50	7.50	7.50
	Dividend yield at R184	1.0%	1.8%	2.5%	2.8%	3.1%	3.5%	4.1%	4.1%	4.1%
Assore	EBITDA margin	52%	46%	49%	44%	38%	37%	37%	37%	37%
	EBIT margin	47%	40%	44%	38%	31%	29%	29%	29%	29%
	ROCE	14%	41%	51%	33%	32%	27%	29%	28%	31%
	Earnings per share (ZAR)	**19.92**	**19.75**	**30.82**	**31.68**	**27.20**	**27.24**	**28.67**	**28.67**	**28.67**
	Earnings growth	*-20%*	*-1%*	*56%*	*3%*	*-14%*	*0%*	*5%*	*0%*	*0%*
	PE multiple at R337	*16.91*	*17.05*	*10.93*	*10.63*	*12.38*	*12.36*	*11.74*	*11.74*	*11.74*
	Dividend per share (ZAR)	3.70	3.95	5.00	6.00	8.01	10.51	12.51	12.51	12.51
	Dividend yield at R337	1.1%	1.2%	1.5%	1.8%	2.4%	3.1%	3.7%	3.7%	3.7%
Exxaro	EBITDA margin	30%	37%	38%	37%	35%	34%	34%	31%	32%
	EBIT margin	23%	31%	33%	31%	27%	26%	26%	23%	0%
	ROCE	27%	40%	42%	27%	22%	20%	20%	18%	19%
	Earnings per share (ZAR)	**7.03**	**14.37**	**20.21**	**14.03**	**16.45**	**15.63**	**17.16**	**17.16**	**17.16**
	Earnings growth	*-28%*	*104%*	*41%*	*-31%*	*17%*	*-5%*	*10%*	*0%*	*0%*
	PE multiple at R162	*23.05*	*11.28*	*8.02*	*11.55*	*9.84*	*10.36*	*9.44*	*9.44*	*9.44*
	Dividend per share (ZAR)	2.00	5.00	8.00	5.00	4.90	4.70	6.80	6.80	6.80
	Dividend yield at R162	1.2%	3.1%	4.9%	3.1%	3.0%	2.9%	4.2%	4.2%	4.2%
Kumba Iron Ore	EBITDA margin	57%	67%	68%	54%	54%	52%	51%	51%	51%
	EBIT margin	55%	65%	66%	51%	51%	48%	47%	47%	47%
	ROCE	102%	152%	151%	86%	83%	75%	71%	54%	45%
	Earnings per share (ZAR)	**21.76**	**44.54**	**52.99**	**37.91**	**45.36**	**44.29**	**44.90**	**44.90**	**44.90**
	Earnings growth	*-4%*	*105%*	*19%*	*-28%*	*20%*	*-2%*	*1%*	*0%*	*0%*
	PE multiple at R468	*21.49*	*10.50*	*8.82*	*12.33*	*10.31*	*10.56*	*10.41*	*10.41*	*10.41*
	Dividend per share (ZAR)	14.60	34.50	44.20	31.70	42.00	41.00	41.00	41.00	41.00
	Dividend yield at R468	3.1%	7.4%	9.5%	6.8%	9.0%	8.8%	8.8%	8.8%	8.8%
	Average earnings growth	**-25%**	**62%**	**31%**	**-23%**	**4%**	**7%**	**8%**	**0%**	**0%**
	Average PE multiple	**17.9**	**11.7**	**8.8**	**11.5**	**11.2**	**10.5**	**9.7**	**9.7**	**9.7**
	Average dividend yield	**1.6%**	**3.2%**	**4.1%**	**3.6%**	**4.2%**	**4.5%**	**5.1%**	**5.1%**	**5.1%**

Source: Company reports, dataCentral, Citi Research * Note that calendarised information will be different from BHP Billiton, ARM and Assore's June year-end information. Priced at 26 March 2013

Downside risks to our forecasts and valuation

Our profit forecasts and valuations are based on input assumptions detailed in this report. Our forecasts are subject to risks that include:

- **Poor capital allocation:** Value-destroying projects or acquisitions would negatively impact earnings forecasts and valuations.
- **Resource nationalism:** Miners' profitability coupled with struggling economies of many resource-rich countries is resulting in increased pressure for resource nationalism. Threats of nationalisation, higher mining taxes and royalties, and pressure on miners to spend more on community development are becoming popular as a political platform. We do not see this theme disappearing and believe the risk is firmly to the upside for royalties, taxation and community development spend of resource companies.
- **Sustaining capex blowout:** Miners need to spend increasing amounts of capex just to maintain volumes. Underestimating sustaining capex would negatively impact earnings forecasts and valuations.
- **Lower commodity prices:** than our base-case forecasts, which would negatively impact earnings forecasts and valuations.
- **Stronger producer currencies:** Stronger-than-forecast currencies for resource-producing countries would negatively impact earnings and valuations.
- **Downside risk to sales volumes:** If commodity demand unexpectedly contracts, sales volume forecasts could face downside.
- **Infrastructure constraints** could limit or delay volume growth or increase cost inflation more than we anticipate. In particular, South African manganese ore and coal exports may not reach our five-year targets due to rail and port constraints.
- **Government actions** in countries where miners operate, such as controls on imports, exports and prices and increased government regulation, could squeeze profitability.
- **Higher-than-forecast inflation** in the mining sector could drive up costs, especially if rapidly growing demand puts pressure on scarce skills and resources.
- **Skills, electricity and water shortages** may impact production and mining inflation more than we anticipate.
- **Over-estimation of mineral reserves or failure to discover new resources** or expand existing resources could lead to earnings estimate downgrades.

Upside risks and catalysts for outperformance

- **Economic stabilisation in the Euro Area.**
- **Higher dividend payout ratios:** We believe investors steer clear of miners with low payout ratios as it could suggest 1) lack of confidence in future profitability or 2) management's desire to spend shareholder cash in potentially low-returning acquisitions or projects. Offering more attractive dividend yields takes away capital allocation risk and would likely result in a rerating.
- **Share buybacks:** Strong free cash flow generation by miners should result in surplus cash. We have not factored share buybacks into our forecasts, but these could lead to share price outperformance.
- **M&A activity:** Strong balance sheets and excess cash generation coupled with target company valuations below replacement cost could spur M&A in the mining sector. This could 1) boost target companies' share prices beyond our target prices and 2) consolidate rather than increase commodity supply, which would have a positive industry margin impact.
- **Cheap money:** Low interest rates in advanced economies could: 1) stimulate growth (industrial demand); 2) increase investment demand for commodities more than we anticipate, 3) spur M&A in the mining sector and boost dividend yields, and 4) reduce miners' weighted average cost of capital as projects and acquisitions are debt-financed.
- **Cheap energy:** Shale gas could make the US energy self sufficient. Cheaper energy could result in lower global inflation and fuel economic growth.
- **A pick-up in US housing starts and infrastructure rebuild:** An eventual pick-up in US housing starts or fiscal stimulus, which may include infrastructure rebuild, could support commodity demand.
- **Stimulus** in Europe, the US and China could provide upside for metals and mining equities.
- **Stronger for longer commodity prices:** Our base-case forecasts are for commodity prices to decline to marginal cost of production over the next decade. However, if commodity prices remain higher for longer, there could be upside risk to our earnings forecasts and valuations. Potentially higher commodity prices than our forecasts over the medium-term also pose an upside risk.
- **Dwindling supply from existing mines:** Falling grades, increasing mining complexity, skills and equipment shortages, weather-related disruptions, and labour issues continue to weigh on miners' production.
- **Limited new supply** caused by project and infrastructure delays. Overpromising and under-delivering on new projects has become the norm in mining. A confidence crisis could potentially lead to further project delays or even cancellations, which could sow the seeds for the next commodity bull market. Commodity supply growth is becoming more difficult due to: 1) Growing resource nationalism, 2) Permitting and environmental issues, 3) Competition for skilled labour, 4) New, mostly riskier, geographies, 5) Managing greater stakeholder concerns, and 6) Access to finance.

Commodity price and exchange rate forecasts

The forecasts below represent Citi's house view per calendar year.

Figure 18. Citi's commodity price and exchange rate forecasts per calendar year

Average per calendar year	2008	2009	2010	2011	2012	2013F	2014F	2015F	2016F	2017F	2018F	2019F	2020F	LT (Real)
Precious commodities														
Gold (US$/oz)	872	973	1,225	1,571	1,668	1,676	1,653	1,540	1,350	1,177	1,206	1,237	1,268	**1,050**
Silver (US$/oz)	15.06	14.80	20.72	36.02	31.70	31.00	26.50	23.25	20.50	18.50	18.96	19.43	19.92	**16.50**
Platinum (US$/oz)	1,572	1,203	1,612	1,720	1,551	1,700	1,775	1,825	1,800	1,716	1,759	1,803	1,848	**1,531**
Palladium (US$/oz)	352	263	526	733	643	774	925	925	900	762	781	801	821	**680**
Rhodium (US$/oz)	6,551	1,594	2,455	2,014	1,275	1,175	1,250	1,500	2,000	3,205	3,285	3,367	3,451	**2,859**
3PGM basket (US$/oz) (63%Pt,30%Pd,7%Rh)	1,555	948	1,345	1,444	1,259	1,385	1,483	1,532	1,544	1,534	1,573	1,612	1,652	**1,369**
Base metals														
Aluminium (US$/tonne)	2,573	1,664	2,173	2,398	2,018	2,100	2,175	2,250	2,100	2,179	2,234	2,289	2,656	**2,200**
Aluminium (US cents/lb)	117	75	99	109	92	95	99	102	95	99	101	104	120	**100**
Copper (US$/tonne)	6,961	5,148	7,536	8,811	7,950	7,965	7,775	7,500	7,300	6,934	7,108	7,285	7,485	**6,200**
Copper (US cents/lb)	316	234	342	400	361	361	353	340	331	315	322	330	339	**281**
Nickel (US$/tonne)	21,115	14,653	21,833	22,842	17,525	19,887	22,725	24,000	22,000	21,796	22,341	22,900	24,144	**20,000**
Nickel (US cents/lb)	958	665	990	1,036	795	902	1,031	1,089	998	989	1,013	1,039	1,095	**907**
Zinc (US$/tonne)	1,876	1,654	2,160	2,190	1,947	2,057	2,125	2,220	2,200	2,281	2,338	2,397	2,535	**2,100**
Zinc (US cents/lb)	85	75	98	99	88	93	96	101	100	103	106	109	115	**95**
Lead (US$/tonne)	2,093	1,720	2,148	2,397	2,061	2,112	2,200	2,250	2,200	2,281	2,338	2,397	2,656	**2,200**
Lead (US cents/lb)	95	78	97	109	93	96	100	102	100	103	106	109	120	**100**
Uranium (US$/lb)	64	47	46	56	49	50	50	50	55	56	57	59	60	**50**
Steelmaking materials														
Iron ore spot (CIF China) (US$/t)	152	85	152	175	132	120	122	122	115	110	108	105	105	**81**
Iron ore fines (FOB) (USc/dmtu)	129	109	177	262	185	170	170	170	156	148	144	140	140	**111**
Iron ore fines (FOB) (USD/tonne)	82	69	112	166	118	108	108	108	99	94	91	89	89	**71**
Iron ore lump (FOB) (USc/dmtu)	177	134	196	288	205	187	187	187	171	162	158	154	154	**120**
Iron ore lump (FOB) (USD/tonne)	112	85	125	183	130	119	119	119	109	103	100	98	98	**76**
Hard coking coal (US$/tonne)	253	172	191	289	211	174	213	213	218	222	226	231	235	**200**
Semi soft benchmark (US$/tonne)	196	116	139	210	149	133	143	149	154	157	160	164	167	**150**
Manganese ore - CIF (US$/mtu)	14.09	5.43	7.71	6.07	4.92	5.56	6.00	6.00	5.69	5.81	5.93	6.05	6.17	**5.20**
Ferro manganese - CIF (US$/tonne)	2,646	1,267	1,449	1,385	1,165	1,200	1,300	1,300	1,422	1,453	1,482	1,512	1,543	**1,300**
Ferrochrome (US$/lb)	1.81	0.93	1.24	1.26	1.21	1.15	1.00	1.00	1.09	1.12	1.15	1.18	1.21	**1.00**
Energy														
Brent crude oil (US$/bbl)	98	62	80	111	112	99	93	91	93	95	97	99	101	**81**
Henry Hub (US) Gas (US$/MMBtu)	9.23	4.43	4.38	4.01	2.75	3.58	4.10	4.80	4.92	5.04	5.17	5.30	5.43	**4.50**
Richards Bay thermal coal (US$/tonne)	120	65	92	118	93	97	109	113	118	119	122	124	127	**109**
Heavy minerals														
Rutile (US$/tonne)	509	535	538	839	1,924	1,800	1,800	1,800	1,094	1,118	1,140	1,163	1,187	**1,000**
Zircon (US$/tonne)	804	947	942	1,880	2,571	1,500	1,500	1,500	1,640	1,677	1,710	1,745	1,780	**1,500**
Synrutile (US$/t)		438	441	793	1,539	1,200	1,200	1,200	984	950	969	989	1,009	**900**
Titanium Slag (US$/tonne)	325	307	333	574	1,315	1,000	1,000	1,000	700	715	730	744	759	**640**
TIO2 Pigment (US$/tonne)	2,483	2,605	2,600	3,350	3,513	3,450	3,500	3,600	3,600	3,645	3,719	3,794	3,870	**4,000**
Illmenite (US$/tonne)	103	87	75	129	278	250	250	250	273	279	285	291	297	**250**
Currency exchange rates														
US$/ZAR	8.25	8.40	7.30	7.25	8.20	9.00	8.89	9.27	9.64	9.85	10.20	10.56	10.94	**10.00**
US$/AUD	0.85	0.79	0.92	1.03	1.04	0.97	0.95	0.94	0.91	0.90	0.88	0.86	0.85	**0.91**
US$/EUR	1.47	1.39	1.33	1.39	1.29	1.18	1.24	1.29	1.34	1.34	1.33	1.33	1.32	**1.25**
US$/CHP	523	559	502	482	486	495	489	510	527	554	584	615	647	**527**
US$/BRL	1.84	2.00	1.76	1.67	1.95	2.13	2.11	2.20	2.27	2.39	2.52	2.65	2.79	**2.27**
US$/COP	1,954	2,156	1,898	1,848	1,797	1,870	1,847	1,927	1,990	2,095	2,207	2,324	2,447	**1,990**
Inflation														
US CPI index	215	215	218	225	230	234	239	244	249	254	259	264	269	
US Inflation		0%	2%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%	

Source: Bloomberg, I-Net, DataCentral, Citi Research estimates

Key Publications

Figure 19. Key recent publication

Date	Publication	No. of Pages
28-Jun-11	Metals & Mining - Nationalisation – Killing The Goose That Lays The Golden Eggs	19
14-Jul-11	Metals & Mining - Coal and mineral sands boost, but costs spoil the party	26
29-Jul-11	Metals & Mining - The Unions Strike Again	14
1-Aug-11	Anglo American (AGLJ.J) - Cash Flow Kickers Coming	22
10-Aug-11	Metals & Mining - Opportunities in Uncertain Times	16
4-Sep-11	Metals & Mining - Uncertainty and Fear Create Value	52
20-Sep-11	Metals & Mining - Panic Provides	84
1-Nov-11	Metals & Mining - Efficiency Rewards: BHP Performed Best; Anglo Our Top Pick	76
5-Dec-11	Metals & Mining - Offering Value – Anglo is Our Top Pick	64
9-Jan-12	Metals & Mining - Less room for disappointment in 2012	76
16-Jan-12	Metals & Mining - Sweating for Success	120
8-Feb-12	BHP Billiton Ltd (BHP.AX) - Matching Capex to Cash Flow	12
10-Feb-12	Kumba Iron Ore Ltd (KIOJ.J) - Valuation Stretched and Margins Unsustainable - Sell	24
15-Feb-12	Anglo American (AGLJ.J) - Enjoyed the Ride – Downgrade to Neutral	28
20-Feb-12	Anglo American (AGLJ.J) - Headwinds and Low Dividends – Maintain Neutral	26
24-Feb-12	Exxaro Resources Limited (EXXJ.J) - Positive outlook and attractive dividend yield - Buy	23
19-Mar-12	Metals & Mining - What if Optimistic Margins Are Just Hot Air?	68
29-Mar-12	BHP Billiton Ltd (BHP.AX) - Home Improvement*	44
16-Apr-12	Metals & Mining - Lower commodity prices bring earnings closer to reality	73
18-May-12	Metals & Mining - Starting To Price In The Downside	22
18-May-12	Global Iron Ore - Pumping Iron II;	140
7-Jun-12	Anglo American (AGLJ.J) - Create Your Catalyst – Increase Dividend Payout	16
15-Jun-12	BHP Billiton Ltd (BHP.AX) - WACC Down	15
15-Jun-12	Anglo American (AGLJ.J) - Coal Briefing Feedback – We Prefer Dividends Over Growth	23
24-Jun-12	Metals & Mining - Searching for Outperformance in the Super-Cycle Sunset	64
16-Jul-12	Metals & Mining - Darkest before Dawn – PE's could rerate at trough ROE	83
23-Jul-12	Kumba Iron Ore Ltd (KIOJ.J) - Accelerated Margin Erosion – Sell Maintained	28
30-Jul-12	Anglo American (AGLJ.J) - Poor Capital Allocation + Poor Profitability = Reduced Valuation	29
8-Aug-12	Exxaro Resources Limited (EXXJ.J) - Growth at the expense of value and dividends	23
3-Sep-12	Metals & Mining - Falling iron ore and coking coal prices crush margins	88
24-Sep-12	Metals & Mining - Downgrading ARM, Anglo and Exxaro to Neutral	89
3-Oct-12	Metals & Mining - Labour issues hurting South African miners – Maintain Neutral	17
30-Oct-12	Metals & Mining - EVAsive Returns	39
17-Jan-13	2013: Recovery Hopes Overshadowed By Structural Challenges	92
18-Jan-13	Big Spenders Attract Small Ratings	8
13-Feb-13	Kumba Iron Ore - Premium Rating despite Limited Growth and Falling Margins - Sell	25
18-Feb-13	Anglo American - Poor Returns and no Quick Fix	26
11-Mar-13	Exxaro - Capital Allocation Concerns and Dividend Trap	25

Source: Citi Research

Appendix A-1

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The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc and its affiliates. No part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

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12 Month Rating ***Relative Rating***

Data current as of 31 Dec 2012	**Buy**	**Hold**	**Sell**	**Buy**	**Hold**	**Sell**
Citi Research Global Fundamental Coverage	49%	38%	12%	7%	86%	7%
% of companies in each rating category that are investment banking clients	53%	49%	45%	60%	49%	55%

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