Global Metals & Mining

Primer: Case studies in value destruction

Bank of America Merrill Lynch

Industry Overview

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Global
Non-Ferrous Metals, Mining & Minerals

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How did the industry earn its unfortunate reputation?

We discuss in Case Study format several examples of value-destruction in the metals & mining industry over the past 10 years. To be clear, our aim isn't to point fingers but rather to highlight patterns & warning signs that investors might use to avoid pitfalls.

Why write this note, now? Is it different this time?(!)

A key question from investors we speak to: Could this time is could be different? Usually, the answer is (a definitive) NO. Still, consider: Managements appears to lack mandates to spend and are choosing value over volume. This combination of capital & supply discipline could be a potent driver of value for shareholders. If it lasts.

Key takeaways

1) Big M&A, particularly at the peak of the cycle, is high risk.
2) Greenfield megaprojects projects are tricky to execute and don't often create NPV.
3) "Branching out" to new businesses is risky. Stick to your knitting.
4) New geographies may offer high rewards but also have higher risk.
5) Question dramatically changed paradigms, new technologies and economics.
6) Consider institutional changes to the capital allocation process.

Our case studies: Nobody has been immune

We study a selection of projects and transactions which led to loss of value for shareholders. Again, our aim isn't to single out any one company, we believe that challenged capital allocation is endemic in the industry. Our case studies:

1) Rio Tinto purchase of Alcan (c. $30 bn destroyed).
2) Rio Tinto purchase of Riverdale ($c. 4 bn destroyed).
3) Anglo purchase of Minas Rio project and construction (c. $11 bn destroyed).
4) BHP purchase & development of shale gas assets (c. $13 bn destroyed).
5) Xstrata/Glencore Koniambo project. (c. $7 bn written down).
6) ThyssenKrupp Steel Americas (c. €7 bn written down).

Can future missteps be avoided?

What institutional changes could be built in to prevent very large scale losses? Some companies discuss the "Company X Way" and rely on experienced people to avoid pitfalls. Others e.g. Glencore are more extreme stating: "We don't do Greenfield projects, they are bad investments". That said, a Glencore associate, Xstrata, started down the road on the Koniambo nickel project, which, ex-post, has been bad investment. Could it have been avoided? We asked a CEO of one of the Big Miners what institutional / procedural changes had been implemented post some big write-downs. Answer (as best as we could ascertain): None. End of the day, we think these companies rely on people to make the right call. Can the industry keep its head and improve its reputation as a custodian of capital? Let's see… Want to read something more "cheerful"? Check out our recent note: "Creative Destruction = path to value release".

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Comparable company valuations

Table 1: BofAML global comparable companies

Company	Symbol	BofAML QRQ	Shr Price	Ccy	EPS			PER-Calendarized			NPV	P/NPV	ND/Eq	FCF Yield			EV/EBITDA			DY	Mkt Cap
					2016	2017E	2018E	2016	2017E	2018E	2018	2018	2016	2016	2017E	2018E	2016	2017E	2018E	2016	US$bn
Diversified / Majors																					
BHP Billiton PLC	BHPBF	BUY (B-1-8)	GBP 1375.5	USD	0.23	1.46	1.25	45.8x	13.2x	13.9x	1736	0.8x	43.5%	3.1%	11.6%	10.6%	9.8x	5.9x	6.3x	1.7%	95.0
Rio Tinto Plc	RTPPF	BUY (B-1-8)	GBP 3479.5	USD	2.84	3.82	4.19	15.8x	12.4x	11.3x	4437	0.8x	22.3%	6.4%	7.5%	8.0%	7.6x	6.3x	6.0x	3.6%	81.2
Anglo American	AAUKF	BUY (C-1-8)	GBP 1277.5	USD	1.72	2.15	1.71	9.0x	7.7x	9.7x	2168	0.6x	35.9%	11.7%	13.5%	12.5%	6.2x	5.1x	5.7x	0.0%	21.4
Glencore Plc	GLCNF	NEUT (C-2-7)	GBP 331.45	USD	0.14	0.27	0.21	30.0x	16.2x	21.4x	359	0.9x	70.1%	4.1%	9.8%	8.9%	9.0x	7.1x	7.2x	0.8%	61.3
Vedanta	VDNRF	BUY (C-1-7)	GBP 743	USD	-1.42	-0.02	1.01	nm	nm	4.4x	679	1.1x	107.0%	27.3%	-0.6%	9.5%	7.5x	5.5x	4.3x	3.1%	2.7
Vale ON	VALE	BUY (C-1-8)	USD 9.85	USD	0.77	0.97	1.28	12.8x	10.2x	7.7x	11.3	0.9x	61.2%	-10.9%	9.0%	13.1%	10.2x	7.2x	7.1x	0.4%	50.8
South32 Ltd	SHTLF	UNDE (B-3-8)	AUD 2.98	USD	0.03	0.20	0.17	46.1x	12.0x	12.2x	2.29	1.3x	-3.3%	3.9%	13.1%	8.5%	11.4x	5.2x	6.1x	0.5%	12.5
Fortescue Metals	FSUMF	BUY (C-1-8)	AUD 5.5	USD	0.30	0.68	0.39	10.3x	9.2x	11.1x	6.92	0.8x	61.7%	14.4%	22.8%	0.8%	6.5x	4.0x	6.0x	2.6%	13.5
Teck Resources Ltd	TECK	BUY (C-1-7)	USD 22.24	CAD	1.91	3.80	3.15	14.9x	7.0x	8.4x	14.10	1.6x	39.4%	7.1%	17.8%	16.1%	6.1x	4.0x	4.7x	0.4%	12.9
Bulk Commodity Producers																					
Eramet	ERMAF	BUY (C-1-9)	EUR 57.58	EUR	-1.63	4.06	2.73	nm	12.9x	19.2x	73	0.8x	37.7%	-6.9%	4.1%	5.7%	6.2x	3.3x	3.7x	0.0%	1.8
Ferrexpo	FEEXF	UNDE (C-3-8)	GBP 265.2	USD	0.32	0.60	0.38	9.5x	5.4x	8.5x	132	2.0x	182.3%	14.9%	14.5%	12.7%	6.7x	4.9x	6.6x	2.1%	2.0
Anglo Pacific	AGPIF	BUY (B-1-7)	GBP 116.25	GBP	15.60	15.52	11.18	7.2x	7.2x	10.0x	98	1.2x	-1.8%	5.4%	3.9%	12.4%	6.1x	4.6x	6.1x	5.4%	0.3
Kumba	KUMBF	BUY (C-1-9)	ZAR 204.02	ZAR	26.97	24.51	20.69	7.3x	8.0x	9.5x	121.57	1.7x	-16.9%	17.8%	12.7%	13.4%	3.7x	4.1x	4.6x	0.0%	4.9
Exxaro	EXXAF	NEUT (C-2-8)	ZAR 114.03	ZAR	13.02	15.98	13.62	6.8x	5.5x	6.5x	119.88	1.0x	3.8%	8.0%	1.1%	-0.4%	5.5x	4.5x	5.0x	5.7%	3.0
African Rainbow Mins	AFBOF	NEUT (C-2-7)	ZAR 95.9	ZAR	4.93	11.79	5.19	11.0x	10.6x	17.2x	130.53	0.7x	17.2%	-1.5%	10.6%	2.1%	5.7x	4.3x	5.0x	3.0%	1.6
Base Metals																					
Antofagasta	ANFGF	UNDE (B-3-8)	GBP 938.5	USD	0.38	0.48	0.55	30.8x	25.8x	22.5x	782	1.20x	9.8%	1.2%	2.5%	5.0%	9.2x	8.6x	7.8x	1.1%	12.0
KAZ Minerals Plc	KZMYF	BUY (C-1-9)	GBP 720	USD	0.40	0.67	1.18	21.4x	13.6x	7.8x	573	1.3x	497.9%	-10%	2%	3.8%	19.6x	8.5x	6.3x	0.0%	4.2
First Quantum	YFM	UNDE (C-3-8)	CAD 12.75	USD	0.24	0.12	0.56	43.7x	92.4x	19.8x	16	0.8x	42.6%	-6%	-6%	2.3%	14.0x	12.4x	9.4x	0.1%	6.9
KGHM	KGHPF	UNDE (C-3-7)	PLN 120.6	PLN	-21.86	9.41	12.23	nm	11.7x	9.0x	236	0.5x	45.5%	4.4%	5.7%	10.6%	7.7x	6.0x	5.1x	0.0%	6.6
Freeport-McMoRan	FCX	UNDE (C-3-9)	USD 14.15	USD	0.23	0.75	1.25	64.7x	19.8x	11.9x	9	1.5x	127.3%	4.2%	7.6%	8.5%	8.3x	8.6x	6.8x	0.0%	20.6
Southern Copper	SCCO	UNDE (C-3-8)	USD 38.55	USD	0.97	1.41	2.00	35.6x	24.5x	17.3x			94.9%	-0.6%	3.8%	3.0%	14.6x	12.2x	10.1x	0.5%	29.8
Norilsk Nickel	NILSY	NEUT (C-2-7)	USD 15.305	USD	1.61	1.51	1.88	8.9x	9.5x	7.7x	9	1.7x	116.8%	7.9%	6.1%	7.4%	7.0x	6.7x	5.7x	10.4%	24.1
Norsk Hydro	NHYKF	NEUT (B-2-7)	NOK 50.85	NOK	1.83	3.73	5.17	27.8x	13.6x	9.8x	65	0.8x	-6.8%	3.0%	1.8%	2.2%	11.4x	7.6x	5.7x	2.5%	13.0
Alcoa Corp.	AA	BUY (C-1-9)	USD 37.78	USD	-1.34	3.15	3.50	nm	11.6x	10.4x			7.7%	-10.5%	12.5%	17.4%	13.3x	6.4x	6.0x		7.0
Nyrstar	XPANF	BUY (C-1-9)	EUR 5.898	EUR	-2.63	-1.30	-1.79	nm	nm	nm	0	11.8x	159.0%	-79%	-56.8%	-23.2%	8.0x	5.7x	5.7x	0.0%	0.6
Boliden	BDNNF	NEUT (C-2-7)	SEK 254.9	SEK	15.49	17.65	19.32	15.5x	13.6x	12.4x	133	1.9x	29.2%	4.6%	3.3%	6.2%	7.6x	7.0x	6.6x	2.2%	8.6
Aurubis	AIAGF	UNDE (B-3-7)	EUR 69.911	EUR	3.63	4.35	3.79	18.3x	16.5x	18.2x	27.2	2.6x	2.1%	3.0%	2.7%	7.0%	9.6x	7.8x	8.5x	1.8%	3.7
Median - Industrial Miners								**15.8x**	**12.0x**	**11.1x**		**1.0x**	**38.5%**	**4.0%**	**6.2%**	**7.7%**	**7.9x**	**6.1x**	**6.1x**	**0.8%**	
Precious																					
Polymetal Int	XPMYF	NEUT (C-2-7)	GBP 946	USD	0.93	1.05	1.36	12.6x	11.7x	9.0x	803	1.2x	135.6%	4.9%	2.5%	10.0%	8.8x	8.5x	7.0x	3.0%	5.2
Petropavlovsk	PPLKF	NEUT (C-2-9)	GBP 6.75	USD	0.01	0.02	0.03	8.1x	4.3x	2.9x	23.4	0.3x	108.9%	8.5%	9.5%	-5.2%	4.4x	3.9x	3.2x	0.0%	0.3
Fresnillo plc	FNLPF	NEUT (C-2-7)	GBP 1553	USD	0.45	0.67	0.81	40.8x	29.6x	24.3x	668	2.3x	-4.2%	3.2%	0.9%	1.1%	14.0x	13.4x	9.8x	1.5%	14.9
Randgold	RGORF	BUY (B-1-7)	GBP 7475	USD	2.64	3.27	4.56	33.8x	29.2x	21.0x	4659	1.6x	-13.8%	3.9%	2.8%	5.7%	14.9x	12.3x	10.4x	1.0%	9.1
Acacia Mining	ABGLF	UNDE (C-3-9)	GBP 187.5	USD	0.23	0.27	0.76	9.5x	8.6x	3.1x	305	0.6x	-11.7%	13.0%	-8.0%	65.9%	1.8x	2.5x	1.2x	4.5%	1.0
Centamin	CELTF	BUY (C-1-8)	GBP 157.5	USD	0.19	0.10	0.13	11.1x	21.5x	17.5x	129	1.2x	-26.2%	12.2%	6.0%	6.0%	5.7x	6.0x	5.0x	8.0%	2.3
Hochschild	HCHDF	BUY (C-1-7)	GBP 331.4	USD	0.09	0.10	0.29	38.4x	36.8x	12.3x	188	1.8x	23.6%	10.4%	6.9%	17.2%	6.4x	6.3x	4.3x	0.8%	2.2
AngloGold Ashanti	AULGF	BUY (C-1-7)	ZAR 130.76	USD	0.34	0.18	1.17	28.0x	57.6x	8.7x	163	0.8x	71.3%	11.4%	-0.1%	10.1%	4.1x	5.3x	3.6x	1.0%	4.0
Gold Fields	GFIOF	UNDE (C-3-7)	ZAR 54.86	ZAR	3.46	2.72	4.52	13.2x	16.8x	10.1x	44	1.2x	36.2%	12.2%	-2.0%	9.9%	2.7x	3.2x	2.6x	2.4%	3.2
Sibanye	SBGLF	NEUT (C-2-8)	ZAR 19.15	ZAR	3.98	-0.99	0.68	4.8x	nm	28.1x	46	0.4x	47.9%	10.5%	4.8%	7.6%	2.4x	2.9x	1.8x	7.6%	1.3
Harmony	HGMCF	BUY (C-1-7)	ZAR 23.73	ZAR	2.18	6.63	7.22	6.5x	3.1x	2.3x	44	0.5x	3.8%	22.4%	5.7%	23.4%	2.2x	2.7x	1.9x	2.3%	0.8
Anglo Platinum	AGPPF	NEUT (C-2-9)	ZAR 338.92	ZAR	7.13	5.24	9.29	47.5x	64.7x	36.5x	287	1.2x	18.1%	7.2%	1.9%	0.4%	11.4x	15.8x	12.8x	0.0%	6.8
Impala Platinum	IMPUF	UNDE (C-3-9)	ZAR 39.13	ZAR	0.12	-1.21	-3.26	nm	nm	nm	24	1.6x	4.3%	-3.8%	-7.6%	-15.3%	10.9x	13.4x	47.6x	0.0%	2.0
Northam Platinum	NMPNF	UNDE (C-3-9)	ZAR 46.19	ZAR	-0.97	-2.18	-2.24	nm	nm	nm	30	1.6x	57.7%	-1.7%	-3.7%	-5.1%	40.4x	46.2x	37.3x	0.0%	1.8
Lonmin Plc	LNMIF	UNDE (C-3-9)	GBP 89.5	USD	-0.36	-0.13	-0.14	nm	nm	nm	10	8.7x	-11.5%	-11.5%	-34.8%	-30.6%	3.9x	11.6x	13.8x	0.0%	0.3
Royal Bafokeng Plat.	XRVBF	NEUT (C-2-9)	ZAR 31.5	ZAR	0.87	-0.72	-1.48	36.3x	nm	nm	37	0.9x	-2.7%	-9.1%	-34.1%	-19.6%	18.5x	29.1x	19.7x	0.0%	0.5
Median - Precious								**13.2x**	**18.6x**	**9.8x**		**1.2x**	**11.2%**	**7.8%**	**1.4%**	**5.8%**	**5.0x**	**7.3x**	**5.0x**	**1.0%**	
Steel																					
ArcelorMittal	AMSYF	UNDE (B-3-9)	EUR 22.93	USD	1.75	2.77	2.56	13.9x	9.7x	10.5x	26	0.9x	34.2%	1.0%	4.1%	9.1%	7.4x	6.0x	6.0x	0.0%	27.5
Thyssenkrupp	TYEKF	NEUT (B-2-7)	EUR 25.6	EUR	0.52	1.25	1.57	41.7x	19.4x	15.9x	24	1.1x	134.4%	0.2%	-3.3%	4.8%	9.7x	9.3x	9.2x	0.6%	17.0
Voestalpine	VLPNF	BUY (B-1-7)	EUR 43.14	EUR	2.92	2.91	3.28	15.1x	13.8x	12.9x	34	1.3x	61.3%	0.0%	1.1%	1.5%	9.1x	8.5x	7.6x	2.4%	8.9
Salzgitter	SZGPF	UNDE (B-3-7)	EUR 38.668	EUR	1.00	2.20	2.28	38.9x	17.6x	17.0x	17	2.3x	4.6%	-2.7%	3.1%	2.6%	9.8x	7.5x	7.5x	0.6%	2.5
SSAB	SSAAF	NEUT (B-2-9)	SEK 40.59	SEK	0.99	2.39	2.23	42.0x	17.4x	18.6x	34	1.2x	36.6%	4.6%	8.6%	10.1%	12.5x	8.2x	8.4x	0.0%	5.1
Aperam	XPMEF	BUY (C-1-7)	EUR 42.895	USD	2.88	3.35	4.00	15.2x	14.4x	12.1x	35	1.2x	6.2%	7.6%	4.4%	7.9%	8.7x	7.8x	6.9x	3.1%	4.3
Acerinox	ANIOF	NEUT (B-2-7)	EUR 11.215	EUR	0.30	0.64	0.68	38.2x	17.6x	16.7x	11	1.1x	28.6%	3.5%	6.8%	4.4%	11.5x	7.5x	7.3x	0.9%	3.6
Outokumpu	OUTFF	BUY (C-1-7)	EUR 7.71	EUR	0.30	0.77	0.53	22.7x	8.8x	12.9x	9	0.9x	51.4%	8.2%	8.6%	1.6%	13.2x	6.0x	6.8x	1.5%	3.8
ArcelorMittal SA	ARCXF	NEUT (C-2-9)	ZAR 5	ZAR	-2.44	-0.59	-0.24	nm	nm	nm	7.15	0.7x	3.6%	-36.1%	-25.7%	-8.5%	43.6x	16.0x	7.1x	0.0%	0.4
Median - Steel								**30.4x**	**15.9x**	**14.4x**		**1.1x**	**34.2%**	**1.0%**	**4.1%**	**4.4%**	**9.8x**	**7.8x**	**7.3x**	**0.6%**	

Source: BofA Merrill Lynch Global Research

Key takeaways

1) Big M&A, particularly at the peak of the cycle, is high risk.

2) Greenfield megaprojects projects are tricky to execute and don't often create NPV.

3) "Branching out" to new businesses is risky. Stick to your knitting.

4) New geographies may appear to offer high rewards but also have higher risk.

5) Question dramatically changed paradigms, new technologies and economics.

6) Consider institutional changes to the capital allocation process.

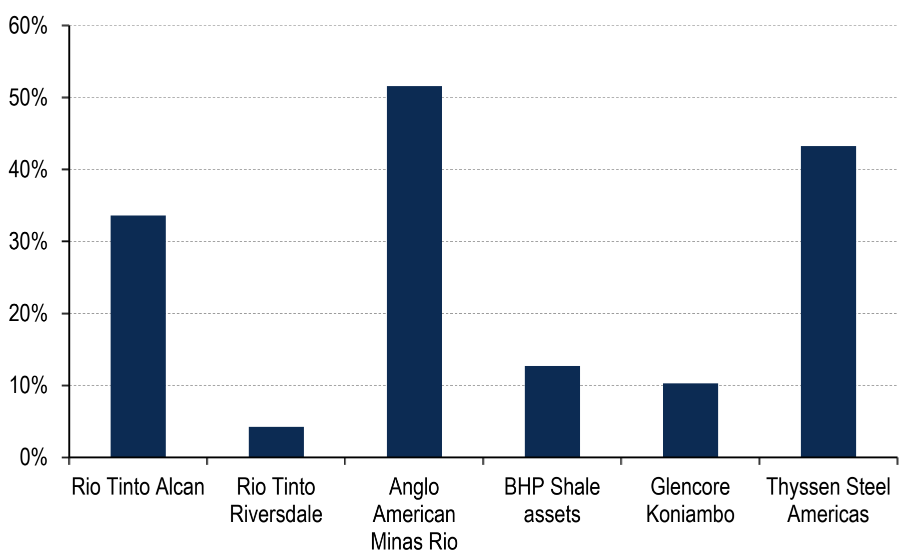
Can future missteps be avoided?

One key question that we find ourselves asking: What could companies have done differently? What institutional procedural changes could be built in to prevent such very large scale value destruction? Some companies discuss the "Company X Way" and rely on their experienced people not to fall into traps and make mistakes. Other companies e.g. Glencore are more extreme stating "We don't do Greenfield projects, they are bad investments". That said, a Glencore associate, Xstrata, started down the road on the Koniambo nickel project, which, ex-post, has not been a good investment. How did this happen? How could it have been avoided? We asked a CEO of one of the Big Miners what institutional / procedural changes had been implemented post some big write-downs. Answer (as best as we could ascertain): None. Can a leopard change its spots? Can the industry keep its head and improve its reputation as a custodian of capital? Let's see…

How big are these mistakes?

Short answer: BIG. For reference we show the size of the total pre-tax write-down vs. current market cap. Is this particularly meaningful (then and now)? We think it gives a feel for the scale of the capital misallocation that has happened.

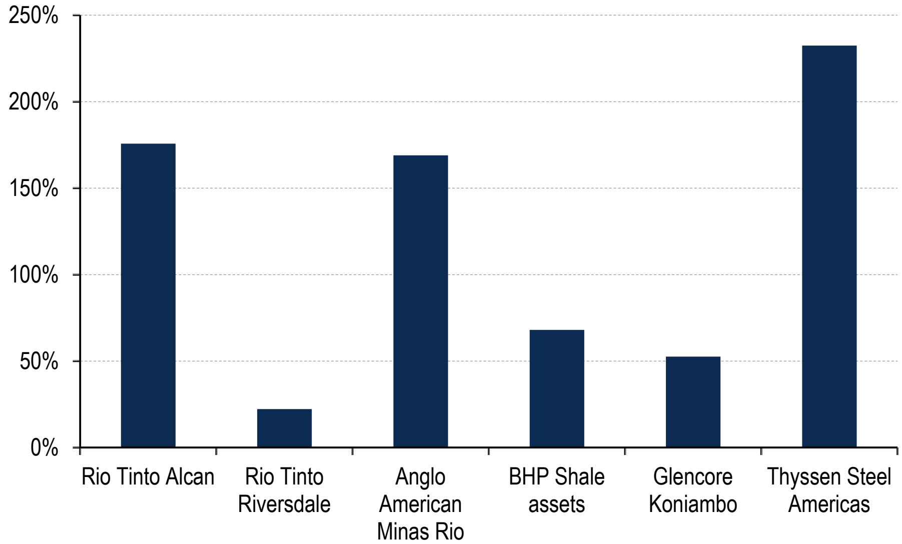
Chart 1: Value-destruction vs current market cap (pre-tax) – for reference



Source: Company data and BofAML research

… and vs. 2018E EBITDA. When things go wrong in a capital intensive sector, they go wrong in size!

Chart 2: Value-destruction vs. 2018E EBITDA – for reference



Source: Company data and BofAML research

Table 2: Pre-tax impairments

	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Rio Tinto Alcan*	7.9	0.9	0.7	9.2	12.4	-	-	-	-	31.1
Rio Tinto Riversdale	-	-	-	-	3.3	0.5	-	-	-	3.8
Anglo American Minas Rio	-	-	-	-	5.0	-	3.8	2.5	-	11.3
BHP Shale assets	-	-	-	-	2.8	0.3	-	2.8	7.2	13.1
Glencore Koniambo	-	-	-	-	-	2.8	-	4.0	-	6.8
Thyssen Steel Americas	-	-	-	2.1	3.6	0.6	-	-	0.9	7.2

Source: Company reports and BofAML estimates *Note: Includes TOTAL Aluminium group and Alcan non-core products impairments

Case studies: Learning from mistakes

We study a selection of projects and transactions which lead to loss of value for shareholders. Again, our aim isn't to single out any one company, we believe that challenged capital allocation is endemic in the industry.

Case study #1: Rio Tinto Alcan

In brief

Rio Tinto became involved in a bidding war for Canadian aluminium company, Alcan. In our view, the bid was predicated on "higher forever" aluminium prices based on an assumption that China was "short" energy. The company paid US$38.1bn for Alcan and subsequently entered the global financial crisis with a highly levered balance sheet. Rio was forced to sell major parts of Alcan at "bottom of cycle" valuations, undertake a $14.8bn rights issue at the bottom of the cycle and write-down a total of $30.0bn related to the transaction (note, there have been some write-backs). Rio Tinto chairman Paul Skinner resigned after the deal.

Notable quote

Indeed, Dick Evans, the former CEO of Alcan has been quoted as saying that buying Alcan was one of the ". . . worst decisions ever, the largest metals and mining transaction in the history of the world at the high point in the commodity cycle." (Wall Street Journal).

Chart 3: Rio Tinto's stock price

Source: Bloomberg

Cost/Impact to shareholders

A few months before the start of the financial crisis, Rio Tinto acquired Alcan for $38.1bn using debt. The company was left exposed to a highly leveraged balance sheet with a 63% net debt to total capital ratio up from 11.2% in 2006 and $8.1bn in short term loans alone. Consequently, Rio Tinto's new focus became strengthening its balance sheet losing out on cheap opportunities for investment in the down cycle and having to reduce capital expenditure by 37% in 2009.

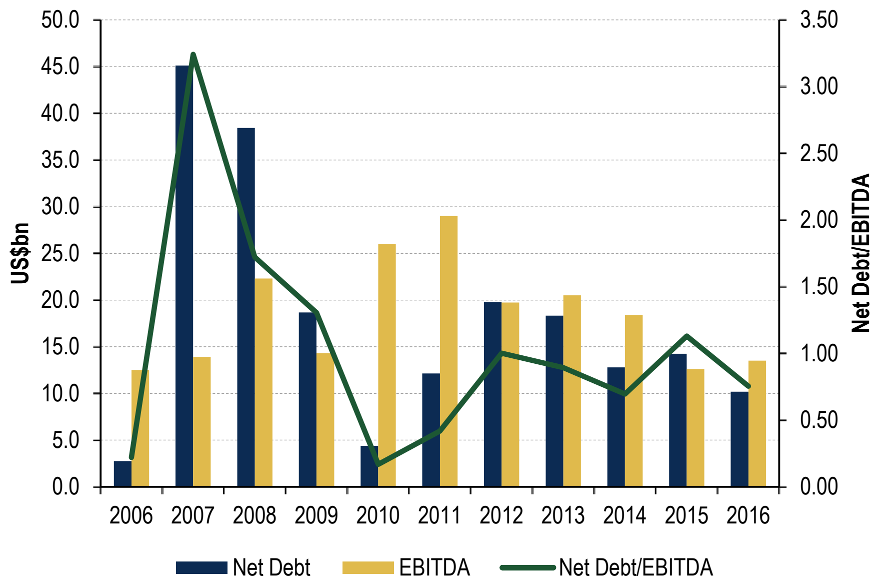
The debt was paid down through a series of divestments and stock issuance. Rio sold off multiple Alcan and Rio Tinto assets during a period of limited credit liquidity and low asset prices, with some sales, such as Alcan packaging, taking far longer to sell than initially expected and, arguably realizing lower valuations than anticipated due to cycle timing. Overall, Rio divested more than $12bn worth of assets.

However, due to the continuing economic weakness and lack of demand for their assets, divestment took far longer than the expected $15bn in the first year. As a result, Rio was forced to seek alternative ways to reduce its large short-term debt position. An initial proposed solution included a controversial sale of assets to Chinese metals company, Chinalco, and would have raised $19.5bn of convertible bonds to.

After investor pressure, the Chinalco deal was pulled and RIO undertook a $14.8bn rights issue. Another part of the financing solution was a proposed 50/50 joint venture with BHP in Pilbara iron ore with net proceeds to flow to Rio Tinto of $5.8bn. After the fact, this part of the transaction was cancelled on competition grounds but by then, events (the 2009 Chinese mega-stimulus) had overtaken the situation, commodity prices had recovered and the incremental capital was no longer required.

Chart 4: Net Debt and EBITDA for Rio Tinto

Net

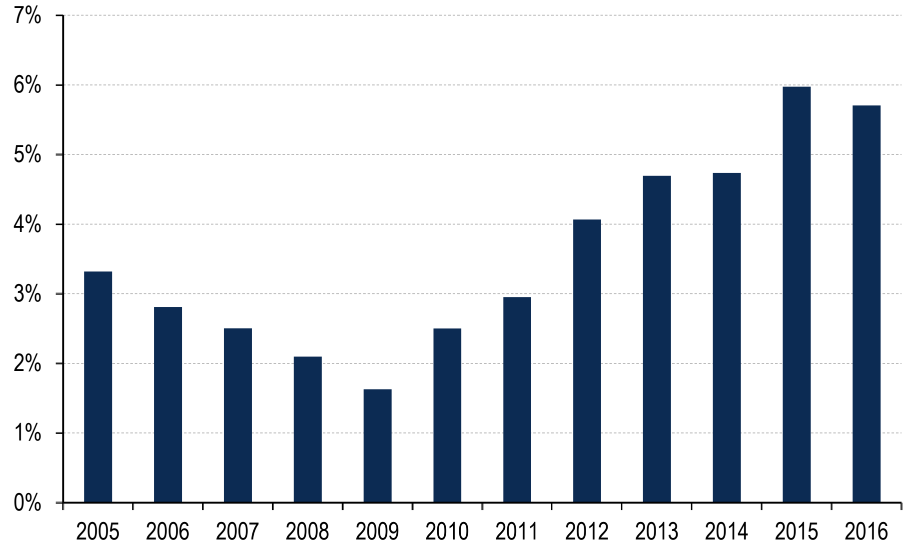


Source: Bank of America Merrill Lynch

Due to the large increase in debt and lower earnings, RIO's interest cover dropped from 77x to 22x. Moody's, a credit ratings agency, downgraded Rio Tinto stock twice in just over a year from AA3 to Baa1. S&P also downgraded the stock to BBB.

The group's announced plan to increase dividends by at least 20% in both 2008 and 2009 was subsequently cancelled. Dividends remained frozen for 2008 and actually decreased by 59.5% in 2009.

Chart 5: Rio Tinto's Dividend Yield

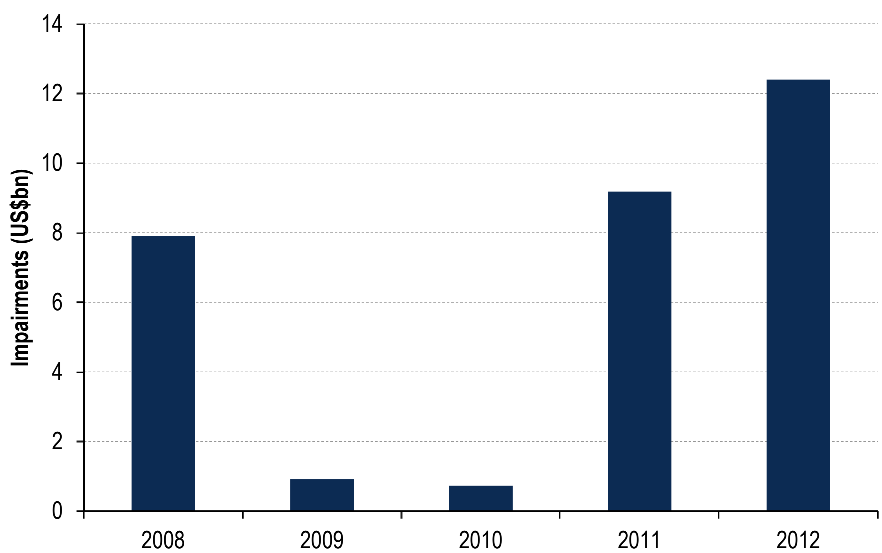


Source: Rio Tinto company reports, Bloomberg . Note: yield calculated based on average share price for the year.

The acquisition of Alcan at $101/share was a 65.5% premium on the closing value before Alcoa's bid, and a 32.8% premium on Alcoa's offer of $76.03/share. It resulted in $30.0bn of impairments by 2013, equivalent to 79% of the headline value of the Alcan transaction.

In our view, these impairments were mainly due to overestimated earnings potential from the Alcan assets based on 1) Persistent high aluminium prices reliant on 2) Continued large growth in Chinese demand which couldn't be met by local reduction and 3) some lower input costs. Ex-post, all these assumptions were proved to be incorrect.

Chart 6: Impairments of Rio Tinto's Aluminium group. Note: Rio Tinto TOTAL aluminium group*



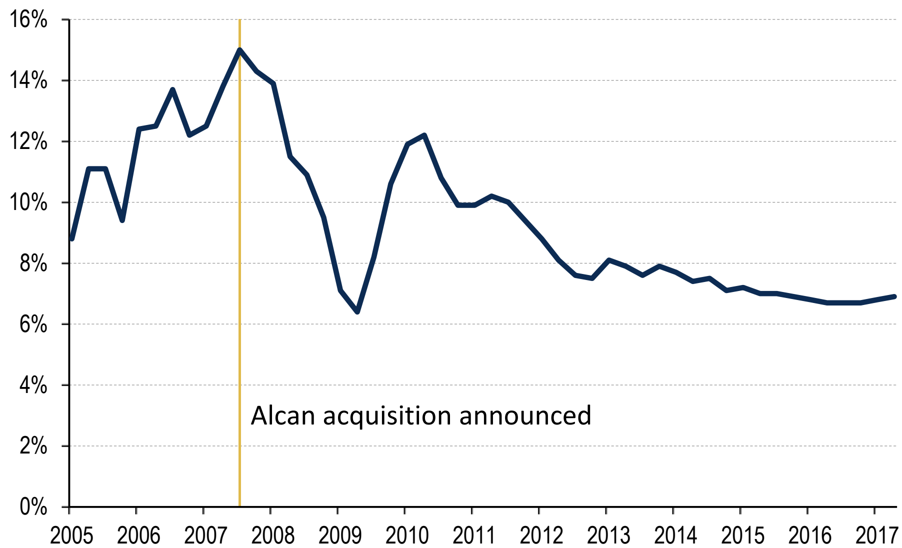
Source: Rio Tinto annual reports *Note: Rio Tinto TOTAL aluminium group impairments + Alcan other related businesses

As a result of this transaction, we saw major changes to Rio Tinto's management. Paul Skinner, the Chairman, widely seen as the architect of the transaction, did not have his term extended. Jim Leng, the replacement Chairman, left a month after joining over a "difference in opinion" on methods to reduce the debt load.

Contributing factors

With a rapidly growing global economy and increasing demand for the commodities, the time seemed ripe for enhancing growth positions. China's growth was 15% and growing exponentially, aluminium demand had experienced 35.6% growth in the past year, and over $75bn had been spent in mining M&A since the start of 2006. Investing in Alcan seemed like the perfect opportunity to benefit from synergies, bolster Rio Tinto's market position and ride the commodities boom. With hindsight, it is possible to see the various misgivings assumed at the time.

Chart 7: China's GDP growth



Source: Bloomberg

We think that a primary driver for the merger was Rio Tinto's bullish position on aluminium. Rio Tinto predicted long term aluminium prices to stay high due to exponential growth in demand in China and China's shortage of energy. In fact, Rio anticipated China's demand to grow at close to 15% annually over the next 5 years.

Rio also noted a potential further increase in demand from India. In total, Rio expected 7.7% annual global growth in aluminium demand until 2011. Little emphasis was placed on risks such as the large supply of cheap aluminium from China which was being mainly consumed by domestic demand in 2007. In reality, Rio Tinto invested in Alcan at the second highest peak in the aluminium price in 15 years. In the following year and a half aluminium prices dropped 62% and China's GDP growth rate had slowed to 7.1%.

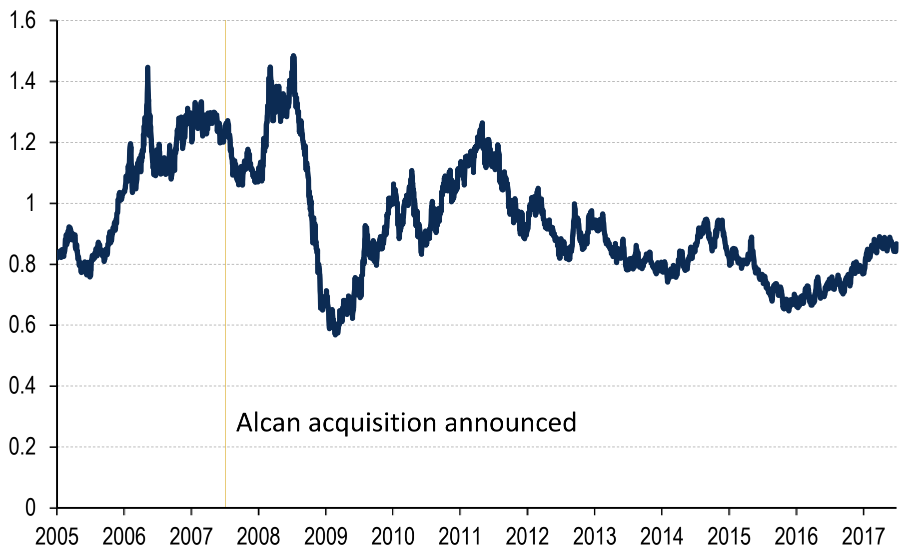
New paradigm alert: China (and the world) were short energy

With power costs being a key factor influencing competitiveness in the aluminium industry, we think that global energy markets were a key contributing factor to the decision to buy Alcan. Oil was on its way to US$150/bbl. Seaborne thermal coal was trading well through US$100/t. There was a view that China was short energy and would become shorter.

Alcan had a unique asset in its captive, hydroelectric power and low-cost hydro power contracts in Quebec. With high energy prices, the aluminium cost curve (supply) curve became steeper and the expectation was that the assets would earn more money, forever. Why was this wrong? Bottom line, China (and the world) were not short energy. High prices drove innovation and more supply. Shale gas & later shale oil, changed the dynamic in terms of energy. To ensure sufficient energy, Rio started to add other sources of power to complement its dependence on coal including Hydro and Wind. Chinese coal demand started to level off even as local supply continued to ramp resulting in materially lower coal prices and ultimately power prices.

China has also since demonstrated its ability to build low **capital-cost** aluminium and, with moves to change power industry regulation in China, delivered power costs came down. As such, rather than being the beginning of a new paradigm in aluminium prices, unfortunately, the transaction simply marked a local peak in aluminium prices.

Chart 8: Aluminium price ($lb)



Source: Bloomberg

Rio overestimated proceeds from divestments

Upon acquisition, Rio's ambitious plan was to divest $15bn of Rio and Alcan assets including Alcan packaging. To obtain their target profits, assuming this level of divestment was possible and an approximate WACC (required return) of 9%, Rio Tinto would have needed a long term price for aluminium of c. $1.35/lb. In reality, the average Aluminium price since the Alcan acquisition has been $0.91/lb. Ultimately, the financial crisis and subsequent low prices, have meant that the deleveraging plan could not be implemented and alternative capital raising solutions were found.

Part of Rio's strategy is to invest in large, high quality (Tier 1) assets which are easily expandable. However, the increasing scarcity of such mines resulted in increased competition and bidding wars between mining companies. Alcan was perceived as a highly desirable asset at the time for which Alcoa had already bid several times.

To ensure the acquisition of Alcan, Rio significantly overbid leading to the world's largest ever mining deal. The bid had a 65.5% premium over Alcan's closing price before Alcoa's bid of $61.03/share and a 32.8% premium on Alcoa's $28.7bn bid of $76.03/share. This "knock-out" bid later led to $30.0bn in write-downs.

Table 3: Bid comparison

Bidder	Rio Tinto	Alcoa
Offer (US$bn)	38.1	28.7
Offer ($/sh)	101.0	76.0
Premium on closing price	66%	25%
Initial costed synergies (US$bn)	0.6	1.0
Combined Revenue in 2006 (US$bn)	49.0	30.4
Combined EBITDA in 2006 (US$bn)	16.5	9.4

Table 3: Bid comparison

Bidder	Rio Tinto	Alcoa
Production Capacity of aluminium in 2006 (mtpa)	4.3	7.8
Production Capacity of alumina in 2006 (mtpa)	8.7	21.1

Source: Alcoa and Rio Tinto data

The market's rush to consolidate

In the economic climate of 2006 and 2007, these bidding wars were a part of a rush in the market to consolidate and indicated the appetite for growth through M&A. In the year preceding Rio's merger with Alcan, the mining industry oversaw large quantity of expensive M&A activity.

The press had speculated that some of the acquisitions were partially driven as pre-emptive responses to any possible takeovers by other competitors; though this was never confirmed by the company. Similarly, we think Rio Tinto's purchase might be viewed as a defensive move to prevent a hostile takeover bid from BHP Billiton, which did propose a bid on 8 Nov 2007.

Table 4: Mergers in the Mining Industry

Date	Acquirer	Target	Cost (US$bn)
Oct 2007	Rio Tinto	Alcan	38.1
May 2007	Norilsk	Lionore	5.3
Nov 2006	Freeport	Phelps Dodge	25.9
Aug 2006	CRVD	Inco	19.0
Aug 2006	Goldcorp	Glamis	8.2
May 2006	Xstrata	Falconbridge	18.8
Oct 2005	Barrick Gold	Placer Dome	10.0
Mar 2005	BHP Billiton	WMC Resources	7.3

Source: Companies' data

Finally, the acquisition provided large opportunities for synergies. Rio Tinto initially claimed $0.6bn in savings per year before taxes (Alcoa claimed $1bn) and cheaper power supply thanks to agreements with the local government resulting in more competitive costs.

Organizational impact on company

Both the Chairman Paul Skinner and CEO Tom Albanese who were integral to the Alcan acquisition ultimately left the company. Mr. Skinner did not have his term renewed at the end of 2009. Mr. Albanese later left Rio Tinto after write-downs associated with the Riversdale coal assets in Mozambique in early 2013 (see the next case!).

After the Alcan acquisition, Rio's debt load prevented it from acquiring additional large companies. As a result, there was a switch to buying smaller and medium sized acquisitions. Despite the large impact from Alcan on Rio Tinto, there did not seem to be much change to systems or approval processes after the sale (taking Riversdale, Mozambique as an example). The institutional scars, however, can still be felt. Rio Tinto's focus on strengthening its balance sheet remains integral to its strategy and it is deemed one of the more financially healthy companies in the mining industry today, paying higher dividends than most peers and with one of the strongest credit ratings.

Table 5: Big 7 Miners Current Credit Ratings

Company	Moody's	S&P
Rio Tinto	A3	A-
BHP Billiton	A3	A
Anglo American	Ba1	BB+
Glencore	Baa2	BBB
Freeport-McMoRan	B1	BB-
South32	Baa1	BBB+
Vale	Ba2	BBB-

Source: Moody's and S&P

Details of the transaction / Asset description

Alcan was a Canadian aluminium company with global assets specialising in bauxite, alumina and aluminium. It was the third largest and fourth largest producer in aluminium and alumina, respectively and provided packaging and other downstream services on a global scale.

Table 6: Alcan Summary Data 2006

Alcan	US$bn
Revenue	23.6
EBITDA	3.9
Net debt	5.8
Net debt/EBITDA	1.5x
Aluminium production (Mtpa)	3.4
Alumina production (Mtpa)	5.5

Source: Rio Tinto Alcan Bid Fact Sheet

The all-cash transaction of $38.1bn with an enterprise value of $44bn at $101/sh was financed by debt and Rio's cash. In total, the cost came to $38.7bn including fees.

Table 7: Alcan Acquisition Loan Structure

	Amount (US$bn)	Type	Length
Facility A	15	Term Loan	364 days
Facility B	10	Revolving Credit Facility	3 years
Facility C	5	Revolving Credit Facility	5 years
Facility D	10	Term Loan	5 years and 1 day

Source: Rio Tinto company report

The deal was structured in the form of a $40bn bullet loan of which $38bn was drawn. Facilities A, B and D were fully drawn and $2.86bn was drawn from facility C.

As part of the transaction, Rio set an agreement with the Government of Quebec to keep Rio Tinto Alcan's headquarters in Canada in exchange for access to cheaper hydro power. Rio also assumed Alcan's debt of $5.8bn.

The initial intentions for repaying the loans were through the long term capital markets and divestment of both Rio Tinto and Alcan assets amounting to $15bn in the first year.

Chronology

- 2006 - Alcoa offer two friendly bids
- 2007 May 07 - Alcoa announces hostile bid of $27 billion
- 2007 Jul 12 - Rio Tinto announce $38.1 billion bid, Alcoa withdraws its own bid
- 2007 Oct 23 - Alcan acquired by Rio Tinto
- 2007 Nov 08 - Hostile takeover bid announced by BHP Billiton for Rio Tinto
- 2007 Nov 15 - Merger fully completed (name change)
- 2008 Feb 01 - Rio Tinto announces Chinalco deal
- 2008 Jun 05 - Rio Tinto announces joint venture with BHP
- 2009 Jun 21 - Rights issue totalling $14.8bn
- 2009 Dec - Chairman Paul Skinner leaves Rio Tinto
- 2010 Oct 18 - Joint venture with BHP scrapped
- 2008 – 2011- Divestment in assets
- 2013 Jan 17 - CEO Tom Albanese steps down after the $14.4bn write-down

Market reaction at the time

What did we say

Just after the public announcement of Rio Tinto's acquisition, Merrill Lynch stated that the deal would be "significantly accretive to earnings" but had hesitations about any possible value creation for shareholders and the cancellation of the shares buy-back program. Merrill Lynch also found the deal less attractive with a -3% value dilution by assuming lower aluminium prices than Rio predicted. Nevertheless, the stock was rated a BUY, claiming Rio Tinto to be an "educate your kids" stocks which "should be core holdings in any long term portfolio". Merrill Lynch forecast the long term price for aluminium to grow +19%.

Merrill Lynch (as we then were) was restricted for much of 2008 on Rio Tinto due to the hostile takeover bid launched by BHP on Rio Tinto. When BHP withdrew its offer as the fallout from the financial crisis became apparent, Merrill Lynch resumed coverage with an "Underperform" rating citing concerns on the balance sheet.

What did the press say

At the time of Rio's bid, mining companies justified M&A by claims of a "super-cycle" in commodities predicting China and India would copy Japan's rapid industrialisation in the 1960's. However, analysts predominantly found the price for Alcan to be expensive i.e. that Rio had overpaid. In the press, there was a lot of speculation about more large mergers and a push to acquire companies to prevent companies being acquired themselves (the so-called "Pac-man" defence). Further comments noted the increasing scarcity of long life mines also contributing to an increased number of deals. (Financial Times)

Case study #2: Rio Tinto Riversdale

In brief

Rio Tinto bought Riversdale Mining Limited for $4.2bn to expand growth options in metallurgical (coking) coal. This was based on assumptions on the quality and quantity of coal at the Moatize basin in Mozambique, infrastructure development opportunities, and high coal prices due to Chinese demand. In reality, the quality of the resource was overstated and Rio could not secure necessary agreements with the government to use the river for transportation and so only had limited rail access. The acquisition was written down by $3.8bn ($3.3bn pre-tax) and sold off for $0.05bn. CEO, Tom Albanese and Chief Executive of Iron Energy, Doug Ritchie left the company after the impairment was announced.

Notable Quote

Former Rio Tinto CEO, Sam Walsh, commented on the acquisitions of Riversdale Mining Limited and Alcan: 'We had been spending as if we had an open checkbook. Quite, frankly, we were living beyond our means.' (Harvard Business Review)

Cost/Impact to Shareholders

Due to the difficulties in developing infrastructure and overestimation of recoverable resources, Rio Tinto wrote down $3.8bn ($3.3bn post-tax) in the next two years, amounting to over 90% of the headline value of the original transaction. Following a continuing decline in coal prices and little progression on infrastructure issues, Rio sold Riversdale's assets, excluding the Zululand Anthracite Colliery, for $0.05bn in 2014 to International Coal Ventures Private Limited (ICVL). ICVL is a Special Purpose Vehicle set up by the Ministry of Steel for the Government of India to increase foreign assets of coal.

Table 8: Rio Tinto Coal Mozambique Financial Data

	2012	2013	2014
EBITDA (US$m)	-96	-114	-64
Capital Expenditure (US$m)	109	32	2
Operating assets (US$m)	556	119	7

Source: Rio Tinto company reports

When the impairment charges for Riversdale and Alcan were announced, CEO Tom Albanese left the company. In addition, Chief Executive of Rio Tinto Energy, Doug Ritchie, who championed the acquisition, was also dismissed.

The US Securities and Exchange Commission started an investigation into Rio Tinto for the write-down associated with Riversdale Limited acquisition in 2013. The investigation is ongoing.

Chart 9: Rio Tinto's share price in relation to completion of Riversdale's acquisition and subsequent $3.3bn write-down

Source: Bloomberg

Contributing factors

We think that Rio purchased Riversdale on the basis of four main assumptions:

1) The infrastructure challenged could be solved,

2) The Moatize basin was "one of the best undeveloped coking coal resources in the world",

3) Chinese consumption of coking coal would continue to climb, and

4) China would be unable to supply its needs from domestic sources.

All four assumptions seemed reasonable at the time, but subsequently proved invalid.

Rio overestimates potential for infrastructure development

The key flaw in Rio Tinto's decision making was its assumption on infrastructure. Mozambique is located close to the shipping lanes for China, India and Brazil, which would have allowed Rio to have competitive freight rates. Coal is a bulk commodity = low value / unit volume. As such, efficient bulk transport, typically rail or boat, are key.

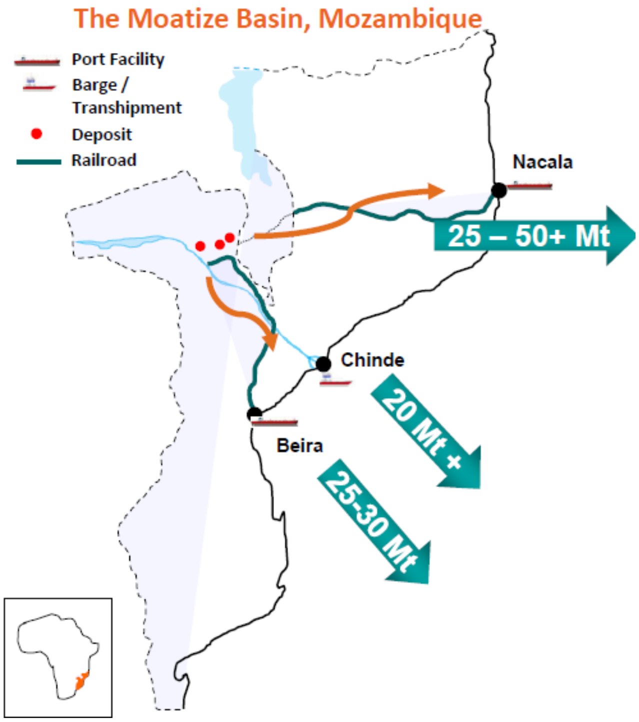
The Moatize Basin is located 600km away from the coast with very limited existing infrastructure. The only method of transportation of coal at the time of purchase was the single passenger carrying rail line to Beira. This rail line could only transport a maximum of 10Mtpa in good weather to Beira, which also had limited capacity as a commodities exporting port. As a result, this was not suitable / sufficient for Rio's long term transportation aims of moving over 26Mtpa.

Rio Tinto considered that there were two other options available to resolve the transportation issue. Firstly, a barge along the Zambezi River to Chinde and secondly, building a 900km train track to Nacala. Neither of these options proved to be successful. Mozambique's government did not permit the use of barges to transport coal, citing environmental reasons. The infrastructure project to Nacala was deemed to be economically unviable once the quantity and quality of coal had been reassessed. As a result, transportation acted as the limiting factor in producing coal.

Rio Tinto had planned to ramp up total production to 2.4Mtpa by the end of 2012. In reality, the Benga project produced less than 0.2Mt in 2012 and 0.6Mt in 2013 and the Zambeze project never went into production.

Mozambique was ranked 139th of 183 in the World Bank's ease of doing business in 2012 and is known for red tape, government interference and civil unrest (PWC report). Civil war destroyed much of Mozambique's infrastructure and in 2014, Renamo an ex-rebel group, now the main opposition party, threatened to hold up the only rail line to the coalfields. These political / security risks may also not have been properly assessed prior to the acquisition.

Exhibit 1: Rio Tinto's proposed transportation methods for coal exports



Source: Rio Tinto data

The quantity and quality of coal in the Moatize Basin was overstated

At the time of acquisition, Rio Tinto predicted the Benga project, a Riversdale asset, would produce 5.3Mtpa run of mine by 2013 rising to 26Mtpa in the long term with further expansion. In 2011, Benga was expected to contain 613Mt of total resources and the Zambeze project was believed to hold 1,984Mt and to produce 42Mtpa by 2019.

Unfortunately, the region's high variability in coal quality was not fully understood. The quantity of coal, in particular metallurgical coal, was also overestimated. In the following year, the prediction for total coal resources was reduced by over 47% for the Benga project alone. This meant that the project was much less compelling than initially envisaged.

The prevailing opinion at the time was that the Moatize basin was "one of the best undeveloped coking coal resources in the world" (Rio Tinto). Vale was already operating in the region and there was speculation that Vale and Tata Steel, among others, were interested in the Riversdale asset as well; though neither company confirmed this.

In order to secure the Riversdale, Rio Tinto quickly offered bids, relaxed conditions and extended deadlines. In rushing to acquire, a lack of due diligence may potentially have contributed to investing in an asset that had potentially overstated values for the quantity and quality of coal available. In our view, this due diligence is especially vital when considering acquisitions of greenfield projects from junior mining companies where there could be a risk of overstatement of resource quality / quantity.

Sam Walsh, who became CEO after the departure of Mr. Albanese commented that he "needed to reinforce the system of checks and balances" for investments. During these decision processes for new acquisitions "vital managers" with sector expertise had been "passed over". (Business Harvard Review)

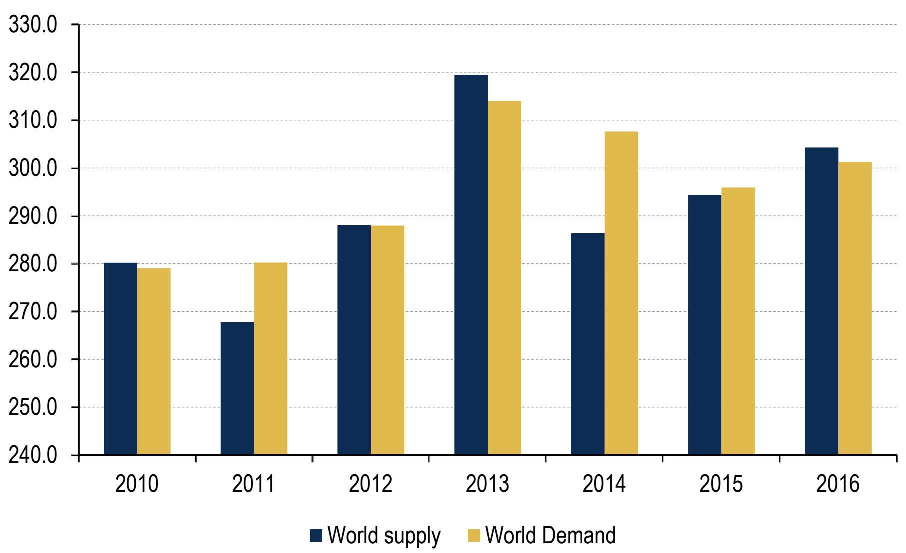
Incorrect assumptions on coal and Chinese demand

In investor market material from 2011, Rio Tinto predicted that China's demand for coal would continue to grow at 3.4% CAGR until 2020. Based on this assumption, they planned for 9.8% CAGR in seaborne coking coal production. In addition, Rio expected supply of energy to struggle to meet demand, which would cause prices to "remain robust" and stay at already high levels.

Instead, China set restrictions on the use of coal in various regions throughout the country and increased investments in renewable energy. As a result, in 2016 China's demand for coal had decreased by 35% since its peak in 2013. This equates to a drop in demand of over 8% for coking coal globally. This decrease in demand contributed to the fall in coal prices. However, as companies had expected continued growth in China's demand, they had increased production. The combination resulted in an oversupply of coal and a further reduction in price.

Another key assumption that prevailed in the industry at the time of the transaction was that 1) China's steel production / demand would continue to ramp and that 2) domestic coking coal supply would be unable to satisfy the domestic requirements. Again, both of these assumptions proved to be incorrect. Chinese steel production and demand have somewhat plateaued and China's domestic producers of coking coal have proved able to satisfy most of China's domestic demand.

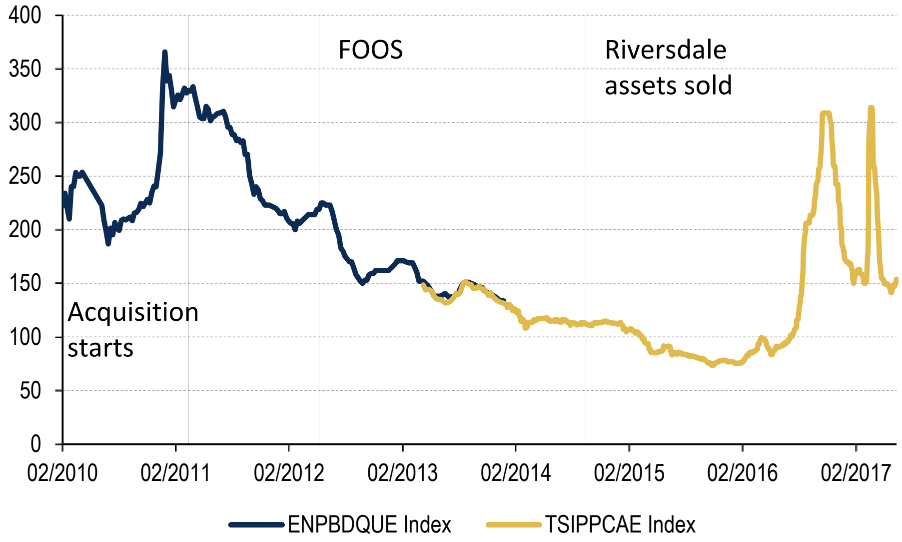
Chart 10: World supply and demand for seaborne coking coal (Mt)



Source: Bank of America Merrill Lynch

Rio's acquisition of Riversdale occurred at a peak in the cycle with coal prices at $330/t, c. 54% above today's price. Furthermore, the price for coking coal fell 34% between the start of Rio's staged acquisition and first ore on ship (FOOS) and continued to fall to $153/t by the time of divestment.

Chart 11: Price of Coking Coal ($/tn)



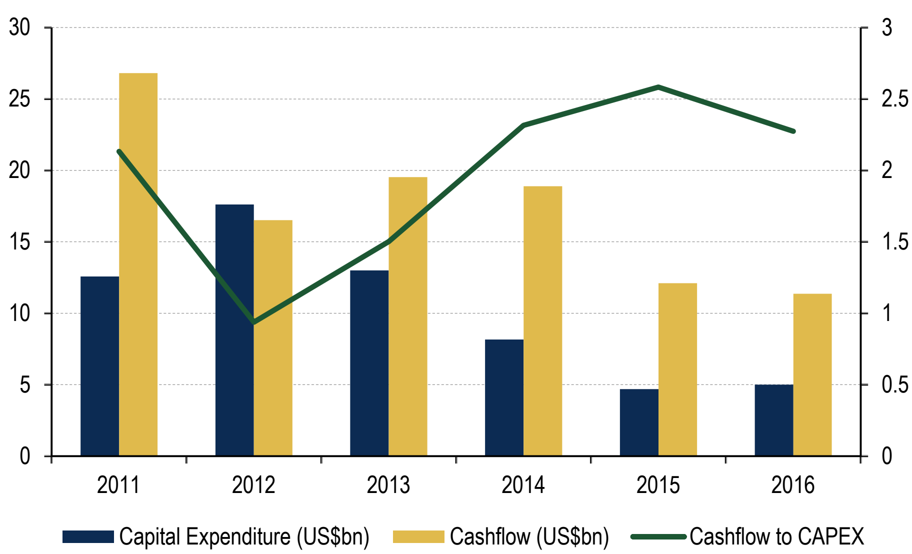
Source: Bloomberg Note: Index for metallurgic coal changes in the period shown.

Organisational Impact

CEO Tom Albanese and Chief Executive of Rio Tinto Energy Doug Ritchie stepped down the same day as public disclosure of the impairment charges. The new CEO Sam Walsh focused on improving investment decisions, maximising shareholder value, and efficiency. He stated that he planned to make Rio Tinto "boring again".

As a result, Mr. Walsh significantly reduced capital expenditure, operating, exploration and development costs to transform Rio Tinto into a more productive, cost effective company and only allowed investments in projects with a marginal rate of return of over 15%. In addition, Rio cut costs by over $5bn.

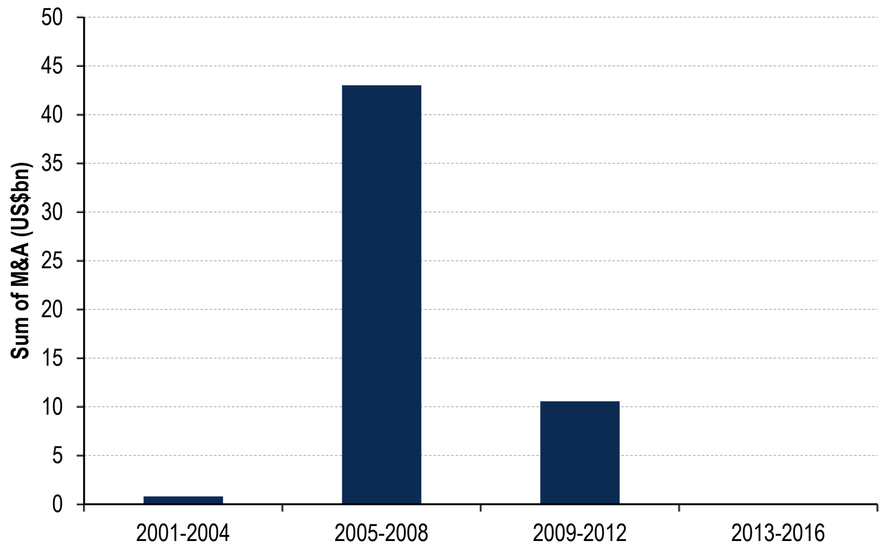
Chart 12: Rio Tinto's Capital Expenditure and Cash flow



Source: Rio Tinto's company reports

Rio Tinto continued to focus on strengthening the balance sheet after the impairments which became a key point following the acquisition of Alcan and its subsequent write-downs. As a part of this aim, Rio Tinto has refrained from any large-scale M&A in the past 4 years and has continued its divestment program.

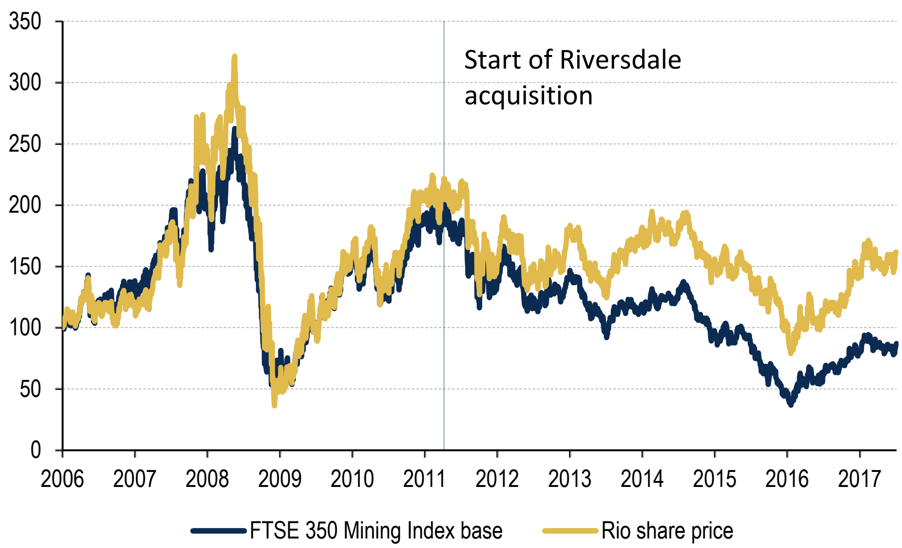
Chart 13: Value of Rio Tinto's acquisitions



Source: Bank of America Merrill Lynch

Despite a focus on more accountability for decision making and greater discipline, Rio Tinto has faced management issues with an investigation into bribery related to two of its directors in the subsequent years.

Chart 14: Rio Tinto's share price relative to the FTSE 350 Mining Index base 100



Source: Bloomberg

Details of the transaction/ Asset description

Riversdale Limited was a junior mining company specialising in exploration and coal mining. It had licences for large parts of Tete province in the Moatize basin in Mozambique. The main assets of Riversdale were the Benga coal project, which was a 65/35 joint venture with Tata Steel Limited, the Zambeze coal project and the Zululand Anthracite Colliery (ZAC).

Rio Tinto acquired Riversdale for $4.2bn in stages. Initially, Rio paid $2.2bn in cash for 52.6% share on 8 April 2011 and proceeded to acquire the remaining shares up until 1 August 2011 for $2.0bn. Goodwill was calculated to be $0.5bn upon acquisition.

After extending offers four times due to slow uptake of shareholders, the final cash value equated to $26.17/sh.

Chronology

- 2010 Dec 06 - Rio makes its first bid for Riversdale Mining Limited
- 2010-2011 - Cash offers for Riversdale Mining Limited extended 4 times
- 2011 Apr 08 - Staged acquisition begins
- 2011 Jul 07 - Riversdale delisted
- 2011 Aug 01 - Acquisition completed and Riversdale Mining Limited renamed Rio Tinto Coal Mozambique (RTCM)
- 2012 Feb - Benga Project commissioned
- 2012 Jun - FOOS
- 2013 Jan 17 - $14.4bn impairment charge, CEO Tom Albanese steps down
- 2013 - Impairment charge for RTCM of $0.5m
- 2014 Jul 30 - Riversdale assets sold for $50m to ICVL
- 2014 Oct 08 - Sale completed
- 2013 - SEC opens an investigation into Riversdale write-down – still ongoing!

Market Reaction at the time

What did we say?

Merrill Lynch found the acquisition broadly positive with only 2% NPV dilution in 2011. These comments were based on the data supplied by Rio Tinto which included overestimated quality and quantity of resources. Our analysis also took as given that the company had a low capital intensity infrastructure solution.

What did the press say?

The assets were viewed as highly attractive, although, again, this was based on the assumption of good quality and high quantities of coal in the basin. Initially, there were expectations of rival bids from other mining companies, such as ArcelorMittal and Vale, which had already invested in the Moatize basin. (The Telegraph)

Case study #3: Anglo American Minas Rio

In brief

In 2007 Anglo America acquired the Greenfield iron ore project, Minas Rio in Brazil for $6.7bn. The complexities in obtaining licences, permits, land access and various other issues, (including caves!) resulted in increased construction costs for the project, which exceeded the original budget by $4.9bn (142%) and the start of production being delayed by over 4 years. The project has also had $11.3bn in write-downs. Further issues, such as droughts and licencing requirements have continued to hamper the project in ramping up to full production. Shareholders were dissatisfied with Anglo's share price performance with the Minas Rio project seen as a key factor. CEO Cynthia Carroll departed the company in April 2013.

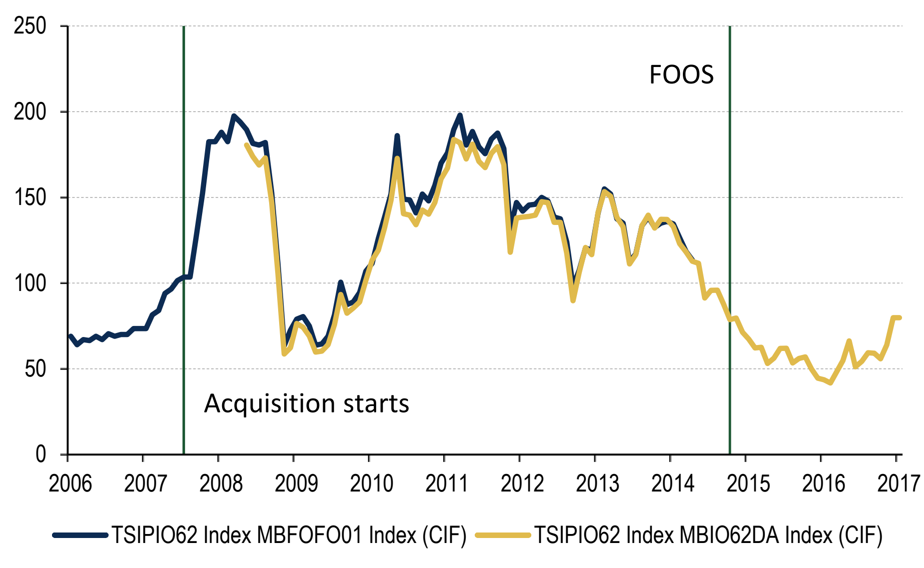
Notable Quote

CEO, Mark Cutifani has stated that: "The mining industry and discipline are not words that usually go together." Indeed, "The mining sector has over many years tried to take on things too big for their balance sheets, we certainly wouldn't do that. We've learnt a lot of lessons the hard way." (Telegraph)

Cost/Impact to Shareholders

Whilst Anglo American's prediction of short and medium term robustness of the iron ore price was relatively accurate, (excluding the financial crisis period), Anglo's 7 year wait to start producing iron ore meant that it missed out on the boom. As a result, Anglo's iron ore from Minas Rio came into the market when it was already oversupplied by competitors who had managed to increase their own production quicker. Therefore, the price of iron ore was c. 25% lower than when the company first acquired shares in the project.

Chart 15: Anglo American misses out on the iron ore boom



Source: Bloomberg Note: The index for iron ore price was changed during the period shown.

As part of the acquisition, Anglo also acquired the Amapá iron ore project. However, due to operational difficulties, the mine only produced 41.5% of initially designed capacity in 2009. That same year, $1.7bn ($1.5bn post-tax) was written down from the Amapá project. In addition, Anglo has written down $11.3bn ($10.4bn post-tax) for the Minas Rio project due to increased capital expenditure costs and the fall in iron ore price.

Table 9: Minas Rio impairments

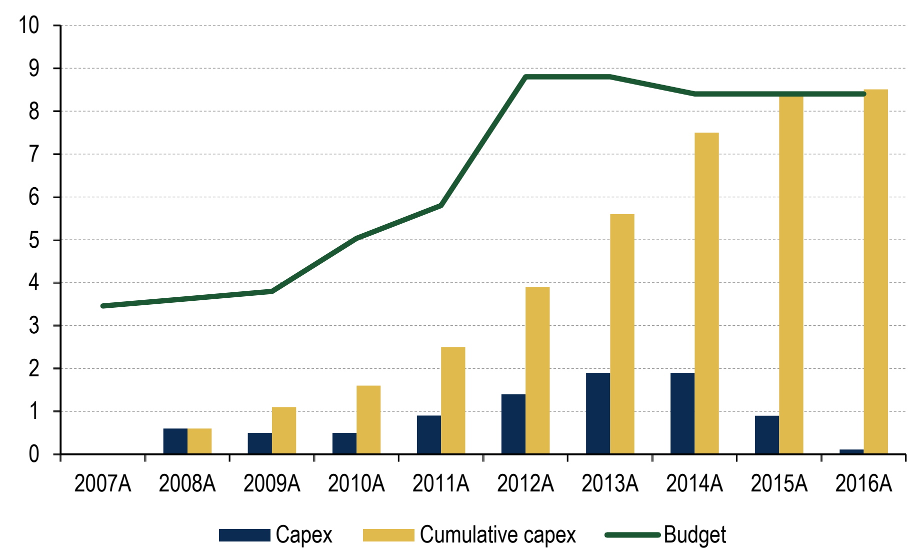
Year	Pre-tax write-downs (US$bn)	Post-tax write-downs (US$bn)
2012	5.0	4.0
2013	0.0	0.0
2014	3.8	3.5
2015	2.5	2.9
Total	11.3	10.4

Source: Anglo American company data

The project suffered from extensive delays. Production was expected to start in 2010. Instead, construction only began in 2011. As a result, the first ore on ship (FOOS) was on 25th October 2014. Furthermore, droughts and additional licencing requirements have meant that the ramp up to design capacity of 26.5Mtpa has yet to be completed. Anglo American hopes to produce at full capacity by the end of 2018. Overall, the various problems and delays resulted in capital expenditure for the project ballooning to $8.4bn, 2.4x larger than the initial estimate of $3.5bn. This project as well as other high growth projects meant that Anglo American continued to invest in capital expenditure, whilst some other mining companies reduced their costs after the financial crisis.

The picture below doesn't really tell the whole story, in our view, as it doesn't include the c. $7 bn in acquisition costs. As such, we consider total sunk capital at Minas to be >US$15 bn. Our NPV estimate is c. $3-4 bn. Zowie!

Chart 16: Minas Rio budget vs capex (US$bn)



Source: Anglo American investor presentations and annual reports

At the start of the project, Anglo American also considered expanding the project to 80Mtpa to obtain its target of producing 150Mtpa of iron ore for 2017. This expansion has been deferred due to 1) market conditions, 2) project execution difficulties, 3) permitting difficulties, and 4) balance sheet constraints.

Table 10: Minas Rio mining

Comparison	Expectations	Realisation
Cost of Phase 1	3.5	8.4
Output by 2016 (Mtpa)	25.6	16.1
FOOS	2010	H2 2014
Quantity of resources (bn tonnes)	1.2	5.8

Source: Anglo American company data

Shareholders expressed their dissatisfaction, in part due to the failures of the Minas Rio project. CEO Cynthia Carroll resigned thereafter.

Contributing factors

In 2007, Anglo American decided to expand into the seaborne iron ore market. They chose to achieve this by acquiring the greenfield project, Minas Rio in Brazil, which contained 5.8bn tonnes of resources able to produce high quality products with c. 67% iron ore. The asset had a projected life span of 45 years, expansion potential, and was expected to be in the lower quartile of cost curves and consisted of iron ore which had growing demand and increasing prices.

Anglo underestimates the complexity of the greenfield project

The main misstep that Anglo took in its decision to acquire the project, in our view, was to underestimate the complexity of the very large-scale greenfield project in a relatively new geography. (The company did have nickel mines in Brazil but these were much smaller, more local operations without the same infrastructure challenges as Minas Rio). In particular, the magnitude of licence and permit requirements and the difficulties in ownership negotiations for land access was miscalculated. This resulted in escalating costs and delays which meant that Anglo missed out on high iron ore prices.

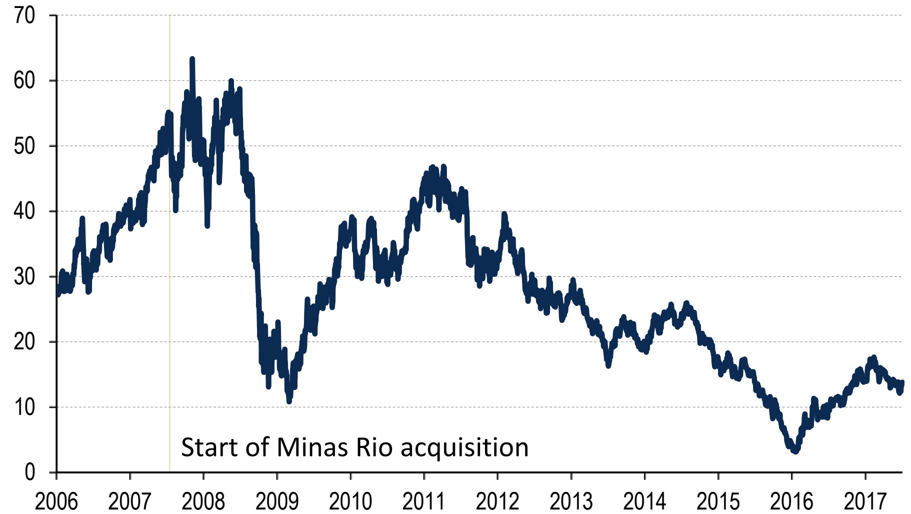
At the start of the project, the initial problems for the delay were: 1) the extensive environmental licences and permits that had to be obtained from the Brazilian government, 2) agreement issues with groups of landowners for building the pipeline, transmission line and access roads to the port across 33 municipalities in 2 states, and 3) port of Açu rights issues. All these issues were eventually resolved, but took far longer than expected. In fact, it took nearly 4 years until the end of 2011 to obtain 90% of the agreements with landowners. These issues led to extensive delays, so that the first ore on ship in October 2014 was over 4 years after initially planned.

As well as having to obtain over 300 licences, there were also unforeseen issues with the project. These included 4 caves at the beneficiation site and 3 injunctions, which were placed on the project in 2012. These injunctions halted construction for various parts of the project. They were related to the transmission line, the caves containing threatened species near the beneficiation plant, and land access for the pipeline.

Issues continue to hamper the project

Once, the project had started producing iron ore in late 2014, Anglo expected to ramp up production to full capacity of 26.5Mtpa by 2016. Unfortunately, Brazil suffered from droughts, which significantly reduced the pace of ramp-up (17-34% lower than expectations). Anglo also needed to obtain further licensing to get to design capacity. This has meant that the ramp up to full design capacity has (still!) not yet been achieved. Anglo American hopes to complete the ramp up process by the end of 2018. In spite of various discussions over the years of executing the project, the company has not to reduce its stake in the Minas Rio project. If taken early enough, this decision might have been a way to reduce risks / financial exposure but still maintain leverage to the high quality of the asset.

Chart 17: Anglo American Share price (US$)



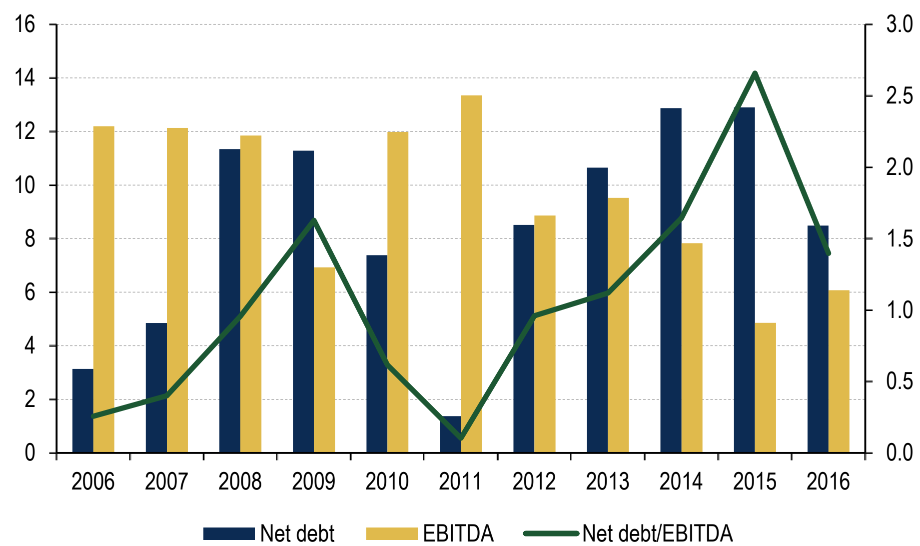
Source: Bloomberg

Organisational Impact

In 2010, Anglo American implemented a "corporate reorganisation" to improve its method of capital approval for new projects. This involved a "single, integrated Group project management system" with increased focus on capital investment. The Minas Rio project was reviewed in 2012 to consider risks and budgets as part of this new approach.

Despite policy changes to provide more responsible capital investments, Anglo American was unprepared for the subsequent fall in commodity prices and its net debt rose to 2.66x EBITDA in 2015. As a result, Anglo had to "pause" (cancel) its dividend in 2016 and rolled out a simplification plan to more than halve its number of mines and employees. We note that year-end net debt in 2015 was $12.9bn, less than the cash outflow associated with the Minas Rio acquisition and project build. Put another way, the Minas Rio acquisition nearly bankrupted Anglo.

Chart 18:Anglo American's Net Debt to EBITDA (US$bn)



Source: Anglo American annual reports

In 2013, CEO, Cynthia Carroll resigned following shareholder dissatisfaction. This coincided with the fall in profits due to falling commodity prices, strikes in South Africa and increasing costs.

However, the Minas Rio mining project was a source of friction with the shareholders and several press reports cited it as her biggest mistake, which may have hastened her departure.

Details of transaction/ Asset description

Minas Rio was a greenfield iron ore mining project based in Brazil, Minas Gerais. The purchase also involved Amapá, which was bought for $361.12/sh in 2008. The total resources at the time of purchase were estimated by Anglo to be 1.2bn tonnes to produce high grade pellet feed of 67% iron ore concentrate, but were later found to be closer to 5.8bn tonnes, a 381% increase.

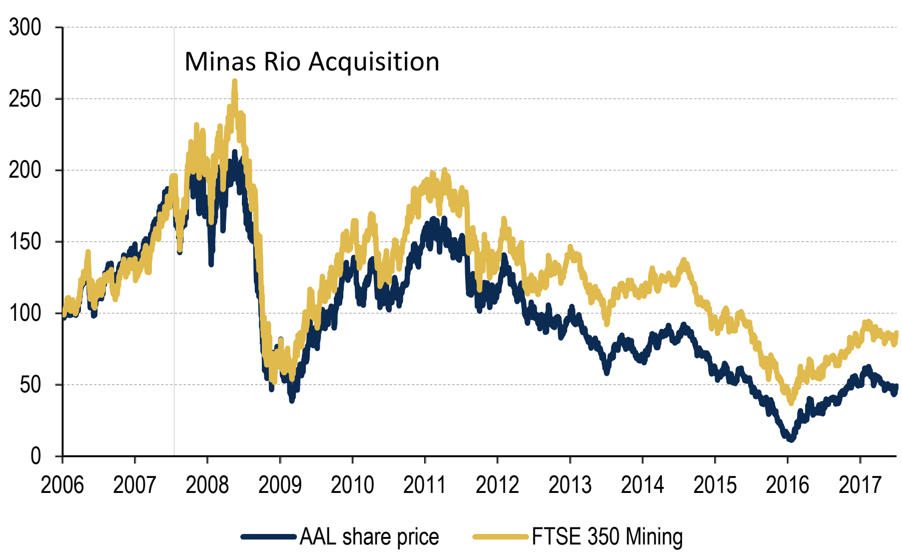
The purchase consisted of a three stage investment.

1. On 18th July 2007, Anglo purchased 63% share in Anglo Ferrous Brazil SA, which consisted of 49% of companies MMX Minas-Rio Mineraçáo SA and LLX Minas-Rio Logística SA (owner of the port of Açu to which the iron pellet feed is transported for export) for $1.2bn. This consisted of a 30% interest in project companies and 19% subscription of shares. [As a tasty aside, the promotor/seller of MMX was Mr. Eike Batista, Brazilian and a one-time billionaire. Mr. Batista has since declared bankruptcy and is being prosecuted for bribery & corruption.]

2. On 5th August 2008, Anglo paid $3.5bn to obtain a controlling interest. In addition, it paid $2bn to obtain minority interests, building up to a 99.4% interest in Minas Rio and a 69.2% interest in Amapá.

3. Finally by 31st December 2009, Anglo American acquired for $49m the remaining minority interests in the Minas Rio project, resulting in interests of 100% in Minas Rio, 49% in LLX Minas Rio (port), and 70% in Amapá.

Chart 19: Anglo American Share price and FTSE 350 Mining Index, base 100 relative to the start of Minas Rio's acquisition



Source: Bloomberg

Chronology

- 2007 Jul 18 - 49% of Minas Rio project bought
- 2008 Aug 05 - Acquires controlling stake of Minas Rio
- 2010 Feb - Amapá system written down by $1.5bn, capex increased to $3.8bn.
- 2010 - Implement reorganisation to improve capital improvement for new projects
- 2011 Mar - Construction starts 4 years late!
- 2011 - Caves are found at the beneficiation plant's site
- 2011 Dec - 90% of land approvals
- 2012 - 3 injunctions placed on project
- 2012 Jul - Start date further delayed to H2 2014 from H2 2013
- 2012 - Capex extended again to $8.8bn, $5.0bn impairment
- 2013 Apr - CEO Cynthia Carroll leaves the company
- 2014 Oct 25 - First ore on ship (FOOS)
- 2015 Feb - Write-down of Minas Rio
- 2016 - Major group restructuring planned to improve balance sheet

Market Reaction at the time

What did we say

Initially, with high prevailing iron ore prices, Merrill Lynch calculated a $5.9bn NPV, resulting in a 7% discount for the acquisition and was positive on iron ore prices medium term. As a result, the acquisition was viewed favourably.

However, with continuing delays and extension of deadlines and budgets, Merrill Lynch saw scope for Anglo American to sell a stake in the project to de-risk. In 2012, BofAML called this a "poor investment", estimating the project to have cost Anglo American up to GBp700/sh in shareholder value.

What did the press say

The acquisition was generally viewed as a positive event. Analysts differed in their opinions. Some stated that the iron ore price was close to its upper limit and others expected 25-50% further increases and a shortage in the supply of iron ore as the demand for steel continued to grow.

This was claimed to be due to a lack of availability of construction resources in both Australia and Brazil meaning that other competitors were struggling to increase production of iron ore and meet the demand coming predominantly from China. (The Financial Times)

Case study #4: BHP shale assets

In brief

In 2011, BHP Billiton bought Petrohawk and Chesapeake Energy Corporation's US Shale assets for $19.9bn. The acquisitions were based on assumptions of 1) robustness of high gas and oil prices and 2) an increase in demand for shale gas given technology breakthroughs in this arena. As gas and oil prices have fallen, BHP's onshore US assets were written down by an aggregate of $13.1bn. CEO, Marius Kloppers, stepped down earlier than expected following a fall in profits, due, in part, to the impairments of shale assets.

Notable Quote

"In terms of shale, if you had to turn the clock back, and if you knew what we knew today, you wouldn't do it." BHP Billiton's outgoing Chairman, Jacques Nasser reflected: "The timing was way off." (Bloomberg)

Cost/Impact to Shareholders

In February 2011, BHP bought Chesapeake Energy's Fayetteville shale assets for $4.8bn. Six months later BHP acquired Petrohawk Energy for $15.1bn at $38.75/sh with a 65% premium on the closing price. The assets were purchased at a time of high oil prices ($100/bbl) and explosive expansion of the shale industry, when the average price for shale assets was rapidly increasing, averaging <$10k/acre in 2010 to upwards of $20k/acre the following year.

Over the next year, the US natural gas price fell $2.5/Mcf (54%) in 10 months, forcing BHP to write down $2.8bn of Chesapeake assets and focus on shale liquids. Geological difficulties, the unprofitability of the assets at lower prices, and a 69% fall in oil prices led to further impairments. In total, BHP wrote down $13.1bn ($8.8bn post-tax) for onshore US shale assets.

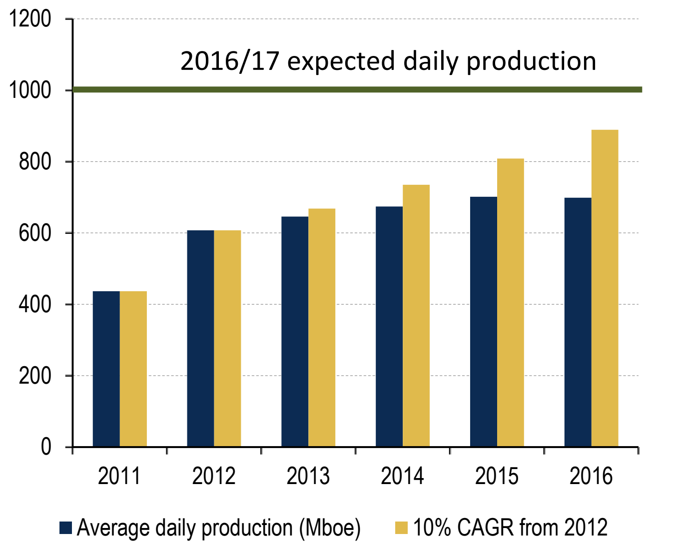
Table 11: BHP Billiton's US Onshore Impairments

Year	2012	2013	2014	2015	2016	Total
Pre-tax (US$bn)	2.8	0.3	0.0	2.8	7.2	13.1
Post-tax (US$bn)	1.8	0.2	0.0	2.0	4.9	8.8

Source: BHP Billiton's annual reports Note: FY: June-June

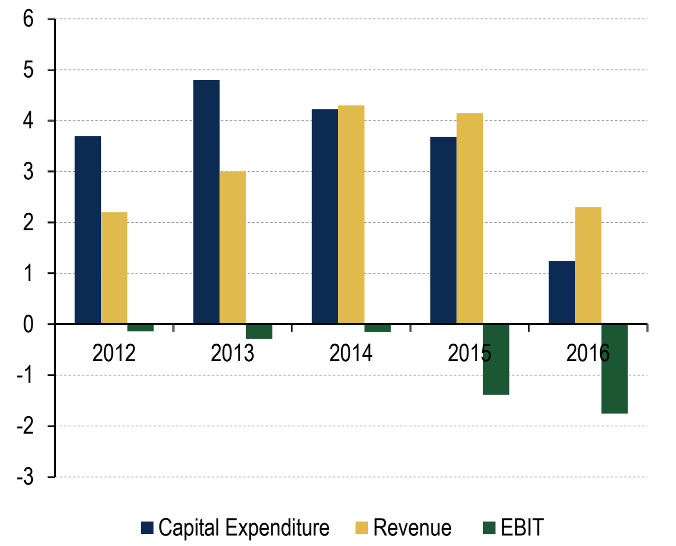
In the years after the acquisition, BHP spent over $17.6bn on capex on US onshore assets. Due to the high levels of capex and low oil and gas prices, BHP's onshore assets are yet to contribute positive EBIT continuing to fall to -$1.8bn in 2016. BHP expected 10% CAGR to achieve 1000 Mboe/day within 5 years. In reality, BHP Petroleum's production was only c. 700 Mboe/day in 2016.

Chart 20: BHP Petroleum's average daily production (Mboe)



Source: BHP Billiton's annual reports Note: FY: June-June

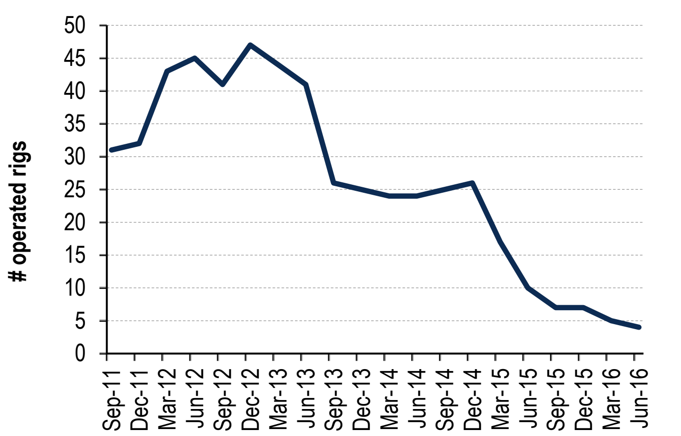
Chart 21: BHP's US Onshore asset's data (US$bn)



Source: BHP Billiton's annual reports Note: FY: June-June

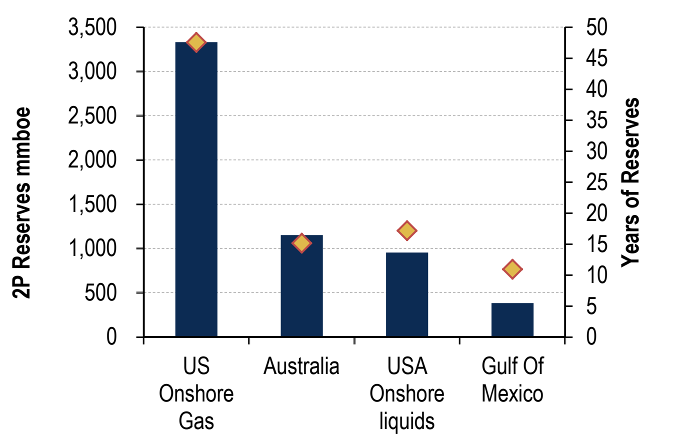
As a result of the fall in prices, BHP reduced production to preserve the life (option value!) of the assets and the number of drills in operation at year end reduced 90% from 40 to 4 in 4 years. In 2016, BHP stopped spending capex at Haynesville and Fayetteville altogether as prices fell below $40/bbl, making extraction unprofitable.

Chart 22: BHP initially invested significantly in US Shale post acquisition, but then paired back capex materially



Source: BofAML research

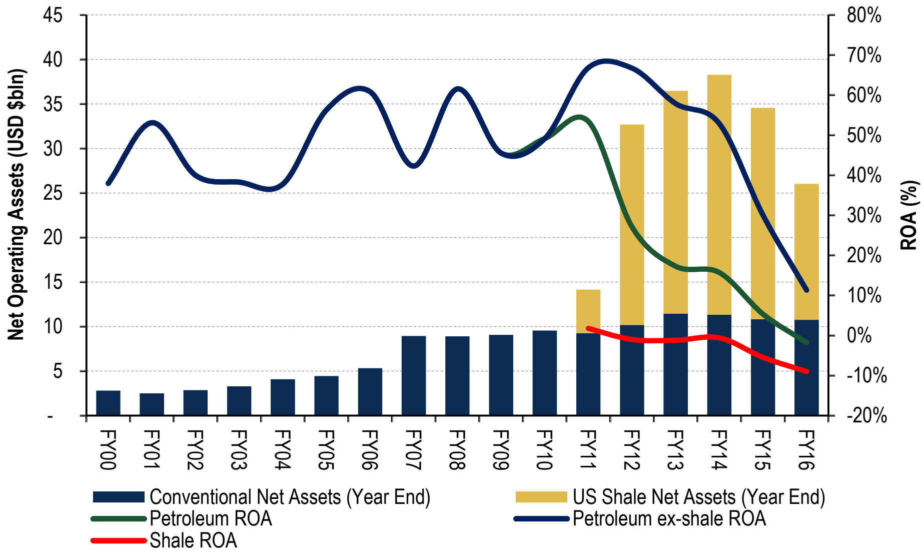
Chart 23: Shale accounts for the majority of BHP's 2P reserves



Source: BofAML Research

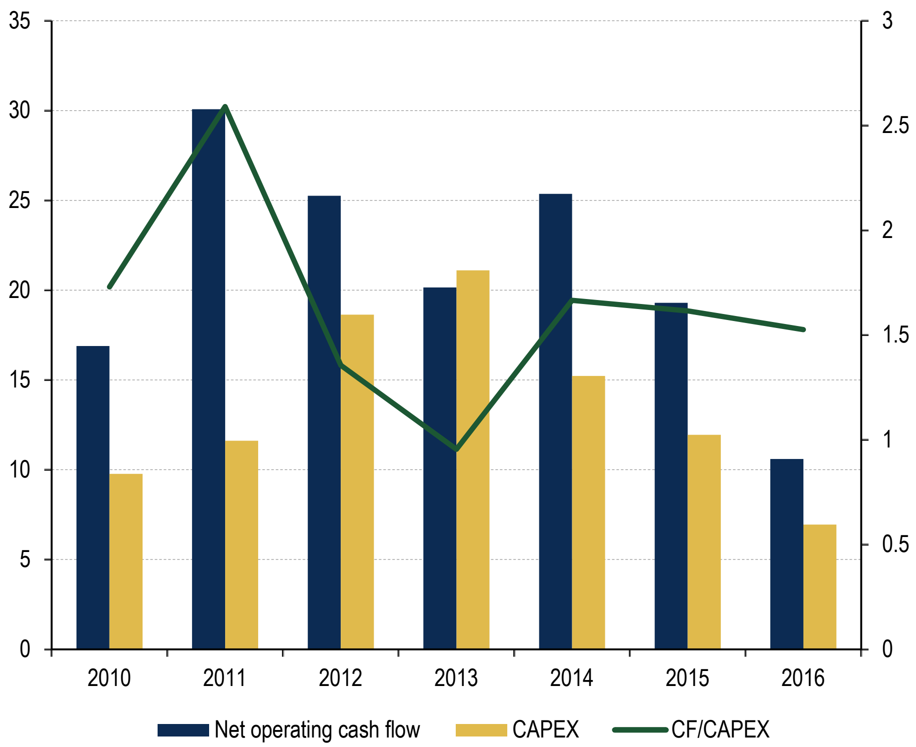
BHP also tried to sell some of the Fayetteville shale assets in October 2014 when the slump in oil prices began, but had to abandon the attempt as it was unable to find a suitable buyer.

Chart 24: A comparison of the profitability between US Shale and BHP's conventional business



Source: BofAML research

Chart 25: BHP Billiton Group's Cash flow to Capital Expenditure (US$bn)



Source: BHP Annual reports, Note: FY: June-June

The consequences of the asset purchases are still apparent today. An activist investor, Elliot Management, is pushing for BHP to spin-off BHP Petroleum, collapse the DLC structure, & return cash rather than investing.

Contributing factors

In 2011, after two failed acquisitions (Rio Tinto and Potash Corp.), we believe that BHP's management may have felt the pressure to deliver growth via a successful transaction. Indeed, then CEO Marius Kloppers also discussed c. $80 bn of planned capex to try to deliver growth. Obviously, this is difficult for a company of BHP's size.

On this environment and mindset, BHP decided to enter the rapidly developing shale industry. Its purchases of various shale assets were based on the assumption that the influx of supply would minimally affect the market and as a result the US natural gas price would trend upwards and the oil price would remain high.

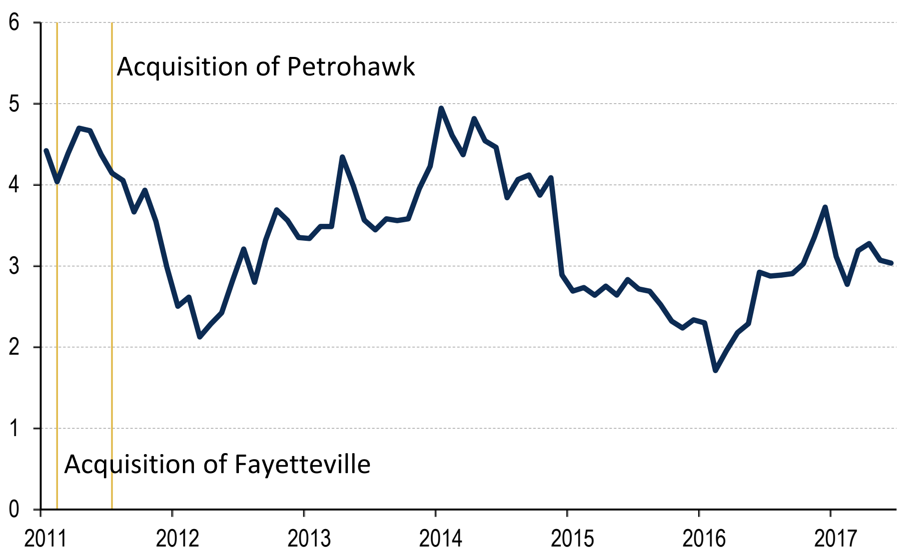
We think that BHP also had a bullish view on the outlook for Chinese oil demand as Chinese per capita oil consumption was still relatively low vs. other mined commodities.

Another key part of the "pitch" on the shale acquisition was the flexibility / scalability of capex i.e. capex could be ramped up and down relatively quickly dependent on the availability of surplus capital.

Supply exceeds demand

In 2011, the shale industry fundamentally changed the global the energy industry. The innovative technology added material and unexpected supplies of oil and gas reduced fears of a peak in oil production. As in any other industry, firms will enter a market whilst it is profitable to do so. Thanks to high oil and gas prices, an increasing number of suppliers entered the shale industry. This influx resulted in an oversupply of natural gas leading to a fall in gas prices of 54% in 10 months the year after BHP purchased Chesapeake's Fayetteville assets. With improving technology, the cost of extracting by fracking continued to fall. This meant that more suppliers were profitable at lower prices and the gas price has remained low vs. its peak of $18 in 2005.

Chart 26: Natural Gas Price US ($/Mcf)

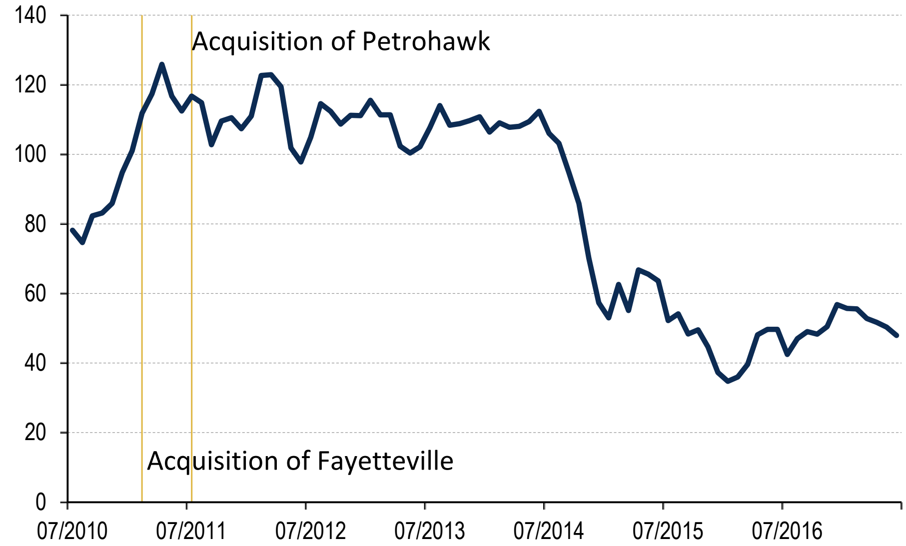


Source: Bloomberg

BHP pivots to oil

Once gas prices had fallen, BHP pivoted to oil. However, the oil industry was also experiencing a similar influx of suppliers. The oil price remained at high levels for longer due to the global nature of the market and OPEC's production cuts. In 2014, Saudi Arabia chose to increase production in an attempt to retain market share. As a result, oil prices fell 53% in 7 months. At these price levels, many shale operations in the US were not economically viable. BHP was forced to scale back production and write down assets, as acquisitions had been based on assumptions of higher oil prices.

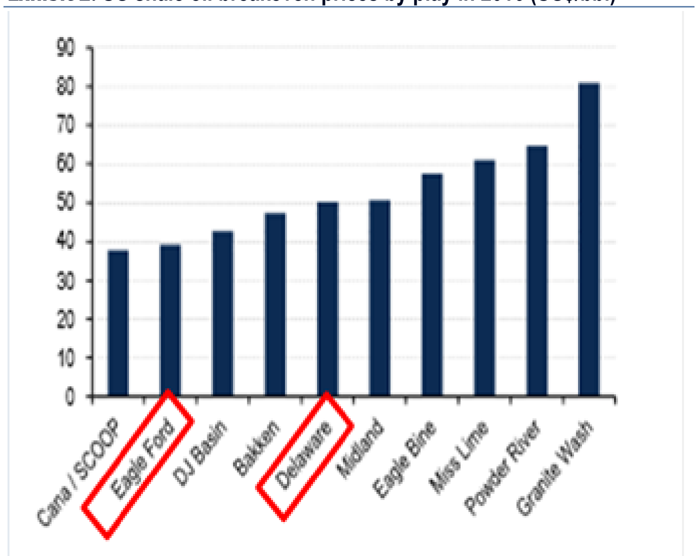
Chart 27: BHP buys high, Brent oil prices ($/bbl)



Source: Bloomberg

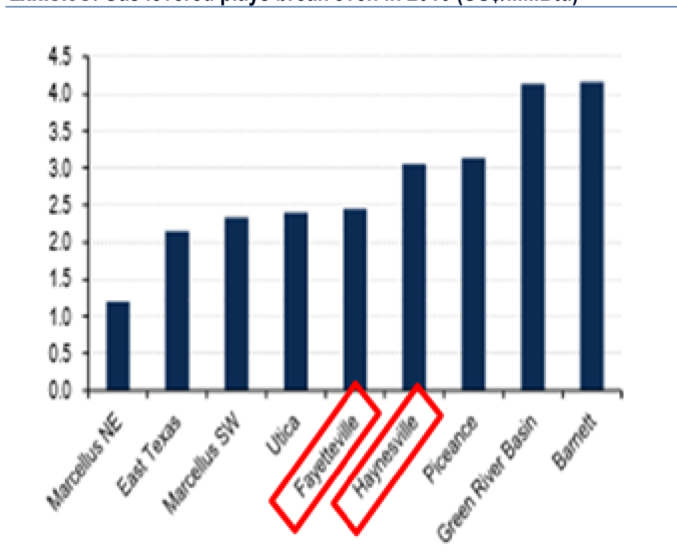
As shale technology has improved and become more efficient, many producers have maintained competitiveness at $40/bbl and supply remains high. This has meant that any subsequent cuts by OPEC have not been powerful enough to increase the oil price substantially. As a result, many of BHP's assets that were higher up the cost curve have continued to suffer from low margins.

Exhibit 2: US shale oil breakeven prices by play in 2016 (US$/bbl)



Source: BofA Merrill Lynch Global Research

Exhibit 3: Gas levered plays break even in 2016 (US$/MMBtu)



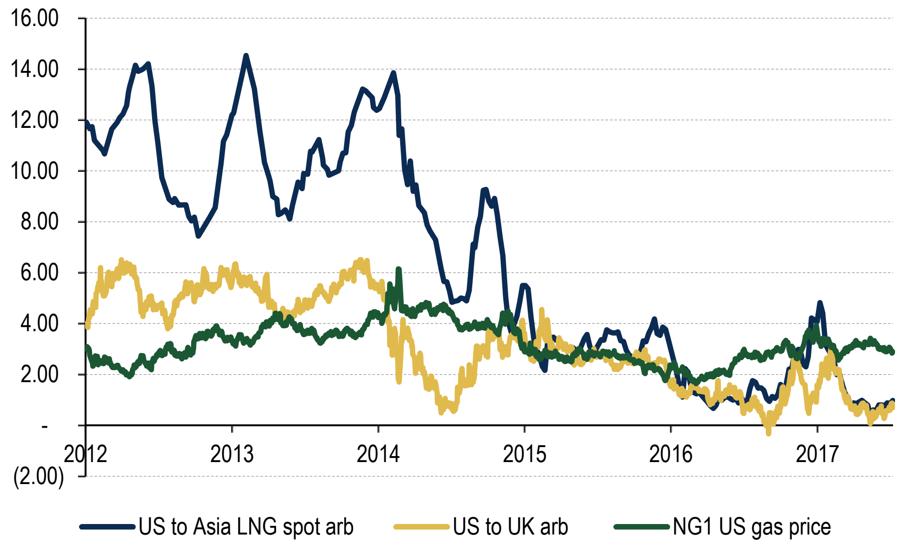
Source: BofA Merrill Lynch Global Research

In acquiring shale assets, it is necessary to make assumptions on oil and gas prices to determine profitability. The effect of increased supplies on prices may have been underestimated when acquiring Petrohawk and Fayetteville assets.

Overambitious for the era

Since 2011, US consumption of natural gas has steadily increased, in line with BHP's expectations. However, this demand growth has not been able to keep up with the increased supply brought about by the shale industry. BofAML noted that the shale industry needed "structural change to deliver supernormal returns" in the form of "globalization of US gas prices". Indeed, when justifying returns from Petrohawk assets in the backdrop of low US GDP growth, former BHP CEO, Marius Kloppers commented: "over time the world will arbitrage calories better". In addition, he considered the possibility of "substitution of liquid fuel for compressed gas" and connecting "cars to natural gas". Indeed, LNG exports have begun to expand, however this has not counterbalanced the increase in shale gas entering the market and gas prices have remained low. Despite BHP's longer term focus when making investment decisions, these factors were too far into the horizon to impact the demand in the 6 years after acquisition.

Chart 28: Arbitrage opportunities start to be exploited, however US gas prices fail to rise ($/Mmbtu)



Source: BofAML Research and Bloomberg, Note: Asia LNG spot – HenryHub*1.15-transport($1.15), NBP*0.95-HenryHub*1.15-transport($0.40)

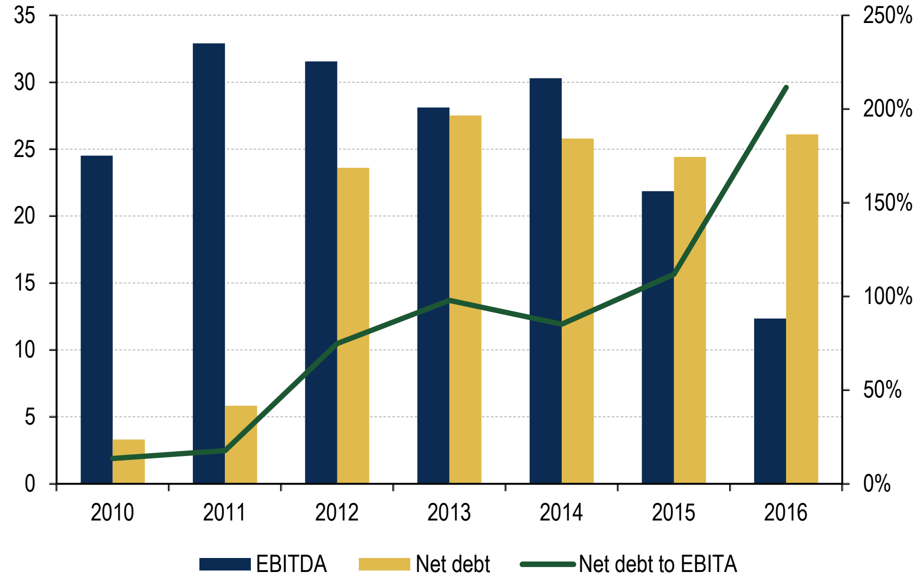
At the time, we wrote that we thought that BHP might have taken a view that the US would move to being a large net exporter of gas, driving US gas prices up to export equivalence. This has not happened.

Organisational Impact

In February 2013 CEO Marius Kloppers announced his resignation from CEO of BHP earlier than expected; share prices had fallen 22% in 6 months. The new CEO Andrew Mackenzie dismissed the CEO of BHP Billiton Petroleum, Michael Yeager who was seen as the instigator of the shale purchases and focused on restructuring BHP, eliminating a level of management in the process.

The aim was to simplify the company and focus on capital discipline, productivity, and value creation. In doing so, he also cuts shale assets from 1.6m to 0.8m acres to improve capital efficiency and sustainably increase shareholder value by selective investment. In addition, BHP began to use gas price hedging to mitigate risk on capital deployment.

Chart 29: BHP Billiton Group's net debt to EBITDA (US$bn)



Source: BHP Billiton annual reports Note: FY: June-June

Despite the changes in management, the shale acquisitions have continued to cause dispute. This year Elliot Management, an activist investor with a 4.1% share of BHP, has suggested that a listing / divestment of BHP's petroleum assets could lead to material value unlock. See our previous research on this topic "Answering the Activist".

Details of the transaction/ Asset description

Chesapeake Energy Assets

BHP acquired Chesapeake Energy Corporation's Fayetteville hydraulic fracturing gas field in central Arkansas, USA. This was the largest single asset transaction in the shale industry at the time, consisting of 487,000 acres of shale gas resources, a midstream pipeline and compression stations, with c. 3,000 wells. The asset was calculated to contain 415MMboe of proved developed and undeveloped reserves and was bought for $4.8bn from cash resources.

Petrohawk Energy Corporation

BHP acquired Petrohawk Energy Corporation, an oil and gas company in US, with hydraulic fracturing assets based in Texas and Louisiana. This purchase included assets in Eagle Ford, Haynesville and Permian Basins and was thought to have 617MMboe of proved reserves. This firm was acquired for $15.1bn using BHP's cash balance and a credit facility. The bid was equivalent to $38.75/sh and was at a 65% premium to closing price.

Chronology

- 2011 Feb 22 - announce acquisition Fayetteville, BHP Billiton enters shale market
- 2011 Jul 14 - BHP announce acquisition of Petrohawk
- 2011 Aug 25 - Acquisition of Petrohawk completed
- 2011-2012 - US natural gas price falls 54% in 10 months
- 2012 - Onshore US impairment $2.84bn
- 2013 - US Onshore impairment $0.3bn
- 2013 Feb - CEO Marius Kloppers steps down
- 2014 - Brent crude oil price falls 53% in 7 months
- 2015 - US Onshore impairment $2.8bn
- 2016 - US Onshore impairment $7.2bn
- 2017 - Chairman Jacques Nasser steps down

Market Reaction at the time

What did we say

Initially, with high oil prices, BofAML valued the acquisition of Fayetteville gas fields EPS and NPV ~1% ($0.35) accretive. The purchase of Petrohawk was also considered a good deal at $15k/acre in comparison to other deals at the time of around $20k/acre.

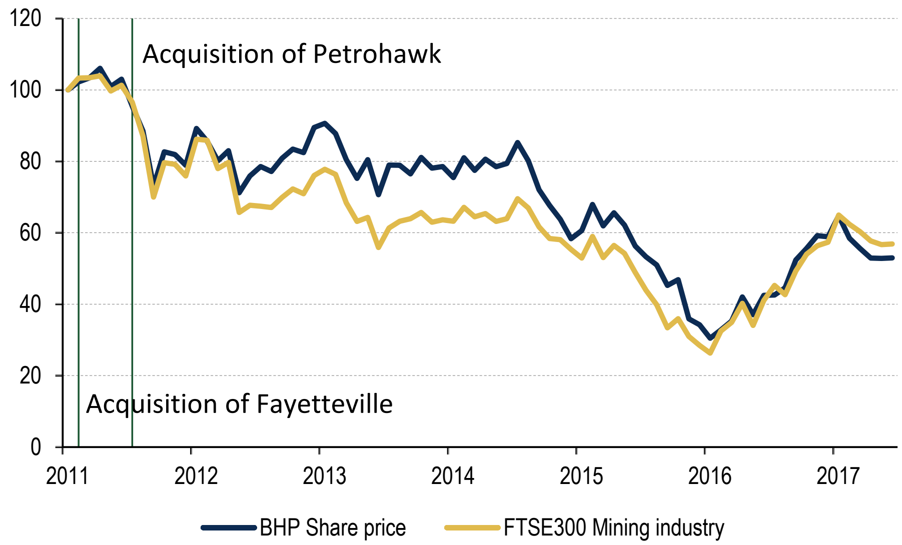
However, we had concerns about the assets ability to return supernormal returns without the "globalization of US prices", which was likely to encounter large obstacles. At the time, we wrote that that we thought this was the key option that BHP was potentially trying to create i.e. what if US natural gas prices were to trade on export equivalence with the global LNG market.

What did the press say

Many in the press were positive about the boom in shale gas. It was predicted to reduce energy dependence from other countries and meet growing demand in US. Natural gas was also growing in popularity thanks in part to beliefs that natural gas was cleaner than coal with lower carbon emissions. Even President Obama stated that "the potential for natural gas is enormous".

However, the NY Times reported in June 2011 concerns from members of the Energy Information Administration that there was "an "irrational exuberance" for shale gas", and that "the shale industry may be "set up for failure"" citing concerns about "high prices" paid for leasing rights and "overly optimistic models".

Chart 30: BHP's performance in relation to the FTSE 300 Mining Index (GBP rebased)



Source: Bloomberg

More recently, Elliot Management, an activist investor, claimed management decisions "have destroyed about $40bn in value". Elliot believes that the shale assets are undervalued by the market as a part of BHP and has advocated selling them off to release shareholder value. (Bloomberg). Elliott has also expressed concerns on the group's plans to continue investment into its Potash project (Jansen).

Case study #5: XTA/GLEN Koniambo

In brief

Xstrata inherited Koniambo, a Greenfield ferronickel project in New Caledonia when it acquired Falconbridge in 2006. The project suffered delays and the capex budget escalated from $3.9bn to $7.7bn. The asset was valued at $0.9bn as of 2016 with impairments of $1.4bn in the past two years alone and the carrying value suggesting value destruction in excess of $6.8 bn. Issues have included metal leaks, fractures in boiler tube welds, and low nickel prices due to oversupply of the market. The project has yet to scale up to design capacity.

Notable Quote

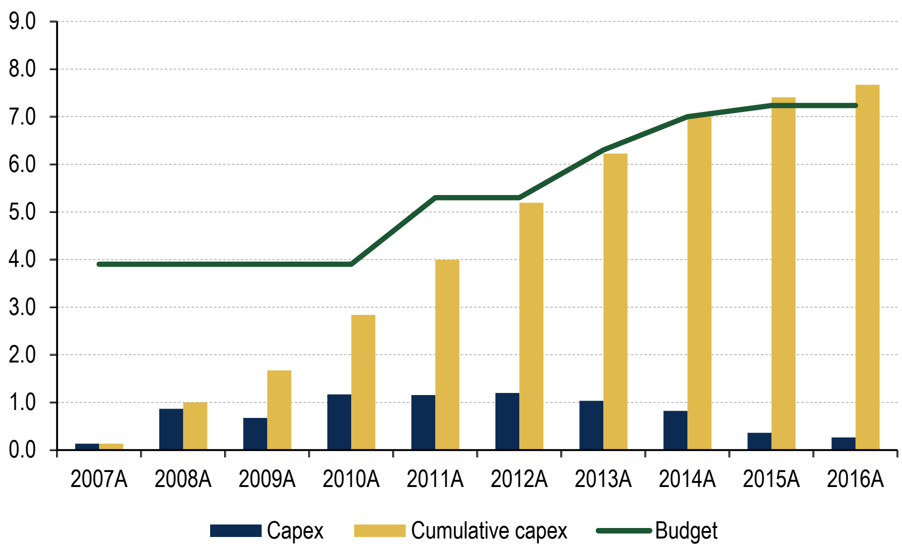
“We have no intention to continue running the asset and burning cash like some other parties in that area”, Glencore CEO Ivan Glasenberg has warned. "We don't understand why people don't react in the same manner as we do. Big mining companies, other mining companies keep operations open, praying for better prices." (Mining MX)

Cost/Impact to Shareholders

In 2006, Xstrata chose to acquire Falconbridge, inheriting the Koniambo project. After a yearlong review of the project, Xstrata approved development of Koniambo in 2007. The project’s initial delay was due to the financial crisis when Xstrata’s budget became overstretched and it had to reduce its capex. Koniambo’s first export shipment was delayed from 2010 to 2H 2013 to save costs.

In 2013, Glencore acquired Xstrata and took a write down of $7.5bn. A large share of this was likely to be attributed to its greenfield projects, including Koniambo. In 2015, a further $1.4bn ($4.0bn including non-controlling interests) was written down due to the low nickel price and difficulties developing the site. Total capital expenditure currently comes to $7.7bn, 2x the initial budget of $3.9bn. This was in part due to “hyper-inflation” of inputs, low labour productivity and uncompetitive contractor rates in 2011.

Chart 31: Koniambo’s budget vs capex (US$bn)

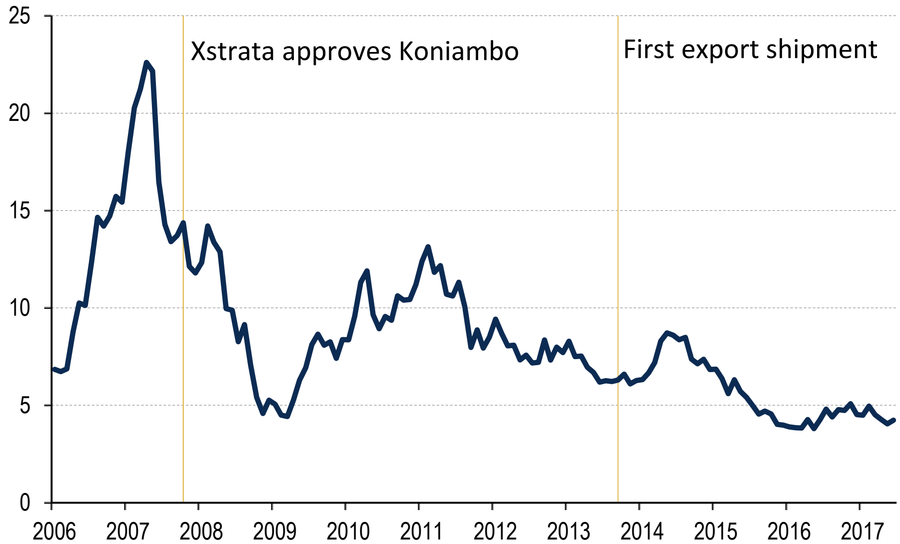


Source: Glencore annual reports and investor presentations

After the merger with Glencore, the project suffered multiple setbacks. These included cracking in boiler tube welds, power stability issues, and metal leaks. The metal leaks, which were discovered a month after President Hollande opened the mine, meant that production was halted in 2015 and one of the lines’ furnace plants had to be rebuilt with costs totalling over $0.2bn. Subsequently, the other line has also required reconstruction, with $58m expected capex.

These extensive delays have meant that Glencore has yet to reach design capacity which has been revised down to 55ktpa from 60ktpa, despite aims to do so by 2014. GLEN expects to reach full capacity by 2021/2022. In addition, these delays have resulted in Glencore missing out on the higher nickel prices of the early of 2010s.

Chart 32: Xstrata misses out on higher nickel prices (US$/lb)



Source: Bloomberg

Consequently, Glencore have reduced Koniambo's valuation to its recoverable value of $0.9bn, which used long and short term nickel prices in the range of $5.67/lb-$7.26/lb in its valuation, well above today's price. Our NPV for Koniambo is -$0.4bn for 2017. Koniambo is yet to generate a profit.

Contributing factors

Xstrata underestimates complexity of greenfield projects

Despite undergoing a yearlong review of the project which investigated project stability, environmental, execution, and socio-political risks, Xstrata underestimated the difficulties and risks associated with developing a greenfield project in New Caledonia. In choosing to proceed with Koniambo, they expected to be NPV neutral at $4.60/lb nickel prices with cash cost c. $2.00/lb in the lowest cash cost quartile. As of 2016, Glencore estimated cash costs at $3.75/lb-$4.10/lb.

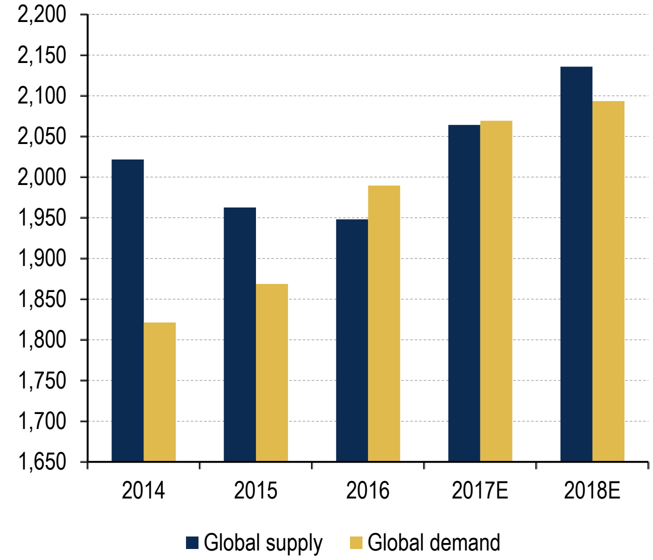
Glencore still chooses to keep Koniambo

Over the years, CEO Ivan Glasenberg has stated: "We are not married" to Koniambo and discussed divesting the asset, asserting: "We will not burn cash." (Mining MX) In addition, upon acquisition Glencore raised their C1 cost projections to $3.88/lb from $2.75/lb. That said, Glencore continued to invest in Koniambo, attempting to ramp-up production despite low nickel prices. Why? In our view, this is because a stable, operating asset is worth more than an asset which isn't producing. With GLEN's latest set of results (H1 2017) it appears that line 1 is nearly operating at design capacity but not without hiccups – the plant recently suffered a shutdown on a water leak.

Price expectations

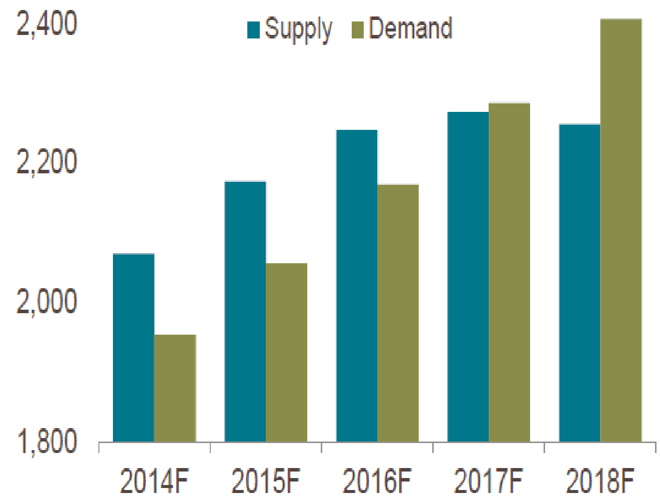
Glencore chose to continue to develop the project based on assumptions of supply and demand. In 2013, they expected global nickel supply growth of 2.2% p.a. until 2018, mainly due to the ramp up of multiple large projects adding 250ktpa. By 2017, they expected demand to exceed supply and consequently for the nickel market to be in deficit for 2017/18.

Chart 33: Nickel demand vs supply (our latest view) – surplus 2018



Source: BofA Merrill Lynch Global Research

Exhibit 4: Glencore's expectations for nickel in Nov 2013 – deficit 2018

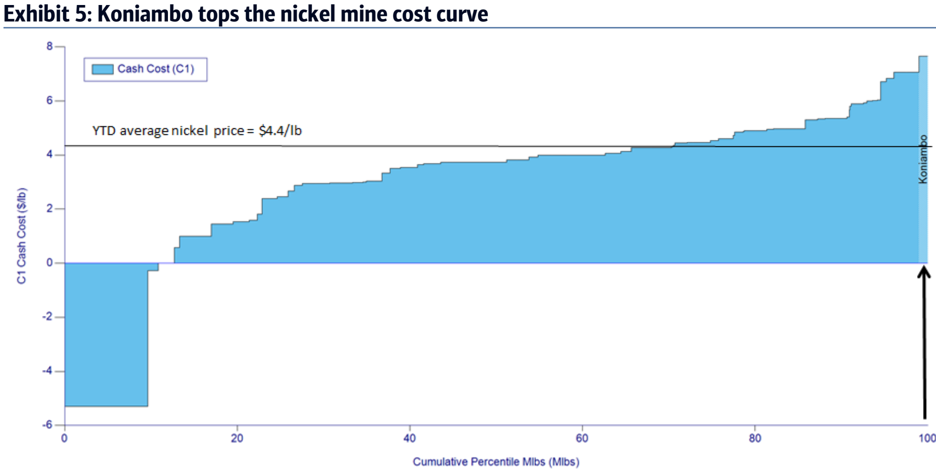


Source: Glencore's "The Realities of the Nickel Market" presentation 19/11/2013

Furthermore, China's production of nickel pig iron (NPI) was expected to decrease as raw material supplies were reduced due to the ban on exports of nickel ore in Indonesia, mine closures in the Philippines and extremely high costs of NPI producers. However, China's suppliers of NPI have been successful in reducing costs with improved technology and efficiency and the ban and closures have since been overturned. As a result, supply is likely to continue to exceed demand and suppress prices.

In spite of sustained low prices, c. 30% of operators, including Glencore, continue to produce at a loss. Many of these loss making mines are owned by large companies, such as Glencore (market cap $59bn), for which all nickel operations combined contribute less than 5% of revenue. Consequently, the option value of keeping a mine open in case of a price rise, due to say the supply interruptions or some positive demand shock (EVs!) outweighs a seemingly negligible cost of running it at a loss. However, these mines produce vast quantities of nickel, which in itself contributes to the oversupply, the suppressed prices and hence their own losses. Koniambo tops the nickel mine cost curve

Exhibit 5: Koniambo tops the nickel mine cost curve



Source: Wood Mackenzie Ltd

Governments induce miners to stay in nickel

Furthermore, Glencore's Koniambo, along with Vale and Eramet's Societe Le Nickel (SLN) are located in New Caledonia, for which nickel related products consist of over 87% of top 10 export commodities. Consequently, its government and France's have been keen to maintain the industry providing various inducements involving $340m in financial support to SLN, $200m in tax concessions to Glencore, and a $200m loan to Vale. These actions have acted as incentives to stay in the oversupplied nickel market, further contributing to the excess supply and subsequently continuing the suppression of nickel's price.

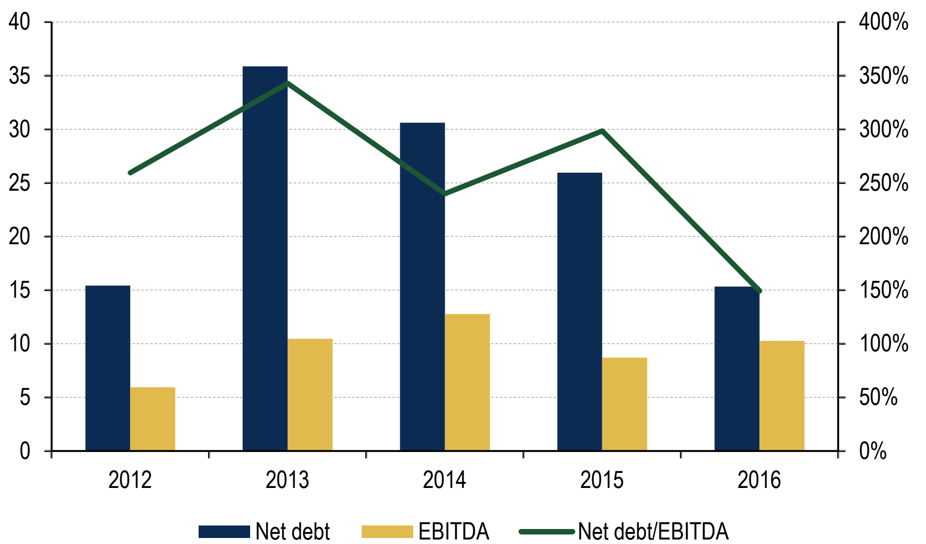
Organisational Impact

In the years after the financial crisis, Glencore continued to acquire assets, whilst other distressed mining companies deleveraged, However, following the recent decline in commodity prices, Glencore's net debt rose to nearly 3.0x EBITDA. Due to investor concern over this $25.9bn debt in 2015, Glencore reduced its debt by $10.1bn the following year by divestment of assets and a $2.5bn equity issue.

In spite of recognition of needing to maintain a lower leveraged balance sheet, Glencore has sought out various assets in 2017. In particular, Glencore became involved in simultaneous bids for Rio Tinto's coal assets and Bunge this summer.

Ivan Glasenberg has previously stated: "We are fearful of greenfield projects" and criticised other mining companies' wasteful spending on them, declaring that Glencore will avoid them. Glencore has sold off the greenfield Las Bambas copper mine. To date it has failed to sell off or shut down Koniambo.

Chart 34: Glencore's Net debt/EBITDA



Source: Glencore's annual reports

Details of the transaction/ Asset description

The Koniambo greenfield ferronickel project is based in New Caledonia and consists of 59.6Mt measured and indicated resources at 2.46% nickel grade. It is a 49/51% joint venture project with Société Minière du Sud Pacifique (SMSP), the development arm of the North Province of New Caledonia. Glencore and Xstrata have been the main financers of the project and as a result have had agreements to gain a higher proportion of revenue via interest and capital payments on project debt.

The project was initially given by France to Falconbridge as part of the Bercy Accords with a view to promote development in New Caledonia. In 2006, Xstrata acquired the 49% share of Koniambo Nickel SAS as part of its purchase of Falconbridge for $18.8bn.

In 2013, Glencore acquired Koniambo as part of its purchase of the remaining 66% of Xstrata for $29.5bn. This was accomplished by an all share exchange.

Chronology

- 1998 - Falconbridge and SMSP enter into the Bercy Accord joint venture agreement
- 2006 Aug 15 - Xstrata acquires Falconbridge, owner of Koniambo
- 2007 Oct 17 - Xstrata approve Koniambo project after yearlong project review
- 2013 May 01 - Xstrata acquired by Glencore
- 2013 Sep - First export shipment
- 2013 - Cracking in boiler tube welds identified
- 2013 - Power issues
- 2014 Nov - President Hollande officially opens Koniambo
- 2014 Dec - Metal leak – suspension of production
- 2015 - Furnace rebuilt for Line 1
- 2017 - Line 2 rebuilding starts

Market Reaction at the time

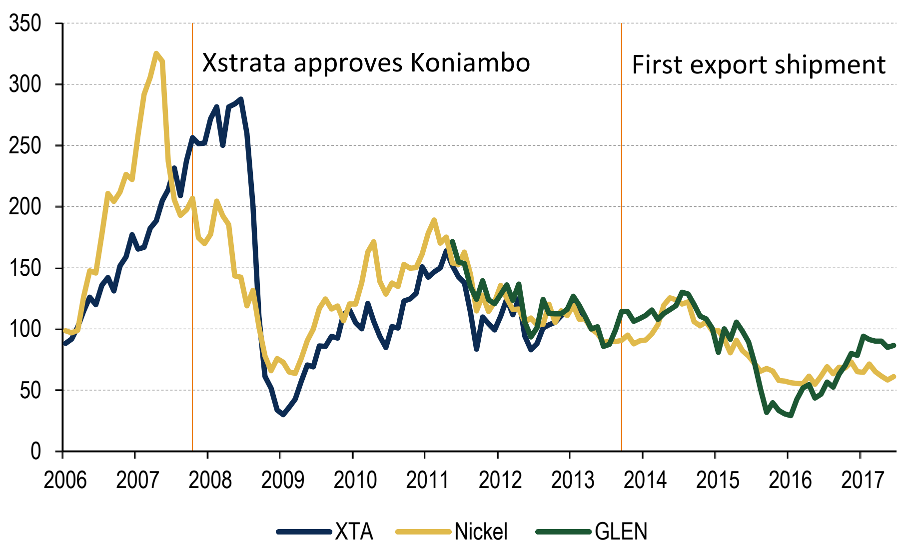
What did we say

Following the approval of development by Xstrata in 2007 and agreed tax plan, BofAML calculated the asset to add $1.7bn in incremental NPV and 18% to long term earnings estimates. At the end of 2014, when Koniambo was starting up production, BofAML was bullish on nickel, with a predicted deficit larger than Glencore's prediction for 2016 and a balanced market in 2015. In 2015, miners produced a 173kt surplus, 9% greater than global demand.

What did the press say

In March 2007, Reuters reported on the large quantity of M&A activities associated with nickel projects that would soon result in a significant oversupply. They commented that, there was little belief that nickel prices would remain as high as the $21.23/lb nickel price of the time, reporting a median forecast of $9.75/lb for 2008 from a survey of analysts.

Chart 35: Nickel price, Xstrata, and Glencore share prices rebased at time of acquisition



Source: Bloomberg

Case study #6: Thyssen Steel Americas

In brief

In a bid to expand into the US high-quality carbon flat steel market in 2005, Thyssen embarked on a project called "Steel Americas". TK planned to build a 'low-cost' steel slab mill in Brazil and a finishing line in Alabama. Steel Americas combined capex was €9.3bn which was subsequently written down by €6.3bn. The project suffered from cost overruns of 75% due to a strong local currency, technical difficulties, and delays. Ramp up was delayed resulting in the asset starting to produce steel at the same time as a global supply glut emerged. The assets struggled to breakeven as raw material costs soared and eventually the steel mill in Alabama was sold for $1.55bn in 2014 to a Mittal/Nippon consortium. TK should finally exit Steel Americas in its entirety by end FY18 as it has entered into an agreement to sell the Brazilian mill to Ternium for €1.5bn, with a further impairment of €0.9bn (TK expects the deal to complete by end FY18).

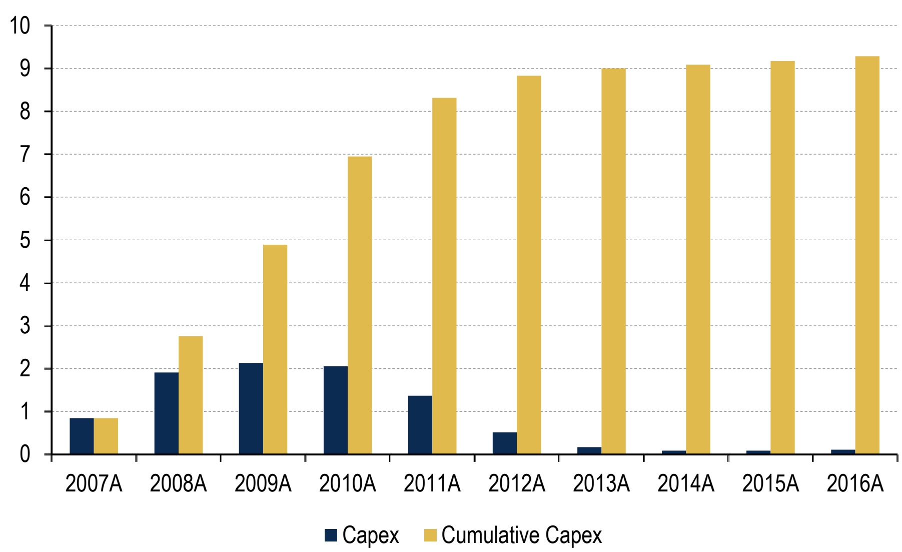
Notable Quote

"The Steel Americas project and the various compliance violations have not just caused immense financial damage. We have also lost trust and credibility," CEO, Heinrich Heisinger, commented. "In the past there has been an understanding of leadership in which 'old boys' networks' and blind loyalty were more important than business success." (The Financial Times)

Cost/Impact to Shareholders

TK spent €9.3bn in capital expenditures to build Steel Americas, which included the mill in Brazil and the processing plant in Alabama, acting as a supply chain to expand in the US and European markets. Serious issues with the coke ovens, constructed by Citic, caused delays and reconstructions. Uhde, Thyssen's own plant construction company replaced Citic on the project in December 2009 as issues surfaced. In spite of the change in management at TK 2011, operating issues persisted.

Chart 36: Steel America's capex, >€9bn of sunk capex!



Source: Thyssenkrupp data and BofAML research

We think poor project execution and awarding a huge contract to Citic rather than using a "known quantity" – TK's own in house plant construction company - was a large contributor to the cost overruns of over 75% above the initial combined budget of €5.3bn, and also contributed to the prolonged struggles in ramping up the mill.

The Brazilian mill, which was delayed by over a year and began production in the summer of 2010, has yet produce at its design capacity of 5 million tons of slab/year.

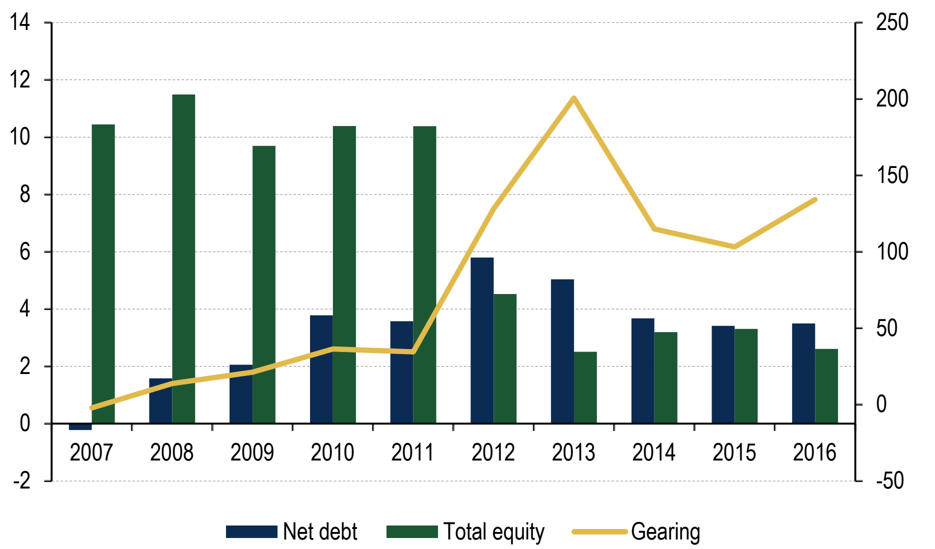
Table 12: Steel Americas systematically underperforms

Year	2010	2011	2012	2013	2014	2015	2016
EBIT (€bn)	-0.6	-3.145	-4.747	-1.18	0.064	-0.147	-0.022
Sales (€bn)	0.068	1.139	2.014	1.867	2.06	1.773	1.489
Brazil steel mill production (m tons of slabs)	0.03617	2.8	3.4	3.6	4.1	4	4.3

Source: Thyssenkrupp's annual reports Note: FY: October-September

Steel Americas has persistently contributed negative EBIT and took on impairments of €6.3bn. This was predominantly due to an increase in costs, fall in the steel price due to a supply glut and technical difficulties in the ramp-up.

Chart 37: ThyssenKrupp's gearing becomes overstretched (€bn)



Source: ThyssenKrupp's annual reports, Note: FY: October-September

At the start of the decade, TK's net debt rose by 62% to €5.8bn, gearing reached 200.6%, and share prices to fell 47% in 3 months. The company was forced to undergo drastic structural reform. Thyssen asked banks to waive loan covenants that had imposed gearing limits of 150%. Dividends were paused for 2 years and dividend yields have failed to surpass 1% since reinstatement. €0.9bn in equity was also issued, and operations valuing €10bn in sales were divested. In addition, the Brazilian mill was put up for sale. However, with technical issues including a not fully operational blast furnace, Thyssen struggled to find any suitable buyers. TK sold the Alabama finishing line in 2014 (US$1.55bn) but retained the Brazilian mill. In 2017, Thyssen finally announced the sale of the Brazilian mill for €1.5bn to local steel producer, Ternium. It is expected to write down a further €0.9bn as a result.

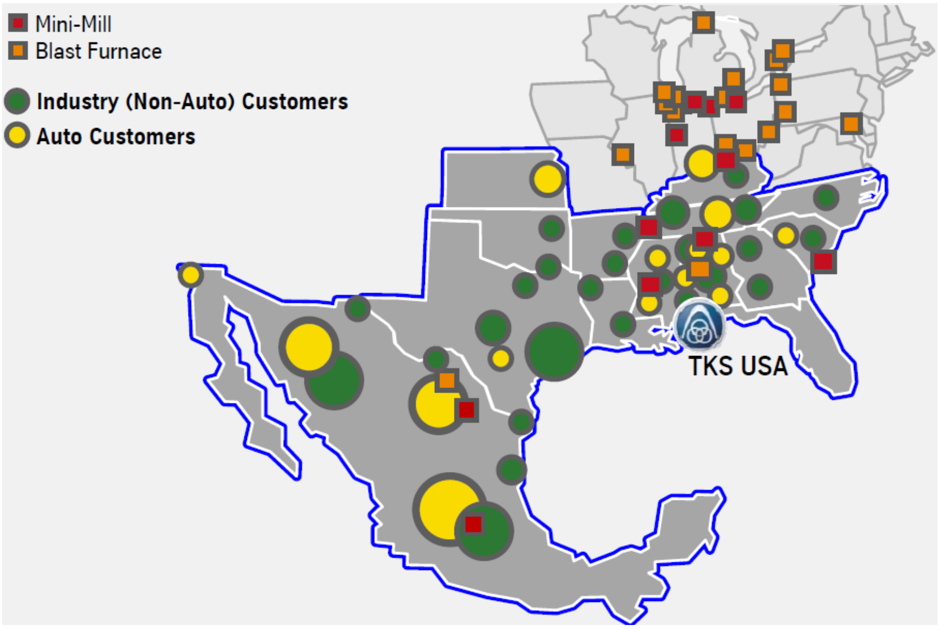
Contributing factors

In 2005, the steel market was booming as China rapidly expanded driving high steel demand growth and associated healthy global steel utilisation rates. Global GDP growth was supportive and Thyssen was keen to gain at least a 5% market share in the US. The company wanted to take advantage of a consolidated growing market with high prices by efficiently producing steel in a low cost region like Brazil to maximise profits. Unfortunately, Thyssen's pricing and construction assumptions were overly optimistic and some even proved to be incorrect. In addition, Citic's execution in Brazil was disappointing.

TK picks Citic bid over in house team

Thyssen wanted to create an efficient low cost supply chain built from scratch to break into the US market. TK envisaged the Brazilian mill would provide slabs of steel to the production plant in Alabama and the ships would return with coking coal for the mill. The American production plant had access to a non-unionised workforce and would be close to end customers, in particular auto producers. In addition, Thyssen expected to use its established relationships with companies in Europe for any of their own planned expansions into the US.

Exhibit 6: Thyssen's plans to expand in the NAFTA market



Source: Thyssenkrupp's Alabama Opening Ceremony presentation, 2010

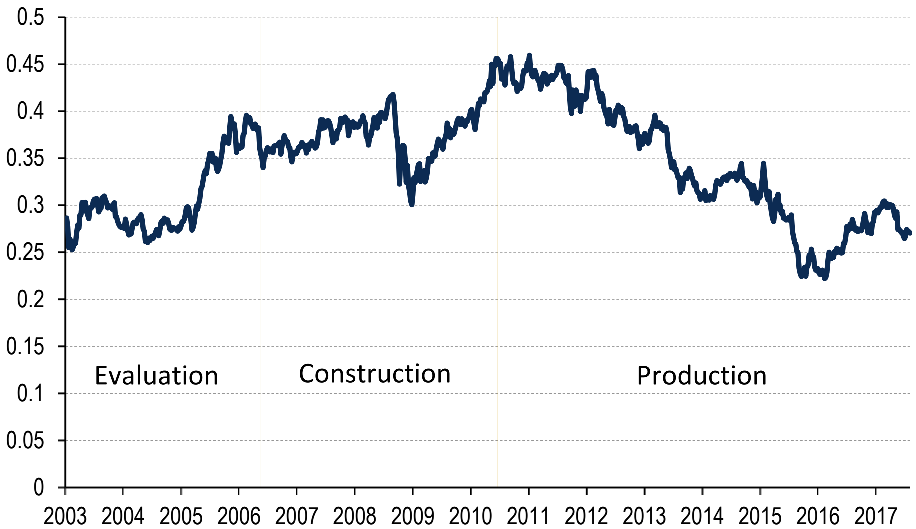
In 2006, Thyssen accepted Citic's (a Chinese conglomerate) lower bid over its own plant construction company's bid. Citic was inexperienced with coking plant contracts of that size and produced faulty coking ovens. These issues had to be resolved and The FT has claimed that Thyssen "incurred more than €500m in additional costs fixing problems with the coke plant."

The subsequent delays and slow ramp-up had a knock on effect on the profitability of the US. A lack of slab supply from Brazil meant that it took longer than expected to gain certifications for quality steel needed for many products and longer term contracts.

Construction costs rise

In the years preceding the decision, when the expansion was considered, the Brazilian Real reached a low of 1 BRL/€0.25. This made Brazil an attractive low-cost location for large mining and steel projects. Many mining companies, such as Anglo American (Minas Rio greenfield project) began to invest in the area during the "super-cycle" and the resulting labour shortage in construction drove construction prices up. This contributed to Brazil's economy which was rapidly growing 4.8% on average over the mid 2000's. The growing economy and tight labour market meant that the Brazilian real appreciated 98% to a high of1BRL/€0.50. Aside from engineering issues associated with the coke ovens provided by Citic, a stronger Real drove up the cost of construction substantially and Steel America's capex increased by 75%.

Chart 38: Brazilian Real vs EUR appreciation led to extensive cost overruns

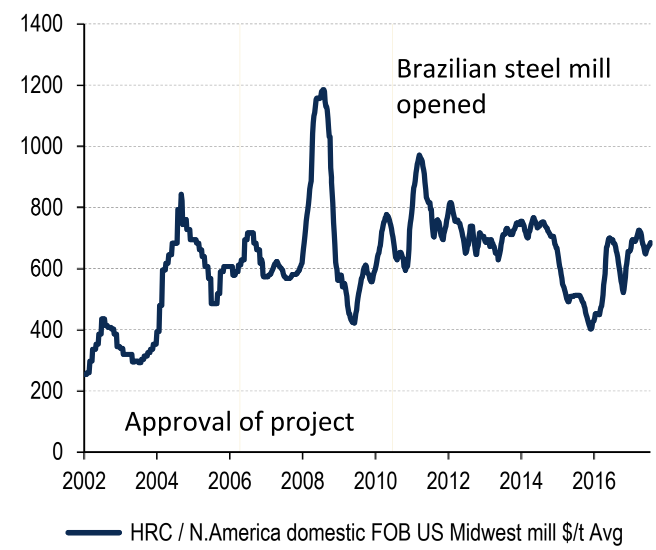


Source: Bloomberg

Thyssen mistimes ramping up new steel capacity

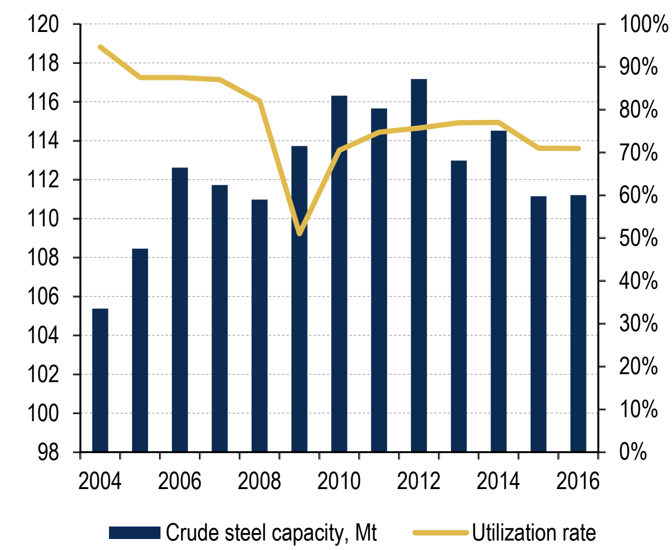
When Thyssen started its development plan to expand in the US market in 2005, steel was on an upward trajectory, demand was expected to increase, and the US consumed more than it produced. Thyssen was keen to "share in the positive performance of the steel market", for which it stated that there was "no end in sight to the positive trend" in world crude steel production. Indeed, global crude steel capacity has consistently grown until 2013 at an average of 6% annually. However, demand for steel started to taper off just as TK was ramping up Steel Americas. This was a results of a slow recovery of US and EU economies, as well as slower demand from China as stimulus was reigned in, leading to significantly low utilization rates and a weak pricing power and margins for steel. The pricing environment was significantly weaker by the time Thyssen started to produce steel.

Chart 39: US Steel HRC ($/t)



Source: Bloomberg

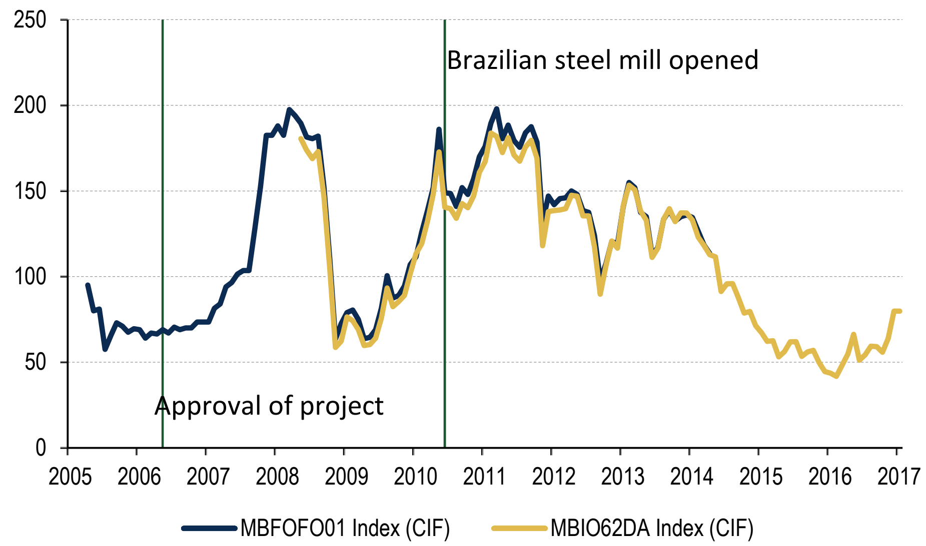
Chart 40: US utilization rate falls, whilst US capacity grows



Source: BofAML Research

Furthermore, iron ore, a necessary ingredient to produce steel had rapidly increased between approval of the project and the start of production by over 116%. This was in part due to China's growth in finished steel production of 58% in the same period of time leading to an increase in demand for its raw materials. These meant that Steel Americas' production costs substantially increased. Weak demand in the US, increased production costs and a stronger Brazilian currency squeezed margins. Consequently, Thyssen continued to lose money from its Steel Americas' operation.

Chart 41: Iron ore price index rebased



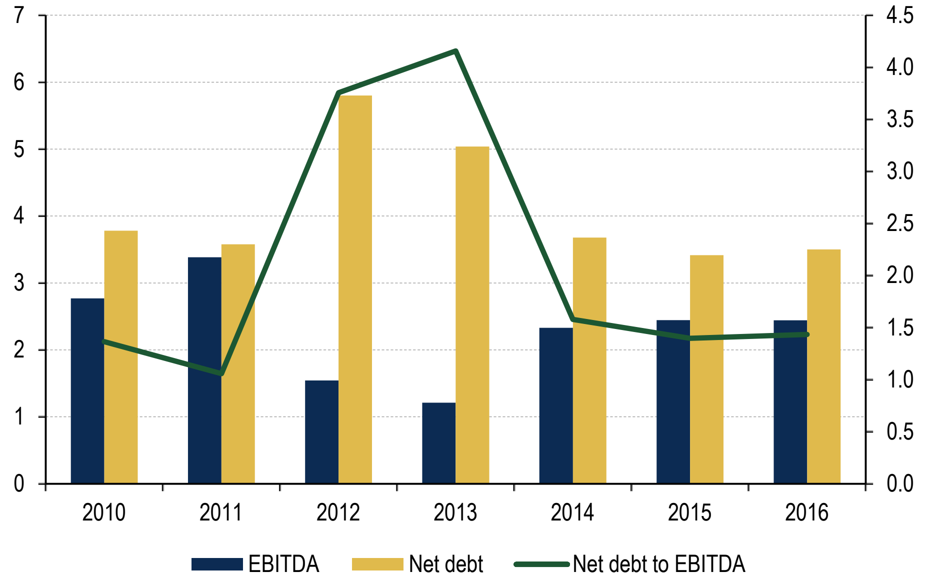
Source: BofAML Research, Note: The index for iron ore price was changed during the period shown.

The US market has typically run at a premium to European steel prices due to trade barriers, demand exceeding domestic capacity, and a more consolidated market leading to increased pricing power for the suppliers. If Thyssenkrupp had been able to efficiently develop the assets in Brazil and Alabama at the proposed low costs, it could have potentially been able to competitively compete with domestic production.

Organisational Impact

In 2012, Chairman, Dr. Heinrich Hiesinger, admitted that the executive board had used assumptions that "were clearly too optimistic or were subsequently shown to be wrong" when approving the Steel Americas' project. Net debt had also risen to 4.2x EBITDA. These issues and Steel Americas' impairments in 2011 and 2012 meant that the company had to undergo structural reform.

Chart 42: Thyssenkrupp's net debt to EBITDA (€bn)



Source: Thyssenkrupp's annual reports Note: FY: October-September

The business was streamlined imposing "more efficient regional organization", reducing corporate functions, business area board members, and replacing 70% of the top management. The company divested businesses with sales of more than €10bn and changed focus from steel to higher margin capital goods/industrials divisions. In 2016, steel and related processing attributed only 14% to sales for the ThyssenKrupp group. There was also an increased emphasis in benchmarking the business with other related businesses.

CEO, Heinrich Hiesinger replaced Dr.-Ing Ekkehard Schulz as CEO in January 2011.

Details of the transaction/ Asset description

Steel Americas was a supplier of carbon steel flat products in the Thyssenkrupp group, made up of the greenfield CSA Siderúrgica do Atlântico steel mill in the state of Rio de Janeiro in Brazil and greenfield processing plant for carbon and stainless steel in Alabama, USA. The Brazilian steel mill planned to produce a 5million tonnes of slab/year and supply Europe and the plant in Alabama, which would produce 4.5 million tonnes of hot-rolled steel/year. The initial budget for the Brazilian mill was €3bn, and €2.3bn for the USA plant (€1.8bn from Steel Americas and €0.5bn from Thyssen's Stainless Global Calvert mill build on the same site).

This Brazilian project was a joint venture with CVRD (Vale), of which Thyssen initially had a 78.85% share. The remaining share was later bought out by Thyssen for a token value in 2016.

The Alabama plant was sold in 2014 for $1.55bn. The CSA Siderúrgica do Atlântico steel plant in Brazil will be bought by Ternium for €1.5bn. This transaction will require Thyssenkrupp to take a further write-down of €0.9bn and is expected to be completed by 30 September 2017.

Chronology

- 2006 May - Board approves build of new steel mill in Brazil
- 2006 Sep - Construction on the Brazilian mill begins
- 2007 - Construction on Alabama plant begins
- 2009 - Change in construction team in Brazil
- 2010 Jun 18 - Mill opened in Brazil by President Lula da Silva
- 2010 Nov - Alabama steel processing plant opened

- 2011 Dec 02 - €2.1bn in impairments, CEO of Steel Americas leaves
- 2011 Jan 21 - Dr Schulz steps down as CEO
- 2012 - Steel Americas put out for sale
- 2013 Nov 29 - Sell ThyssenKrupp Steel USA rolling and coating plant in Alabama
- 2014 Feb 26 - US rolling and coating plant sold to ArcelorMittal/Nippon JV
- 2017 Sep - CAS Siderúrgica do Atlântico to be sold to Ternium

Market Reaction at the time

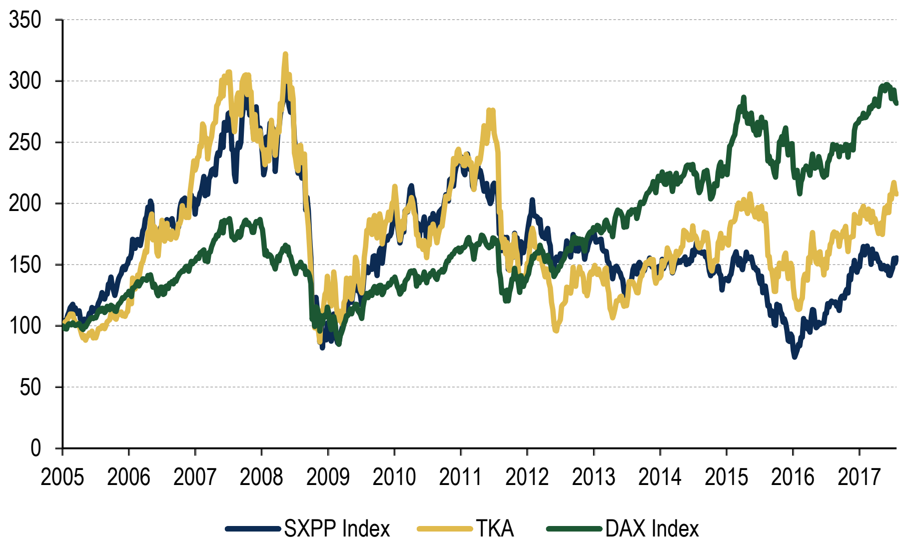
What did we say

In 2008, Merrill Lynch found the Brazilian project to be "competitive relative to current replacement costs" despite delays and 50% capex budget increases and in February 2010 we were more positive than Thyssen's management, predicting EBIT to be break even by 2012 compared to their 3-5 years. BofAML advocated selling the Steel Americas asset in early 2012.

What did the press say

Thyssen's decision to expand into the US market received little attention from the press. Moody's changed its outlook for Thyssenkrupp in part due to the "very favourable environment in the steel industry", but noted that expanding in steel gave Thyssen "a risk of it being overexposed to a still cyclical sector" and the possibility of "a supply/demand imbalance" in the north American market. As the disappointing revelations continued to develop the media has continued to view Thyssenkrupp negatively.

Chart 432: Thyssenkrupp vs SXPP and DAX indices



Source: Bloomberg

Price objective basis & risk

Anglo American (AAUKF)

Our price objective of GBp2000 is set at the average of the high and low-ends of our SOTP valuation, which assumes market values for stakes in listed subsidiaries Kumba and AngloPlatinum and uses peer average multiples to derive value for other assets. Our price objective represents about 0.9x our DCF derived valuation. Diversified miners have historically traded through the cycle at 0.7-1.4x NPV, averaging around 1x.

Downside risks to our price objective are a sustained slowdown in global economic growth (in particular China, the key driver of commodity consumption), a strengthening of the Rand exchange rate, an escalation of other cost pressures such as labour and energy prices, poor operational performance leading to missed production targets. An improving macro outlook leading to higher commodity prices and implementation of the announced asset optimisation target could provide upside risks to our EPS and valuation.

BHP Billiton Ltd (BHPLF / BHP)

Our price objective of A$26.00 (US$39.00/ ADR) represents approximately 1.0x our DCF-derived NPV per share, calculated using a discount rate of 9%. This is in line with the average historical trading range of BHP. Diversified miners in general have historically traded in a range of 0.7-1.4x NPV.

Upside/Downside risks to our price objective are: Global economic slowdown, volatility in commodity prices, operational risks associated with mining, project execution risk, currency pressures and mining cost inflation.

BHP Billiton PLC (BHPBF / BBL)

Our price objective of GBp1570 (US$39.25) represents approx. 1.0x our DCF-derived NPV per share, calculated using a discount rate of 9%. Diversified miners in general have historically traded in a range of 0.7-1.4x NPV.

Upside/Downside risks to our price objective are: Global economic slowdown, volatility in commodity prices, operational risks associated with mining, project execution risk, currency pressures and mining cost inflation.

Glencore (GLCNF / XGLNF)

Our price objective of GBp 360 / ZAR74.84 is based on 1.0x our DCF and peer multiple derived SOTP valuation. Large cap miners have historically traded between 0.7-1.3x NPV. Upside/downside risks to our price objective are commodity prices being stronger/weaker than our forecasts, trading profits being better/worse than our estimates, better/worse than modelled cost savings at industrial assets, positive/negative operational surprises at the group's industrial assets, a rise/decline in the market value of the group's listed assets.

Rio Tinto Ltd (RTNTF)

We set our price objective at A$78.00 at approximately 1x our NPV estimate. Through the cycle, diversified miners have tended to trade at 0.7-1.4x NPV. Since the GFC, they have traded towards the lower end of this range. Rio Tinto Ltd. tends to trade at a premium to its London listing (Rio Tinto Plc.) due to the availability of franking credits to Australian investors - this premium has averaged 9% over the last 12 years.

Downside Risks to our PO are:1) commodity prices, which could be lower than our forecasts, resulting in lower-than-forecast earnings, 2) unsuccessful project execution, and 3) operational problems at mines and smelters.

Upside Risks to our PO: 1) China growth is higher vs. our expectations 2) Iron ore price surprises to the upside.

Rio Tinto Plc (RTPPF / RIO)
We set our price objective of GBp4500/US$56.48 at c.1x our NPV estimate. Diversified miners have historically traded in a range of 0.7-1.4x NPV, however since the global financial crisis, Rio Tinto has tended to trade at a discount to our NPV valuation. Therefore, we consider our PO reasonable given the company's growth profile and its exposures to iron ore, where we have a cautious outlook.

Downside Risks :1) commodity prices, which could be lower than our forecasts, resulting in lower-than-forecast earnings, 2) unsuccessful project execution, and 3) operational problems at mines and smelters. Upside Risks: 1) China growth is higher vs. our expectations, 2) Iron ore price surprises to the upside.

Thyssenkrupp (TYEKF)
Our price objective is set at EUR27/sh. Our PO is set at 1x our SOTP valuation for thyssenkrupp. In terms of our SOTP: we value the steel assets at around 6-7x FY17E EV/EBITDA (in line with industry peers). Capital goods divisions are valued at between 6-15x EV/EBITDA (also in line with peers). Finally we account for debt and pension liabilities at book value.

Upside risks: Continued restructuring/disposals under new management, tightness in German steel markets supports more aggressive price rises, better than expected sale price for stainless, cost cutting surprising to the upside, and elevators margin expansion surprising to the upside.

Downside risks: Elevator margin contraction due to weak Chinese market and slower build out of service network, prolonged decline in global GDP results in extended destocking, breakdown in supply discipline resulting in further price deflation and further increases in Chinese net exports of steel puts additional pressure on prices.

Analyst Certification

We, Jason Fairclough, Cedar Ekblom, CFA and Duncan Simmonds, CFA, hereby certify that the views each of us has expressed in this research report accurately reflect each of our respective personal views about the subject securities and issuers. We also certify that no part of our respective compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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Australia - Metals, Mining & Steel Coverage Cluster

Investment rating	Company	BofA Merrill Lynch ticker	Bloomberg symbol	Analyst
BUY				
	BHP Billiton Ltd	BHPLF	BHP AU	Duncan Simmonds, CFA
	BHP Billiton-ADR	BHP	BHP US	Duncan Simmonds, CFA
	Evolution Mining Limited	CAHPF	EVN AU	Sophie Spartalis
	Fortescue Metals Group Ltd.	FSUMF	FMG AU	Duncan Simmonds, CFA
	Incitec Pivot	ICPVF	IPL AU	Sophie Spartalis
	Independence Group	IPGDF	IGO AU	Sophie Spartalis
	Newcrest Mining Limited	NCMGF	NCM AU	Sophie Spartalis
	Northern Star	NESRF	NST AU	Sophie Spartalis
	OceanaGold	YOGC	OGC CN	Sophie Spartalis
	OceanaGold Corporation	OGDCF	OGC AU	Sophie Spartalis
	Oz Minerals Ltd	OZMLF	OZL AU	Sophie Spartalis
	Rio Tinto Ltd	RTNTF	RIO AU	Duncan Simmonds, CFA
	Whitehaven Coal Limited	WHITF	WHC AU	Duncan Simmonds, CFA
UNDERPERFORM				
	Alumina Limited	AWCMF	AWC AU	Duncan Simmonds, CFA
	Orica	OCLDF	ORI AU	Sophie Spartalis
	Sandfire Resources	SFRRF	SFR AU	Sophie Spartalis
	South32 Ltd	SHTLF	S32 AU	Duncan Simmonds, CFA
	South32 Ltd	XKTPF	S32 LN	Duncan Simmonds, CFA
	South32 Ltd	XMWTF	S32 SJ	Duncan Simmonds, CFA
	Western Areas Limited	WNARF	WSA AU	Sophie Spartalis
RVW				
	Iluka Resources Limited	ILKAF	ILU AU	Duncan Simmonds, CFA

EMEA - Metals & Mining, Steel, Paper Coverage Cluster

Investment rating	Company	BofA Merrill Lynch ticker	Bloomberg symbol	Analyst
BUY				
	Anglo American	AAUKF	AAL LN	Jason Fairclough
	Anglo Pacific Group Plc	AGPIF	APF LN	Jason Fairclough
	Aperam	XPMEF	APAM NA	Cedar Ekblom, CFA
	BHP Billiton PLC	BHPBF	BLT LN	Jason Fairclough
	BHP Billiton PLC	BBL	BBL US	Jason Fairclough
	Centamin Plc	CELTF	CEY LN	James Bell
	Centamin Plc	YCEE	CEE CN	James Bell
	DS Smith	DITHF	SMDS LN	Alexander Berglund
	Eramet	ERMAF	ERA FP	Jason Fairclough
	Gem Diamonds	GMDMF	GEMD LN	Jason Fairclough
	Hochschild Mining plc	HCHDF	HOC LN	James Bell
	Lucara Diamond Corporation	XDVAF	LUC SS	Jason Fairclough
	Lucara Diamond Corporation	LUCRF	LUC CN	Jason Fairclough
	Mondi Plc	MONDF	MNDI LN	Alexander Berglund
	Mondi Plc	XDPMF	MNP SJ	Alexander Berglund
	Nyrstar	XPANF	NYR BB	Jason Fairclough
	Outokumpu	OUTFF	OUT1V FH	Cedar Ekblom, CFA
	Petra Diamonds	PDMDF	PDL LN	Jason Fairclough
	Randgold Resources	RGORF	RRS LN	James Bell
	Randgold Resources	GOLD	GOLD US	James Bell
	Rio Tinto Plc	RIO	RIO US	Jason Fairclough
	Rio Tinto Plc	RTPPF	RIO LN	Jason Fairclough
	Smurfit Kappa	SMFTF	SKG ID	Alexander Berglund
	Smurfit Kappa	SMFLF	SKG LN	Alexander Berglund
	Vedanta	VDNRF	VED LN	Cedar Ekblom, CFA
	Voestalpine	VLPNF	VOE AV	Cedar Ekblom, CFA
NEUTRAL				
	Acerinox	ANIOF	ACX SM	Cedar Ekblom, CFA
	Boliden	BDNNF	BOL SS	Jason Fairclough
	Fresnillo plc	FNLPF	FRES LN	James Bell
	Glencore	GLCNF	GLEN LN	Jason Fairclough
	Glencore	XGLNF	GLN SJ	Jason Fairclough
	Norsk Hydro	NHYDY	NHYDY US	Jason Fairclough
	Norsk Hydro	NHYKF	NHY NO	Jason Fairclough
	Petropavlovsk	PPLKF	POG LN	James Bell
	SCA	SVCBF	SCAB SS	Alexander Berglund
	SCA	SVCBY	SVCBY US	Alexander Berglund
	SSAB	SSAAF	SSABA SS	Cedar Ekblom, CFA
	Thyssenkrupp	TYEKF	TKA GR	Cedar Ekblom, CFA
UNDERPERFORM				
	Acacia Mining Plc	ABGLF	ACA LN	James Bell
	Antofagasta	ANFGF	ANTO LN	Jason Fairclough
	ArcelorMittal	AMSYF	MT NA	Cedar Ekblom, CFA
	ArcelorMittal	MT	MT US	Cedar Ekblom, CFA
	Aurubis	AIAGF	NDA GR	Jason Fairclough
	Ferrexpo plc	FEEXF	FXPO LN	Jason Fairclough
	Salzgitter	SZGPF	SZG GR	Cedar Ekblom, CFA
	Stora Enso	SEOJF	STERV FH	Alexander Berglund
	Stora Enso	SEOAY	SEOAY US	Alexander Berglund
	UPM	UPMKF	UPM FH	Alexander Berglund
	UPM	UPMKY	UPMKY US	Alexander Berglund

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Equity Investment Rating Distribution: Non-Ferrous Metals/Mining & Minerals Group (as of 30 Jun 2017)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	56	50.91%	Buy	23	41.07%
Hold	19	17.27%	Hold	11	57.89%
Sell	35	31.82%	Sell	12	34.29%

Equity Investment Rating Distribution: Steel Group (as of 30 Jun 2017)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	20	58.82%	Buy	11	55.00%
Hold	11	32.35%	Hold	6	54.55%
Sell	3	8.82%	Sell	2	66.67%

Equity Investment Rating Distribution: Global Group (as of 30 Jun 2017)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1550	51.41%	Buy	980	63.23%
Hold	674	22.35%	Hold	410	60.83%
Sell	791	26.24%	Sell	388	49.05%

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Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster*
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

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