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CHAIR OF FIXED INCOME, CREDIT AND COMMODITIES MARKETS

GLENCORE PLC: DECODING A BLACK BOX

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Introducing the Black Box: a snapshot of Glencore

Glencore PLC (from now on also the "Company", "Glencore", the "Giant") is a global merchant, producer and market maker of many commodities, operating over 50 countries through more than 200 offices, mining sites, offshore oil facilities, and other processing facilities all over the world. As the many other commodities players, the Company has its headquarter located in Switzerland – Baar, Canton Zug. Glencore is highly vertically integrated (producing, smelting, refining, processing, and storage/transportation related activities) in many commodities markets (covering 93 commodities).

Why Should We Be Interested in Glencore?

In order to make the reader understand why Glencore is important and why we have decided to analyze Glencore, and not another commodity company, it is beneficial to quickly illustrate how the commodities market is structured, how Glencore operates in this market (and with which facilities) and which are its main sources of income. The commodities industry can be proxied with two main dimensions – (i) sectors and (ii) business lines – which can be split into the following sub-dimensions:

- Sectors: (a) Agriculture (e.g. crops, sugar), (b) Energy (e.g. coal, oil and gas products), (c)
 Non-Precious Metals and Minerals (e.g. copper, zinc), (d) Precious Metals (e.g. gold, silver);
- (ii) Segments: (1) Industrial activities (e.g. production, processing), (2) Marketing activities (e.g. logistics, delivery), (3) Financial Trading (e.g. contango, rolling futures).

Hence, if you have ever heard of Glencore you must have heard something like "Glencore is the most globally integrated and diversified player in the commodities industry", which sounds very imperious but it cannot be deeply understood till someone puts you in front of the data. Here are the data:

GLENCORE	Agriculture	Energy	Metals&Minerals
	(a)	(b)	(c+d)
Industrial activities (e.g. production, processing)	Handling of originating and handling of grain, pulses, sugar rice, cotton vegetables oil, protein meals and biodiesel	Coal Mining and oil orductions	Mining activities for Copper, zinc, lead, nickel, ferroalloys, alumina&aluminium
Marketing activities (e.g. physical trading)	Processing and marketing grain, pulses, sugar rice, cotton vegetables oil, protein meals and biodiesel	Supplying and shipping thermal coal (utilities), coking coal (steel producers), oil, refined products and natural gas	Copper, zinc, lead, nickel, ferroalloys, alumina&aluminium and iron ore
Financial	Represents a small	Represents a small	Represents a small
Trading	percentance of	percentance of Glencore's	percentance of Glencore's
activies (e.g.	Glencore's business,	business, whose	business, whose
derivatives	whose maximum VaR _{5%} is	maximum VaR5% is about	maximum VaR5% is about
strategies)	about US\$100	US\$100	US\$100

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The grid above is showing how Glencore is operating at each single step of the supply chain of each sector of the commodity industry, from mining activities to the physical and pure trading activities. Moreover, as the chart below illustrates, Glencore is the only commodities player which is significantly present on each single square of the above illustrated grid, confirming the importance of Glencore not only with respect to its role in the international trade, but also with respect to its role in shedding (some) lights on the dynamics of an industry which, even though is one of the most relevant systematic risk generator, often results a black box for many people outside the industry.



Hence, our attempt to understand the features of Glencore is somehow equivalent to understand the dynamics of a central, yet opaque, market which is often in the limelight of the news and despite that is never deeply understood from people outside the industry.

In order to do so, we did not follow a top-down approach, but we have focused mainly on a bottom-up approach, which first led us understand Glencore's business model, by analyzing each square of the previous grid, and then enabled us to give a name, a number and a value to its strategic tangible and intangible assets of each segment. However, disaggregated data are not easily available, especially just using Glencore's annual reports, which are not first in class for transparency and disclosure. Hence, we had to collect data (all the references and sources are provided in "References" and "Sources") from journal articles (e.g. Financial Times articles), Compass Maritime weekly reports, daily data available on a Bloomberg terminal, Antitrust documents (European Commission, Case No. COMP/M.6541 – GLENCORE / XSTRATA), filings and investor presentations of Glencore and of Glencore's main peers (e.g. BHP Billiton, Anglo American, Rio Tinto, Vale, Noble Group). On the next page, we provide a concise outline of the main findings, which will be thoroughly illustrated in the following paragraphs:

Main Assets

Extraction and Production: GE Wandoan CCS (Coal extraction and storage); Open Pit and Underground Mines



Storage, Blending, Processing and Refining: Metals Refineries; Global Refineries



Logistics and Delivery: Bulk Carriers (*portarinfuse*); Tankers (*petroliere*); Coal Rail Assets (e.g. Grail)



Note: Re-elaboration of outlines available in Glencore's annual reports

Strategic Assets: extraction and production

Glencore's resources in 2016 were spread out over 250 mines located in 36 countries, covering all the continents, and amounted to about 75,000 metric tons (Mt). The resources were mainly concentrated in Africa and Oceania respectively for base metals and coal. Overall, Glencore's resources breakdown by areas was as follows: (i) Oceania (25,185 Mt), (ii) Central and South America (21,999 Mt), (iii) Asia (3,625 Mt), (iv) North America (1,953 Mt) and (v) Europe (39 Mt). Furthermore, The resources controlled by Glencore were mainly Metals & Minerals products, representing 66% of total Glencore's resources in 2016. In terms of volumes, Glencore's resources segment breakdown was as follows: (i) Metals & Minerals (49,668 Mt), (ii) Energy (25,321 Mt). A detailed breakdown follows:



Source: Re-elaboration of fragmented data available on Bloomberg terminal

Glencore's reserves in 2016 also were spread out over 250 mines located in 36 countries. The reserves were concentrated in "Central and South America" and in Oceania respectively for base metals products

and coal related products, which also represented the majority of Glencore's controlled reserves. Below we provide a more detailed breakdown by product of Glencore's reserves in 2016:



Strategic Assets: storage, blending, processing and refining

Glencore also owns many core midstream assets in strategic locations, which enable Glencore to create a perfectly structured and integrated network with which the Company transforms its inputs into marketable products ready to be supplied to its customers all around the world. The combination of these assets, used for storing, blending, processing and refining commodities, are critical to optimize the Company's marketing activities and are those assets, usually not under the radars, which set up Glencore's integration synergies. As already mentioned, these assets are located in strategic spots, which are easily connected to Glencore's main downstream assets and easily reachable from its logistics facilities. Below we provide an outline of the major findings on storage and smelter facilities:

- Australia: (i) GE Wandoan CCS coal storage facility in Queensland, Mount Isa Smelter copper and smelter in Queensland;
- **Canada**: (i) Sodbury Smelter copper and nickel smelter in Ontario, (ii) Horne Smelter in Quebec, (iii) Kidd Creek Smelter copper and zinc smelter in Ontario, (iv) Belledune Smelter lead smelter in New Brunswick, (v) Gaspe Smelter copper smelter in Quebec;
- Chile: Altanorte Smelter copper smelter near the port of Antofagasta;
- Germany: Nordeanham Smelter lead smelter in Lower Saxony;
- Philippines: Bantagas Terminal 200 km global storage facility accessible from the sea;
- United Arab Emirates: Chemoil Corp Fujairah Terminal 330 km global storage facility accessible from the sea in the Oman Golf;
- United States of America: (i) Vancouver Smelter aluminum smelter in Washington, (ii) Hawesville Smelter aluminum smelter in Kentucky;
- Zambia: Mufulira Smelter copper smelter in Copperbelt.



Additionally, Glencore owns 46 refinery facilities, whose main features are outlined below:

Strategic Assets: logistics and delivery

So far we have illustrated assets which are part of downstream and midstream Glencore's activities, such as mining, processing, optimizing, refining and so on. However, Glencore's strategic assets related to its logistics and commodities delivery are the real difference maker between Glencore and an average mining players. These assets are essentially what we can think as the essential infrastructure of the international trade, which is daily managed and operated by Glencore and the other commodities traders.

In 2015, Glencore's in its notes to the financial statements specify that the Company mainly traded iron ore, alumina/aluminum, copper and zinc, which amounted for more than 80% of Glencore's total marketing volumes¹. What was not disclosed on Glencore's annual reports, or elsewhere, was physically how Glencore did its marketing activities. Indeed, Glencore's annual reports do not go into these details, just mentioning that the Company leases and owns shipping assets (e.g. vessels) and haulage asset (e.g. locomotives).

After a bottom-up research, which had as main sources Bloomberg and marine traffic trackers databases², we have been able to come up with an estimation of Glencore tradable volumes, which was about 2.1 million tons of products potentially transported in each voyage (about the 0.0002% of what

¹ Marketing volumes in 2015 were in total about 67,500 metric tons (Mt).

² First, we used a Bloomberg function called "BMAP", which plots energy and mining assets, and allows you to filter for the results and look for the assets with a specific owner. Once we filtered for Glencore, we were able to write down all the IMO number (International Maritime Organization) of each vessel owned by Glencore. Then, we inserted these unique identifiers in official maritime tracker databases to trace Glencore's vessels main route.

can be transported in a year by the entire global merchant fleet, i.e. 1.4 billion metric tons³). Also interesting was to find the main routes that Glencore has taken for its marketing activities during 2016. In particular, Glencore's delivery activities were realized via sea, mainly by bulk carriers and tankers, and via land, mainly by wagon locomotives used especially in Australia for transporting internally coal related products. It is also interesting to see that Glencore's main routes basically involved the entire globe, with Asia playing first fiddle with its 45% weight⁴. Even more interesting was to track Glencore's fleet from their departure to their destination to understand which products, and in which amount, were going from a location to another. Below we provide detailed information about our findings in terms of most tracked routes with their corresponding capacity expressed in DWT⁵:



Furthermore, in order to have some reference points, we have done the same analysis for other commodities players. Small competitors hardly own fleet that can be used to trade, since vessels such Aframax Tankers or Capesize Bulk Carriers, which are owned by Glencore, represent an extremely expensive investment (our estimation for Glencore's fleet and locomotive assets, using data available in vessels sales report and last market offer for Glencore rail assets, is about US\$ 1.5 billion). Therefore,

³ Source: "The Merchant Fleet: A Facilitator of World Trade", by DNB Bank AS, 2012.

⁴ The overall ranking is as follows (percentages have been rounded): 45% Asia, 15% Oceania & Indonesia, 14% Africa, 13% Americas, 8% Europe.

⁵ We cannot know exactly effectively how many tons of the products were transported from a spot to another. Our numbers and estimations are based on an assumption of constant full capacity transportation, using vessels' deadweight tonnage (DWT) as reference point. Note that DNT is a measure of a vessel's weight carrying capacity.

some players, Glencore included, lease vessels for their marketing activities. However, we found that Glencore's main peers, such as BHP Billiton, Rio Tinto, Vale and Anglo American, do own part of their fleet. Anglo American's and BHP Billiton's owned fleet are by far smaller than Glencore's owned fleet. On the contrary, Rio Tinto and Vale, even though they own less numerous fleet, both potentially have higher capacity in terms of "full" tradable tons. Below we provide more details about our findings:

PEERS	Vessels Owned Tracked	Overall DWT	Main Routes/Destinations
GLENCORE	Glencore's owned tracked fleet is composed by 33 vessels, mainly made of VLCC, Aframax, Panamax, Long Range 1 and Capesize Bulk Carriers	2,010,148 tonnes	- Sao Luis (Brazil) – Richards Bay (South Africa) - Anyer (Indonesia) – Ulsan (South Korea) - Capetown (South Africa) – Lome (Togo) - Jeddah (Saudi Arabia) – Fujairah (Emirates)
::: bhpbilliton	BHP Billiton's owned tracked fleet is composed by 7 vessels, mainly made of tankers, offshore processing ships and support vessels	480,693 tonnes	- Kobe - Osake (Japan) - Nogoya (Japan) - Indian Ocean - Lennox (Canada)
RioTinto	Rio Tinto's owned tracked fleet is composed by 17 vessels, mainly made of bulk carriers and oil carriers	2,412,336 tonnes	- Gladstone (Australia) - Zhoshan (China), Caofeidan (China) - Luojiman (China), Jingtang (China) - Muroran (Japan)
VALE	Vale's owned tracked fleet is composed by 15 vessels, mainly made of ore carriers and bulk carriers	3,568,268 tonnes	- Donjikakou (China) - Sao Luis (Brazil) - Subic Вау (Philippines) - Pegba (Singapore)
ANGLO AMERICAN	Anglo American's owned tracked fleet is composed by 3 vessels, mainly made of bulk carriers	256,438 tonnes	- Ponte Delgada (Portugal) - Praia Mole (Brazil) - Itaguai (Brazil) Source: Re-elaboration of fragmented

data available on Bloomberg and official maritime trackers

Strategic Assets: conclusions

In the previous paragraphs, we wanted to shed some lights on the accounts of the Company's balance sheet which represent the breeks of Glencore's business model. These findings gave a number and a name to Glencore's main strategic assets, which are not directly disclosed in its financial statements. We have understood how Glencore represents a relevant portion of the global mining and trading commodity infrastructure, which makes international trades possible every day. From the analysis we have illustrated, we are already able to highlight Glencore's common focuses at each level of the supply chain in terms of products (copper, coal, iron ore, zinc and lead), and in terms of geographies (Asia, Oceania and South America). However, we want to underline that there are other facilities, we did not focus on, which are used by the Company in its operations. These facilities are not directly owned by Glencore's business lines. In this respect, we point out Glencore's management of a significant share of London Metal Exchange (LME) warehouses. These facilities are not directly owned by Glencore, but are managed by Pacorini Metals, a Glencore's subsidiary (100% ownership) warehousing company.

Products and Business Lines

As already mentioned, historically Glencore's activities ranged from production to transportation of oil products, metals, minerals, coal. Recently, Glencore has extended its business to agricultural products

and got more related with food processing industries as well. However, still today metals and minerals, such as aluminum, coal, copper, ferroalloys (used to produce steels and alloys), lead, and nickel, represent Glencore's main focus (above all coal and copper). Table "N.1" summaries Glencore's main products, while Table "N.2" illustrates the main Glencore's services:



Metals and Minerals

The following graphs and tables illustrate the company's main producing assets and their locations for the division Metals and Minerals:



To complete the blocks, we should add Mauritania and Republic of Congo, since Glencore is now studying the feasibility of the new iron ore projects Askaf and El Aouj (Mauritania), and Zanaga (Republic

of Congo). The production level of the above mentioned commodities is extremely high. Table N.3 shows some numbers from the end of 2014, which are likely to give the reader a better idea of the size of this company:



Table N.3

annual reports

These volumes made report in 2014 US\$ 63.9 billion revenues for the Metals and Minerals division, which accounted for almost 30% of Glencore's total revenues, which went significantly down in 2015, given the lower demand in particular for these products (e.g. copper and coal related products) and the consequential "forced" lower production. The most significant drops were related to copper production, which went down to about 1.5 Mt, mainly due to the temporary stop of production activities at Katanga and at Mopani, and coal production, which went down to 131.5 Mt mostly for the strong decrease in Chinese imports of thermal coal in 2015 due to lower economic growth, and relevant deviations from their manufacturing activities which characterized the Chinese economy for the several previous years⁶.

Energy Products

The Energy Products are mainly coal, natural gas, crude oil, oil products, including fuel oil, heating oil, metallurgical coal, steam coal and coke. These products are sold by Glencore to several governments and industrial customers (among which different oil companies). The main products of this division are coke and coal, which are produced in more than 30 mines in South Africa, Colombia and Australia, with

⁶ These findings are based on what was disclosed directly by Glencore in its notes to its 2015 financial statements. Here, we just mentioned these factors. For more details see next paragraph "Luck or Skills: the BRICS cool down".

a relevant focus on the latter which was even more intensified after the merger between Glencore and Xstrata. Moreover, Glencore owns other strategic facilities, such as ports, plants, vessels and tankers, which are used to store and transport these products (mainly coal and oil/chemical related products). In the FY2014, Glencore produced around 146 million tons of coal (coking, semi-soft and thermal), generating revenues for US\$ 131.2 billion, which accounted for almost 60% of the total revenues.

Agricultural Products

The Agricultural Products which are in Glencore's agricultural portfolio are the following: barley, biodiesel, corn, ethanol, meals, sugar, oilseeds and edible oils. Also for this division, Glencore owns several facilities which are used for the storage, farming, processing, handling and transporting, which is done for its main clients as the processing industry, government's entities and local importers. In FY2014, Glencore produced 10,863 kt of agricultural products, generating around \$US 26 billion revenues, roughly the remaining 10% of the total revenues.

Income Statement Breakdown

In the previous paragraph, "Why Should We Be Interested in Glencore?", we have focused on Glencore's strategic assets, which represent the "stock level" of Glencore's financial statement. We now move to give a detailed breakdown of Glencore's revenues, which represents the "flow level" of Glencore's financial statements. Later in the next paragraphs, we also focus on other accounts, which are more likely to represent Glencore's profitability, such as EBITDA and EBIT. In this paragraph, we just want to complete Glencore's big picture, by analyzing the first input of the Company's income and cash flow statements. As we have done earlier for the stock dimensions (resources, reserves, logistics facilities and other strategic assets), in the next tables we will provide and illustrate some breakdowns in terms of Glencore's segments served and geographies covered. In this way, we can complete Glencore's overall mapping of what can be considered the main exposures of the Company. Table N.4 illustrates the time series of Glencore's revenues breakdown by its macro segments and how in the FY2015 Glencore's segments (Energy, Metals & Minerals and Agriculture) have contributed to the total revenues (respectively 47.3%, 39.5% and 13.1%). More interestingly the table is also showing a clear pattern in the sources of revenues, which was mainly driven by the increase in the revenues coming from the agricultural segment and the metals and minerals segment. Especially for the latter, a significant increase started between 2012-2013 (25%-27%), year of the merger with Xstrata, to 2015 (39%-40%). The time series (to compute all the time series presented in the following tables we have used Bloomberg as main source, since it provides longer time series than Glencore's reports do) are showing a clear pattern in Glencore's revenues, which is oriented to balance the weight of the revenues of each Glencore's segment:

Date	Energy Products	Metals & Minerals	Agricultural Products
Semester		<u>% on Total Revenues</u>	
2007S1	56.17%	37.88%	5.95%
2007S2	61.6%	30.26%	8.11%
2008S1	64.2%	27.14%	8.63%
2008S2	64.79%	26.19%	9.02%
2009S1	57.84%	32.98%	9.18%
2009S2	59.27%	33.49%	7.25%
2010S1	61.88%	31.80%	6.32%
2010S2	61.40%	30.61%	7.99%
2011S1	63.02%	27.38%	9.60%
2011S2	62.75%	28.46%	8.79%
2012S1	63.43%	27.82%	8.75%
2012S2	64.29%	25.02%	10.69%
2013S1	58.62%	27.09%	14.29%
2013S2	60.99%	27.38%	11.63%
2014S1	61.75%	27.35%	10.90%
2014S2	55.99%	31.80%	12.21%
2015S1	49.48%	36.87%	13.65%
2015S2	47.34%	39.51%	13.15%

Table N.4

Table N.5 and Table N.6 illustrate the time series of the geographical breakdown of Glencore's revenues from 2007 to 2015 and how in the FY2015 Glencore's activities were located in the Americas, Europe, Asia, Africa and Oceania (respectively 19.5%, 32.2%, 37.7%, 3,7% and 7%). Here, we can spot another interesting pattern, which shows how Asia and Oceania has clearly increased since 2012 (year of the merger with Xstrata), with an overall increase of 23% (Asia from 20% to 37%, Oceania from 1% to 7%).

Date	Asia / Africa / Oceania	Europe	Americas
<u>Year</u>	<u>% on Total Revenues</u>		
2007	29.66%	40.13%	30.20%
2008	30.76%	42.49%	26.74%
2009	38.52%	35.39%	26.07%
2010	40.05%	32.91%	27.02%
2011	37.60%	37.77%	24.62%
2012	29.49%	50.78%	19.72%
2013	42.64%	33.85%	23.49%
2014	46.68%	31.93%	21.38%
2015	48.47%	32.17%	19.34%

Table N.5

Date	Asia	Oceania	Africa
Year		<u>% on Asia / Africa / Oceania Aggregate Rev</u>	<u>venues</u>
2009	29.22%	0.76%	8.54%
2010	29.53%	0.88%	9.63%
2011	25.65%	0.91%	11.03%
2012	20.64%	0.95%	7.88%
2013	29.16%	2.45%	11.03%
2014	39.18%	3.79%	3.71%
2015	37.71%	7.08%	3.68%

Table N.6

Table N.7 illustrates the breakdown done by line of business: industrial activities and marketing activities. In the FY 2015 the latter represented 79% of Glencore's total revenues. Even though 79% is a clear majority, remember that Glencore started in the 70's as a pure commodity trading house. The time series once again are showing us another interesting pattern, which is linked to Glencore's vertical integration process started between the end of the 80's and the beginning of the 90's (when Glencore bought an US smelter (1987), a Peruvian mine (1988) and its first stake in Xstrata (1990)), and ended recently after completing the merger between the Company and Xstrata.

Table N.7

Conclusions

In conclusion, we have spotted three main patterns which characterized Glencore business evolutions on three different levels: (i) segments; (ii) geographies; and (iii) business lines. Even though it is not the goal of this chapter, here we want to introduce briefly the topic of Glencore's distress and provide what can be considered a link between each of these processes and the default scenario nearly touched by Glencore between 2014 and 2015 (for a detailed analysis refer to the last chapter "Post – Merger: Glencore's restructuring"). For the moment, it is sufficient to say that Glencore went through really hard times between 2014 and 2015, when the Company basically risked to destroy each pence of its equity market value (incurring in a drop which led Glencore's share price plunge from its IPO opening price of 558 pence in 2011 to about 80 pence – 90 pence in 2015). Why are we talking about this now? Simple, we believe that the three processes illustrated above had a significant role in making Glencore getting closer and closer to a default scenario. Below we provide an outline, which summarizes for each of these processes its description and its potential link to a default scenario:

• <u>Dimension</u>: segment

<u>Process</u>: Glencore was involved in a long diversification process, which turned a "simple" commodity trading house into the most globally diversified player in the market, with a coverage of more than 90 commodities;

Link to default: a priori diversification is everything but something can be considered harmful in term of default probability, since it is a process that enables any company to be less correlated with single factors/industries thus reducing the risk of default triggered by the collapse of specific factor/industry. However, this is not a normal case. Glencore did diversify its business but the diversification process involved only sectors which are included in the same market, i.e. the commodities market. In 99% of the cases, this kind of diversification can still give a partial beneficial effect, given the positive correlation – yet not unitary – between these sectors/subsectors. The problems come when a company has to incur into the 1% of the cases, the "black swan" of the commodities market, when the agricultural sector, the energy sector, the minerals and metals sector all collapse at the same time. Unfortunately for Glencore, the more unlikely scenario is exactly what happened;

• <u>Dimension</u>: geography

<u>Process</u>: in its history Glencore has been more and more "Oceania and Asia intensive". Indeed, firstly Glencore's trades have been year-by-year more concentrated in the Asian market, secondly Glencore went through an extensive process, started in the 90's with Glencore's first acquisition of a stake in Xstrata (a big size mining firm mainly operating in Australia, refer to the chapter "The Merger: Glencore & Xstrata" for further details), which led Glencore to merge with Xstrata and to be strongly exposed to the Oceania's economies, which in turn are extremely exposed to Asian countries economic health. This is especially true for China, since the "red dragon" alone accounts for about 20% of the thermal coal exported from Oceania;

<u>Link to default</u>: growth of the importance of geographies as Oceania and Asia, in terms of volumes traded, meant higher exposures to Asian developing countries, which, as we will show later, were exactly the countries which triggered the commodity market collapse between 2014 and 2015 (again China played the most important role);

• <u>Dimension</u>: business line

<u>Process</u>: Glencore's business become more and more "industrial intensive", which brought Glencore from being a pure trading house to become the most globally integrated player in the commodity market. Crucial in this process was again the merger with Xstrata and other minor acquisitions which gave Glencore an extremely sophisticated network of mining facilities and other downstream assets;

<u>Link to default</u>: as we early said for diversification, a priori there are not clear cons in starting a vertical integration process. On the contrary, if well managed there are chances to build an unique entity in the mining market, which can benefit from significant synergies by creating a perfect infrastructure, which efficiently links exploration and extraction activities, trading

activities and arbitrage strategies. However, industrial activities are much more correlated to movements of the commodities prices (while a trader is more affected by changes in terms of volumes), since a miner is structurally long on their inventories⁷.

In this chapter, we have focused on Glencore's business model, its characteristics (both looking at Glencore's balance sheet and income statement accounts) and their evolution through time on a three analysis levels (segments, geographies and business lines). The evolution of these features explains a part of what brought Glencore closer to a default scenario. However, this analysis cannot be considered complete without a deep study of the main events through which Glencore went in the last years. In this regard, each of the next chapters is focused on a single event which had a relevant impact on Glencore's history. The events we have selected and analyzed are the following: (i) Initial Public Offering (19th of May 2011), (ii) the merger with Xstrata (2012 – 2013), (iii) the overall restructuring of Glencore (2014 – 2015).

⁷ Even if we assume that Glencore is hedging its long position, this hedge cannot be perfect and it must leave some unhedged long positions on Glencore's commodities inventories (unless it wants to close its mining activities).

The IPO: the birth of a giant

Glencore was founded by March Rich, also known as "the king of oil", in the 70's under the name of Marc Rich & Co AG. In its early days, Glencore was focused exclusively on physical marketing of commodities (mainly focused on minerals, metals, non-ferrous and ferrous, and crude oil), and so it was for the entire decade, when the deals carried by the Company were only related to M&A activities meant to enlarge and diversify its marketing business, such as the acquisition completed in 1981 of a Dutch grain marketing firm, which exposed Glencore to the agribusiness sector for the first time. It is only between the end of the 80's and the beginning of the 90's when Glencore started its vertical integration process (just lately ended with the merger with Xstrata) by buying an US smelter (1987), a Peruvian mine (1988) and a stake in Xstrata (1990). At the beginning of the 90's, March Rich was charged with more than 300 years in prison for evasion, wire fraud, racketeering, and trading with Iran during the oil embargo, which basically led Rich to live as a fugitive. The sentence put together with a big fail⁸ of the trading house brought Glencore very close to its default. Hence, in 1994 Rich sold the Marc Rich & Co AG to its management for US\$ 600 million (from that moment on March Rich will be never mentioned by the company neither in public documents, nor in its website). After the Management Buy Out (from now on the "MBO") Marc Rich &Co AG became Glencore, whose meaning and origin are still unknown⁹. In 90's Glencore continued its expansion at the mining level by buying its first stakes in what today are some of Glencore's main production facilities, such as Prodeco, for coal related products, and Kazzinc, for zinc related products. Then, the third millennium opened the beginning of Glencore's "brightening" process, which started in 2004 with first Glencore issue of public bonds for a total value of US\$ 950 million and it reached its peak in 2011 with the IPO of Glencore, concluding an era of private partnership which led the Company to be valued US\$ 60 billion from its initial value (considering the MBO as the starting point) of about US\$ 0.6 billion, an incredible value creation path (9,900% growth, reached in less than two decades) if compared with average equity market performances, such as S&P500 and FTSE 100 (respectively 102% and 50%).

Glencore pre-IPO: Why Did Glencore List?

In the introduction of this chapter, we briefly explained the processes which brought Glencore from being a small-medium size trading house to a public global commodities giant. However, what is really interesting is to understand why Glencore went public in 2011. In general there are many reasons why

⁸ March Rich invested about US\$ 1 billion trying to control the price of the zinc. However, this strategy did not payoff and yielded a loss of more than US\$ 170 million.

⁹ The main assumption is that Glencore stands for first two letters of the following words: global, energy, commodities and resources.

a company should want to be listed, and here we report some of the most important: (i) sources of capital are much more easily accessible; (ii) cost of capital usually lowers its average value; (iii) the market might trust more a company listed because of the enhanced availability of data, fast accessibility to market values and so on. Anyhow, there must be some reasons to make these points real pros of a listing decision. For instance, it is true that listed companies on average have an easier life in collecting capital, but if a company does not need extra sources of capital it is really unlikely that a private structure which is used to work in a partnership frame for years could be willing to dilute their ownerships and voting rights for some extra capital which is not effectively needed. Therefore, "why did Glencore list" becomes, did Glencore need additional capital? Did Glencore need additional liquidity? If yes, were these needs in line with the executives' interests? What we found made us answer "yes" at each of the previous questions. In the following paragraph, we are going to explain the reasoning behind our "yes".

Did Glencore Need Additional Capital?

As we already said, the answer to this title is "yes". Now let us tell you why. The period that goes between 2002 and 2010 is a period that is characterized by strong shocks on the demand side of the commodities market. The entire world was speeding up its growth both in terms of Gross Domestic Product (GDP) and in terms of industrial production. Most of these growth was driven by Asian developing countries, which kept growing almost with double-digit percentages for about 6 years (especially from 2003 and 2005). The urbanization, industrialization and general development of these countries, and above all the size of these events, came quite unexpectedly for the commodity players, which were not ready for such a shock, being used to a "just-in-time inventory policy". Inevitably, if you put together a supply not ready to adapt to new sizes of demand and a demand which is growing at double-digit rates, the only possible result is a significant increase in commodities prices, which is exactly what happened. For many of the commodity players this background was a once in a life train and many of these players, some of them sooner and some later, did everything was possible to accommodate the upturn. If what were are saying is correct, then we would expect to find the following indicators:

- Steadily growing assets to support higher production levels: growing delta assets;
- Higher percentage of non-current assets on total assets: growing ratio between non-current assets and current assets;
- Higher capital intensity: a higher "Capital Expenditures (CAPEX) on number of employees" ratio.

The charts provided on the next page tell us exactly this story. Glencore's main peers (Vale, BHP Billiton, Rio Tinto and Anglo American) between 2002 and 2010 put great effort in growing their asset base, increasing the percentage of non-current assets, especially intensifying their investments in intangible assets (such as software and licenses) and significantly enhanced their capital intensity (see the in the Appendix "The IPO: the birth of a giant" for data referring to the overall market):



Ion-current assets (%) 🛛 Total Assets 🗕

Non-current assets growth (%)



Peer **Total Intangible Assets** 7000 2006 – 2012 CAGR 6000 5432 5000 41% **S** In 4000 3000 2000 683 1000 2009 2010 2011 2012 2013 2014 2006 2007 2008 2015 Softwares&Licences 2500 2000 2007 -2012 CAGR bhpbilliton 1500 53% 1000 500

2012 2013 2014 2015

0

2007 2008 2009 2010 2011



Source: Re-elaboration of data available on Vale's, BHP's, Rio Tinto's and Anglo American's notes to financial statements







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It is important to note that all these investments were made before Glencore's IPO, which took place only in 2011. Now imagine you are the CEO of Glencore. Incredible double-digit growth rates in the market, many macroeconomics indicators (e.g. GDP, industrial production, inflation) saying you are in the middle of an upturn, steadily higher growth in demand for commodities especially coming from the unbelievable process of growth of the Asian developing countries. Then, add that all your biggest mining competitors, which at that time were all listed, have proved that they were serious about trying to accommodate the upturn in the market by making significant investments in terms of non-current tangible and intangible assets. Given this background, we are quite sure that many of you would have thought to try to do the same, following your competitors, accommodating new levels of demand and growth in order to not be left outside alone. Finally, for those of you who were positive on following your competition, now it is time to actually follow the market and make several investments in terms of marketing infrastructure, production plants and so on. However, these investments are really expensive and Glencore at that time had just US\$ 1.4 billion liquidity in its pockets. Hence, the problem becomes "where do we get the money". Definitely, selling less strategic assets in order to buy more strategic ones could be a possibility, but the point is not to have only better assets, here the point is to make investments to enable Glencore to have higher levels of production and to build an infrastructure which is able to handle higher volumes and a more globalized international trade market. If we take into account that Glencore already had a relevant portion of debt, higher than anyone else's in the market, and that Glencore's brand at that time is increasing in value each single day, you might end up with just three words: initial public offering.

Besides the fact that we cannot know whether Ivan Glasenberg, the actual Glencore's CEO at that time, really had this pattern in mind, we know that Glencore did list in 2011 and we have data that seem to confirm our beliefs. Indeed, the data are confirming that:

- Glencore was already trying to increase their assets between 2008 and 2010, but Glencore started growing its non-current assets at its peers' level between 2011 and 2013;
- Even though Glencore did not adopt IAS 38 until the year of its IPO and therefore we have a limited time series of intangible asset accounts starting from 2011, we can still see an incredible growth in Glencore's investments in intangible assets (380% 2011 – 2013 CAGR), whose main accounts were warehousing, port rights, licenses and software expenses;
- Glencore's intensity of capital steadily increased since 2009 until 2013, which again looks very
 familiar and similar to the process through which most of Glencore's main peers had gone
 before Glencore (some of them, e.g. Vale and Rio Tinto, 4-5 years before Glencore and other
 later, e.g. BHP Billiton, just few months before Glencore).



For more detailed observations refer to the graphs which are presented below:

Source: Re-elaboration of data available on Glencore's notes to its financial statements

CAPEX/Personnel Costs

2011

2012

2013

2014

■ CAPEX/# of employees and contractors

2015

2009

2010

CAPEX/Provisions

In conclusion, the graphs above are a clear proof of our assumptions. Hence, it is plausible to state that Glencore went public in 2011 in order to have a faster and easier access to sources of capital which are necessary to go through any sustainable growth in terms of volumes produced and traded. Was this the only reason? Absolutely not. Definitely, there were at least two other reasons to go public at that time:

2009

2011

2012

CAPEX/Personnel Costs

2013

2014

2015

• To get enough liquidity for the planned merger with Xstrata: the merger with Xstrata, as we will see in next chapter "The Merger: Glencore & Xstrata", was an all equity merger, i.e. no

additional liquidity was necessary for the acquisition of Xstrata. However, this liquidity was necessary to handle Xstrata financial debt. Indeed, Glencore itself already had a relevant exposure to financial debt (about 104% book leverage¹⁰), and the acquisition of Xstrata meant also the acquisition of Xstrata's financial debt, which was very substantial as well (about 40% book leverage, with a US\$ 17,407 million¹¹ of net financial debt);

As a cash out strategy for some of Glencore's investors: Glencore was sold from Marc Rich, its founder, in 1994 to its management via a management buy-out for about US\$ 600 million. Glencore's equity was officially valued at a range of 480 pence – 580 pence per share, which put together with the numbers of share issued at that moment (and to be issued for the IPO) gave an expected equity market value of about US\$ 60 billion. A 10,000% return, or a 34% CAGR, over 16 years is something way above any a priori imagination in any type of investment. Moreover, initial public offerings, mergers and acquisitions are the most common forms of exit strategies for investors, which in this case were Glencore's employees. Even though just few of them decided to cash out their shares¹², the IPO in few hours made 500 Glencore's employees millionaires and some of Glencore's executives, Ivan Glasenberg included, billionaires.

The IPO: let's give it a value

Officially, Glencore went public with an offer of a maximum up to 1,250,000,000 shares, whose offer price range was expected to be between 480 pence and 580 pence. The number of ordinary shares expected to be issued and sold in the Global Offer were 1,132,075,472 of which 893,292,886 new offer shares and 238,782,586 sale shares thus yielding 6,893,292,886 total shares (refer to the footnote "12" for the actual numbers). The IPO initiative raised more than expected with an opening price of 548

¹⁰ Book leverage is defined as book value of financial debt on book value of equity. Glencore before the merger with Xstrata had US\$ 35,526 of financial debt and an equity book value of US\$ 34,173.

¹¹ Xstrata financial statements are available until 2011-2012. The merger with Xstrata, even if was started in 2012, was completed only in 2013. Therefore, these data are not coming from a direct Xstrata's source. However, we got this information from the following statement which was written in the notes to Glencore's 2013 financial statements: "*as at 31 December 2013 increased to US\$ 35,810 million from US\$ 15,416 million as at 31 December 2012 of which US\$ 17,407 million of the increase was due to the debt assumed on acquisition of Xstrata and US\$ 2,872 million related to the net additional funding requirement in excess of FFO required to fund primarily the various ongoing expansion activities".*

 $^{^{12}}$ In the global offer of shares (1,250,000 shares), only 261,026,766 shares were available by the selling shareholders.

pence¹³. In this paragraph, we want to understand which assumptions, in terms of numbers, which could have made investors evaluate Glencore at a higher price than the expected official Glencore share price, whose valuation in turn we believe, as the time has proved just few months later, was already "upward skewed". Indeed, if we compute the average closing price in the following seven months we get a share price of 436 pence, which is far below the floor of the expected price range (480 pence).



Source: Bloomberg terminal

Ironically, Glencore IPO opening price turned out to be Glencore's maximum share price so far. Thereafter, its share price, on average, kept falling each year more and more, dropping to 400 pence by the end of 2011 and reaching its bottom price (80-90 pence) in 2015.

In order to check which assumptions were in the mind of the investors/market, we decided to run a discounted cash flows (DCF) valuation. However, we want to underline that our exercise was not to try to give a value to Glencore. Our main goal was to build a "valuation box" with some standard corporate finance tools, to put in this box some reasonable assumptions, which will be detailed in the next sub-paragraph, and to make some sensitivities on the most uncertain and "subjective" variables which usually are the difference makers in a valuation, such as the expected growth of the revenues for the mid-term. In this way, with a backward engineering approach, we can see implicit values of the average investor estimation of interesting features in terms of the expected return (e.g. 5 year expected revenues growth, long term growth) – risk (e.g. cost of capital) profile.

Backward Engineering via DCF Valuation

Our assumptions are really standard hypotheses, which are commonly used in practice to price the equity of a firm. Most of our proxies are based on business variables, such as Glencore's historical performances or the evolution of Glencore's main listed peers, and on external variables, such as

¹³ Very simplistically, Glencore assumed that Glencore's expected share price was a simple average between the extremes of the offer share price range, i.e. 530 pence.

regulations (e.g. emissions regulation) or macro-variables (e.g. inflation targets). All the main assumptions, and their evolution throughout the estimation period, are summed up in the outline below. Some others standard assumptions, which are not provided in the outline "Main Assumptions".



Main Assumptions

are for example: (i) Glencore tax expenses: Glencore actual taxes paid in the 3 years prior to the IPO have been lower than the official Swiss corporate tax rate in 2011 (18.31%). Since it is almost impossible to forecast the actual tax rate for each year in the medium-long term, we just considered, as it is done in the practice, figurative tax expenses for E2012 till E2015 (tax expenses were computed by applying 18.31% on the Earning Before Taxes accounts) and the average previous years actual tax rate for E2011; (ii) Glencore's beta: we have used a unlevered-leveraged beta approach to compute the implied Glencore's leveraged beta; (iii) Glencore's cost of equity: we have assumed Capital Asset Pricing Model (CAPM) for the estimation of Glencore's cost of equity; (iv) Glencore's cost of debt: we have based our estimation on the Damodaran's coverage ratio iteration approach which is largely used for going public companies (see next page to see how we got to the estimation of the cost of debt).

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CO	verage ratio	Rating	Spread		2012E It	eration 0:	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	lteration 6	Iteration 7	Iteration 8	Iteration 9	teration 10
~~~	. ≤	ţ			Trailing interest coverage ration	0	5.51	4.09	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54
	-100000	0.2 D2/D	12.00%		Credit rating		A1/A+	A3/A-	-A3/A-							
	0.2	0.6 C2/C	10.50%		Credit spread		1.10%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%
	0.7	0.8 Ca2/CC	9.50%		Yield on debt		4.25%	4.90%	4.90%	4.90%	4.90%	4.90%	4.90%	4.90%	4.90%	4.90%
	0.8	1.2 Caa/CCC	8.75%		Interest paid	\$949	£ 1,280.61	£ 1,476.47	£ 1,476.47	£ 1,476.47	£ 1,476.47	£ 1,476.47	£ 1,476.47	£ 1,476.47	£ 1,476.47	E 1,476.47
	1.3	1.5 B3/B-	7.25%		2013E It	eration 0	Iteration 1	Iteration 2	Iteration 3	Iteration 4	lteration 5	lteration 6	Iteration 7	Iteration 8	Iteration 9	teration 10
	1.5	1.7 82/8	6.50%		Trailing interest coverage ration		7.30	5.54	5.41	5.22	5.22	5.22	5.22	5.22	5.22	5.22
	1.8	2 B1/B+	5.50%		Credit rating		Aa2/AA	A1/A+	A2/A							
	2	2.25 Ba2/BB	4.25%		Credit spread		1.00%	1.10%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%
	24.7 22.2	+99/TE9 6666	3.25%		Yield on debt		4.15%	4.25%	4.40%	4.40%	4.40%	4.40%	4.40%	4.40%	4.40%	4.40%
	0. 2 0	3 Baa2/BBB	2.2% %22.2		Interest paid	\$949	£ 1,250.48	£ 1,280.61	£ 1,325.81	£ 1,325.81	£ 1,325.81	£ 1,325.81	£ 1,325.81	£ 1,325.81	£ 1,325.81	E 1,325.81
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	5.5	6.5 A1/A+	1.10%		I railing interest coverage ratio		9.28	64.7	/.04	/.04	/.04	7.04	/.04	1.04	/.04	1.04
	6.5	8.5 Aa2/AA	1.00%		Credit rating		Aaa/AAA	Aa2/AA								
	8.5 100	000 Aaa/AAA	0.75%		Credit spread		0.75%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
					Yield on debt		3.90%	4.15%	4.15%	4.15%	4.15%	4.15%	4.15%	4.15%	4.15%	4.15%
					Interest paid	\$949	£ 1,175.15	£ 1,250.48	£ 1,250.48	£ 1,250.48	£ 1,250.48	£ 1,250.48	£ 1,250.48	£ 1,250.48	£ 1,250.48	£ 1,250.48
	Ĩ	nut														
		har h		(	2015E It	eration 0:	Iteration 1	Iteration 2	Iteration 3	Iteration 4	Iteration 5	Iteration 6	Iteration 7	Iteration 8	Iteration 9	teration 10
Dick Eroo	Init	l ci		_	Trailing interest coverage ration	0	11.36	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18	9.18
					Credit rating		Aaa/AAA	AGa/AAA								
Kate:	Finar	ncial	Initial EBII		Credit spread		0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
3.15% - 10Y	Del	bt:	£ 3.8 B		Yield on debt		3.90%	3.90%	3.90%	3.90%	3.90%	3.90%	3.90%	3.90%	3.90%	3.90%
UK Gov.	£ 3(	0 B			Interest paid	\$949	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15	£ 1,175.15

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Given the set of assumptions and estimations illustrated on the previous pages and in the Appendix, we got to the following three main results, which are the main ingredients to get to estimate Glencore's and any other firm's equity market value:



In order to get to the expected equity value, we just needed to do some standard adjustments to get to operating cash flows. The adjustments that we have done considered only normalized forecastable¹⁴ items as non-cash items included to get to the net income ((i) net working capital, (ii) depreciations and amortizations) and cash items not included to get to the net income (capital expenditures). First, we have deducted/added increases/decreases of net working capital, which is made of inventories, plus receivables, minus payables. Secondly, we have added back depreciation and amortization accounts, previously deducted to get to Glencore's net income. Finally, we deducted capital expenditures, getting the following expected operating cash flows:

Accounts\Year	2011E	2012E	2013E	2014E	2015E
EBIT	5,087	7,477	10,138	12,059	13,264
less: Taxes	(326)	(1,369)	(1,856)	(2,208)	(2,429)
Taxes on EBIT	6.4%	18.3%	18.3%	18.3%	18.3%
EBIAT	4,761	6,108	8,282	9,851	10,836
add: D&A	1,139	1,389	1,625	1,869	2,056
less: CAPEX	(2,366)	(2,974)	(3,581)	(4,236)	(4,917)
less: ΔNWC	(2,709)	(3,037)	(3,397)	(3,790)	(4,215)
UFCF	825	1,486	2,929	3,695	3,760
Discount period	1	2	3	4	5
Discount Factor	93%	86%	80%	75%	69%
PV of UFCF	764	1,280	2,350	2,754	2,603

¹⁴ There are other non-cash items which should be added back, such as increase/decrease in deferred tax liabilities/assets, and other cash items which should be deducted, such as gain on sale assets. However, we did not consider these accounts which are too complicated to be forecasted, since are mainly driven by extraordinary factors/events.

Applying the estimated series of the discount factor (see the Appendix for WACC computations), the discounted series of cash flows plus the discounted value of the terminal value (US\$ 58 billion) gave us an enterprise value of US\$ 68 billion, from which by subtracting Glencore's Q1 2011 net financial position we got an equity value of US\$ 53 billion. Given the number of shares expected after the IPO (6.9 billion), we got a share price of US\$ 7.76, which given the exchange rate of the day before the IPO ( $\frac{f}{1.62}$ ) gave us a share price of £ 4.79. This value is sensible to significant changes in its main inputs. For this reason, we have run a sensitivity analysis on the main sources of uncertainty (coming out of estimation process) as WACC, perpetual growth rate and E2011 – E2015 CAGR of revenues growth:

							E20	)11 -	E2015 CAGR									
		14	4.00%		14.50%		15.00%		16.00%		17.00%		17.50%	18	8.00%	Perpetual Growth Rate	Sha	re Price
	7.1%	£	4.53	£	4.75	£	4.99	£	5.46	£	5.94	£	6.20	£	6.44	2.50%	£	4.31
14/	7.2%	£	4.42	£	4.66	£	4.87	£	5.33	£	5.79	£	6.03	£	6.24	2.75%	£	4.56
~	7.4%	£	4.14	£	4.41	£	4.61	£	5.00	£	5.56	£	5.75	£	5.97	3.00%	£	4.79
C A	7.6%	£	3.91	£	4.16	£	4.36	£	4.79	£	5.18	£	5.40	£	5.62	3.25%	£	5.15
C	7.8%	£	3.78	£	3.99	£	4.18	£	4.59	£	5.04	£	5.23	£	5.46	3.50%	£	5.51
C	8.0%	£	3.61	£	3.79	£	3.98	£	4.38	£	4.80	£	5.01	£	5.21			
	8.1%	£	3.52	£	3.72	£	3.90	£	4.28	£	4.69	£	4.90	£	5.09			

### The Sum of the Parts Valuation

In order to check our discounted cash flow approach, we have used two multiples as control methods: EBITDA and EBIT multiples. We have selected EBITDA and EBIT because of two main reasons:

- EBITDA-EBIT multiples have tracked Glencore's equity market value much better in other years;
- Other multiples do not work properly for Glencore. Indeed, Glencore even if shows similar levels of net income has revenues much higher than its peers shows lower levels. Significantly different levels of margins makes revenues comparison quite pointless in terms of valuations.

In order to make Glencore's equity market valuation reliable, we need listed comparable firms. However, as other giant firms, it is impossible to find a perfect comparable for Glencore. In these cases, it is much better to divide the company into parts, to breakdown their corresponding accounts in terms of EBITDA and EBIT and to find comparable firms for each of the parts, commonly called "pure plays". With all these data and once the multiples of the comparable firms have been computed, it is just a matter of simple algebra. We had two ways to do this computation: (i) split Glencore into industrial and marketing activities, or (ii) divide Glencore into its main industries (Agriculture, Energy, Metals & Minerals). However, there were just few companies which can be considered comparable and at the same time are listed (e.g. Noble Group). Inadequacy of data led us to choose the second way to decompose Glencore. The list of the selected comparable firms¹⁵ are provided in the Appendix, while

¹⁵ These comparable firms were also used to compute Glencore's levered beta, one of the inputs for our WACC estimations (see Appendix, "The IPO: the birth of a giant").

here we provide the numbers for the input, Glencore's industries EBITDA and EBIT breakdowns, median multiples, and the results: Glencore's implied Enterprise Value, implied equity market value (by simply deducting Glencore's net financial position illustrated before) and finally its implied share price range:



Note that Glencore's financial statements report EBITDA and EBIT accounts divided for its three industries. However, these three accounts did not add up to Glencore's total EBITDA and EBIT accounts in the years before the IPO. The rest is usually explained by Glencore's "Corporate & Others" segment. In our valuation, for simplicity, we have assumed that this segment has multiples which are simply the average of Glencore's Agricultural, Energy, Metals & Minerals multiples¹⁶.

IPO opening price IPO £4.80 £5.80 £5.48 <u>Multiples</u> DCF & £4.86 f4.79 £4.18 £5.56 Sensitivity Minimum share Expected share Maximum share price price price

For graphical simplicity, the graph below sums up our results:

¹⁶We have applied the same method also using EBITDA and EBIT accounts from 2010 Glencore's financial statements. The results are presented in the Appendix (see "The IPO: the birth of a giant"). The comparison between the two results is an interesting proxy of Glencore's expected value creation. Using 2010 accounts yielded share prices close to £ 400 pence, which in turn yields an expected value creation of about 80 pence per share.

We can see that each approach (Discounted Cash Flows, EBITDA multiples and EBIT multiples) yielded a share price lower than the opening IPO price. Only the sensitivity analyses show us a window where the opening IPO share price was somewhat possible (in the upper part of the expected ranges). As we said at the beginning of the paragraph, it is interesting to use our valuation tools with a backward engineering approach. Ceteris paribus, and using our set of valuation tools, estimations of Glencore's WACC and perpetual growth rates, to get to Glencore's IPO share price we need a E2011 – E2015 CAGR of [17%-18%], which is significantly higher with respect to our estimation and obviously to what really happened. Interestingly, a E2011 – E2015 CAGR of [17%-18%] was about the 2006 – 2010 CAGR of the mining industry in general and of Glencore's main peers (Vale, Rio Tinto, BHP Billiton, Anglo American). As we already have seen, this unique growth path was mainly driven by sensational growth of demand for raw materials, especially coming from Asian developing countries, good health of BRICS' economies, global high level of GDP and industrial production and so on. However, we have shown how there were some potential evidences of BRICS and Asian developing countries cool down. We tried to account for this potential cool down by reducing our expected growth in revenues with respect to the recent past records of Glencore, Glencore's main peers and in general of the overall mining industry. Moreover, each commodities boom in history, with a similar path of the 2003 – 2011 one, lasted for no more than 3-4 years (as the 1949 – 1953 and the 1972 – 1975 booms). Even if we have to pretend to be right before the IPO, we would be in front of a "2003 – 2010 boom", which was already the longest lasting boom in the history of the commodity market. Hence, we would have had a hard time to believe that 18% CAGR paths were sustainable for other 5 years, which cumulatively means a 12 year lasting upturn.

## **Overvalued or Perfectly Timed?**

Today we can say that the results yielded by the valuations were probably showing the truth, but this does not mean that Glencore was clearly overvalued. On the 19th of May 2011, Glencore was considered one of the diamonds of the commodities market. Therefore, far be it from us to say that Glencore was overvalued. However, it is clear that Glencore's executives perfectly timed the initial public offering at the overall peak of the market. The graphs presented on the next page well illustrate the reasons which led us to consider the IPO perfectly timed. Each graph shows one of the three commodities sectors: (i) Agriculture; (ii) Energy; (iii) Metals & Mineral (which also includes precious metals for simplicity). As it is clear from the graphs, basically each sector reached its historical peak between 2008 and 2011, in particular Metals & Minerals and Agriculture indices which reached their peaks exactly around mid-2011. In order to show how the values of those indices have never again came close to mid-2011 values, we included in the graphs their maximum drawdown and their running maximum at each observation¹⁷.

¹⁷ These variables are defined by formulas which we illustrated in the Appendix (see "The IPO: the birth of a giant").



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## Luck or Skills?

Now it should be clear that Glencore's initial public offering was perfectly timed. However, it is still interesting to understand whether, at that time, it was possible to know that the 19th of May 2011 was the perfect timing, or whether they were just lucky enough to go public at the right time.

## Luck or Skills: Glencore fundamentals

In order to do so, the only way to understand whether Glencore could have grown even further is to analyze its business fundamentals, i.e. the external "inputs" which can make Glencore's revenues grow or decline. Hence, we started to look at the Company's financial statements. The first thing we have done was to breakdown their revenues and EBIT accounts into three pieces corresponding to their segments (Agriculture, Energy and Minerals & Metals):



Given these results, first we focused our analysis on Glencore's exposure to Metals & Minerals. Indeed, even though energy is representing most of the revenues, Glencore's profitability is mainly generated in the Metals & Minerals segment. Therefore, a significant drop of a price of metals/minerals has a greater impact compared to a drop in the price of energy commodities. Then, we moved to break down these accounts even further to be able to focus on specific products. If the previous breakdown was easily available in Glencore's financial statement, this was not as easy and it required a collage work by putting together the information of Glencore's financial statements (mainly volumes produced), Bloomberg articles¹⁸ and Glencore's analyst presentations. With these data we have been able to break down even further their industrial exposures by specific products. Furthermore, in order to have a reference point we have used the same breakdown procedure for Glencore's main mining peers. The results are really interesting and illustrate that Glencore has an enormous exposure to copper, thermal

¹⁸ The reference to the articles used follows: (i) Glencore Credit Primer, by Richard Bourke; (ii) Glencore Primer, by Kenneth W Hoffman and Sean Gilmartin.

coal and zinc compared to its mining peers, which have an exposure about three times smaller, as the following pie charts show:



# Source: Bloomberg terminal

Once found the Company's main exposures in terms of products, the following step was to understand how copper, thermal coal and zinc markets work.

#### Luck or Skills: demand driven market and the BRICS role

It is safe to say for copper, thermal coal and zinc markets that they are pretty much demand driven, differently from crude oil and oil related products, whose markets have much more frictions and complications. Hence, we focused on the main demand drivers of these markets. In order to do this, we needed to know which are the main usages of these products and which are the most important net importers. Here, we provide the main results related to their main role in various industries:



#### **Demand driver**

- Building Construction: corrosion resistance, durability, low thermal movement, light weight, recyclability Power Generation and Transmission: copper wire
- Electronic product manufacturing: electric wiring Telecommunications: copper cable Transportation vehicles: [20 kg-45kg] for cars and
- trucks (motors, radiators, connectors, brakes, etc.) Zinc galvanizing: 50% of produced zinc is used to add
- thin layers of zinc to iron or steel to prevent rusting Zinc as an alloy: zinc is combined with copper (to form brass) and other metals to be used in automobiles
- electrical components, and building fixtures Production of zinc oxide: zinc oxide is used in rubber manufacturing and protective skin ointment
- Electricity: Coal-fired power plants currently fuel 41% of global electricity
- Steel: 70% of steel production uses coal (Met Coal) Cement: Cement is made by mixing calcium carbonate,
- silica, iron oxide and alumina into a coal fueled kiln
- Transport: Coal-derived fuels, coal-based electricity, and raw material (steel, cement, aluminium) to build transport infrastructure

Source: Re-elaboration of data available on Glencore's, Vale's, BHP's, Rio Tinto's and Anglo American's notes to financial statements

The outline shows how these three products are crucial for many industries, in which often they are used as main inputs or, in the case of thermal coal, as a source of energy which is necessary to fuel machines, kilns and various devices used in the production process.

As we said earlier, in order to have a complete view of the market we need to know which are the countries representing most relevant copper, thermal coal, zinc net importers. In this way, we can build a grid based on two dimensions (industry and country) and analyze its most relevant squares in terms of demand drivers. Here, we provide the main results related to the countries which play a significant role in the international demand of these three products:



Source: Trademap, a platform which provides for each country the \$ amount of imports and exports related to any tradable product

All findings show a clear two clear common factors: Asia and BRICS¹⁹. In particular, China²⁰ and India alone play a dominant role as drivers of the demand of these commodities. Let us give you some numbers to make you understand the size of the role of these economies in these commodity markets:

¹⁹ BRICS is an acronym that stands for "Brazil, Russia, India, China, South Africa".

²⁰ Just to give an idea in terms of commodity consumption, Chinese 2011 consumption accounted for almost overall 50% of the aggregate global consumption of zinc, lead, copper, nickel and cobalt. Here for the details we quote the information given in the European Commission approval to the Merger: "37% of global zinc concentrate production, 41% of zinc metal production, 62% of lead concentrate production, 44% of lead metal production, 18% of copper concentrate production, 39% of refined copper production, 39% of nickel production, and 32% of refined cobalt production".

Country\Product	Copper	Zinc	Coal	
China	1 st net importer	2 nd net importer	First importer	
	(US\$ 38.3 bn)	(US\$ 1.4 bn)	(292 Mt)	
India	9 th net importer	Top 10 importer	Second importer	
	(US\$ 3.3 bn)	(US\$ 0.44 bn)	(239 Mt)	

Source: Trademap, a platform which provides for each country the \$ amount of imports and exports related

to any tradable product

In conclusion, our findings enabled us to build a grid whose interceptions form what can be considered the main demand drivers of the prices of copper, thermal coal and zinc. On one axis we have the dimension "industry", whose components are the industries turned out to have a copper, and/or zinc, and/or thermal coal intensive production, i.e. "construction", "transportation", "power transmission", "electronic products manufacturing" and "telecommunications". On the other axis we have the dimension "country", whose elements are the most relevant net importers of the three commodities under exam, i.e. in order "China", "India", and "Brazil". Therefore, the growth and the evolution of each block of these dimensions may have a significant impact on the global price of copper, thermal coal and zinc. In the next paragraph, we will show how close is the relation between what happened to these commodities prices and the evolution of blocks of the grid previously illustrated.

## Luck or Skills: the BRICS cool down

The history of the commodities market has been characterized by mainly three booms, which happened in different times but all shared the same three common factors: strong growth in GDP, strong growth in the industrial production and significant positive levels of inflation. If for the first two booms²¹ we have not reliable data for BRICS, we do have them for the last boom started around 2003 and ended around 2011. The data tell us that if OECD countries' GDP was running faster than the previous years, developing Asia countries were flying nearly at double-digit speed, and even if OECD countries' GDP has a bigger weight in computing the global GDP (52% for OECD countries versus 27% for Asian developing countries²²), BRICS Asian developing titans, such as India and China, were moving through their macroeconomic expansion, industrial maturation and urbanization process which are much more copper, zinc and coal intensive than those evolutions of the intangible developed OECD countries. China alone could almost explain the overall double-digit expansion in 2003 – 2008. Indeed, between 2000 and 2005 the Chinese economy was moving about 28% of the overall global oil demand growth, 50% of

²¹ The first commodity boom we referrer to started in 1949 and it ended by the end of 1953, while the second one started in 1972 and it ended in 1975.

²² Source: "The anatomy of three commodity booms", by Marian Radetzki.

the aluminum demand, 84% of the steel demand and 95% of copper demand²³. Therefore, BRICS developing Asian countries swallowed at least twice the demand than developed countries have done in that period, since they not only were in the middle of a raw materials intensive evolution, but also their were growing at a much higher speed compared to OECD countries (around 3% average growth between 2002 and 2005 for OECD countries and about 8% average growth rate for overall developing Asian countries).

Therefore, we now can assume that the fundamentals tell us that there is a strong and direct relation between the economic conditions of the BRICS countries and the commodity market "health". If this is the case, then we must find a significant positive correlation for example between the Chinese imports growth (for copper, zinc and thermal coal) and the change in price of the respective commodities. This result is confirmed by the numbers which illustrate a strong positive correlation²⁴ between the Chinese imports growth and the growth of copper, zinc and thermal coal prices during 2003 and 2011 (e.g. 42% correlation between China copper imports and the copper price series compared with just 2% correlation between US copper imports and the copper price series).

Now that is clear how BRICS, and especially China and India, are main drivers of the copper, zinc and thermal coal prices, we want to understand, by looking at the macroeconomic and industrial background of these countries, whether it was somehow possible to forecast a BRICS' cool down and a potential consequential slowdown in the growth of the prices of the commodities under analysis. In order to do so, we examined each square of the virtual grid previously illustrated, with a specific focus on China, since this country represents what we could define the principal component of the entire grid, i.e. the element which is able to explain much of the variance/information of the entire dataset²⁵. Hence, first we show aggregate data for the aggregate BRICS' and Asian squares, then we provide the results of the analysis separately for the Indian squares and in particular for the Chinese squares.

First, we analyze the main drivers of copper prices. Above all (as we have already explained), the main driver of copper price was copper demand coming from BRICS countries and Asian countries. If we look at aggregate data from 2000 to 2011, we just see an incredible double-digit growth throughout all the

²³ Source: IEA Oil Market Monthly Reports.

²⁴ We used as source for the imports Trademap (http://www.trademap.org), a platform which gives for each country the time series of the dollar amount of imports and exports related to any tradable product.

²⁵ We adapted the definition to fit the metaphor. The proper definition of the first principal component is a variable/object which represent the largest variance of the dataset, i.e. it accounts for the majority of the variability of entire dataset.
years under analysis. Nevertheless, if we break down the entire period into three smaller blocks we can see something really interesting. The charts (see key findings for simplicity) below show that the average between the CAGR of the copper demand of BRICS net copper importer (China, India and Brazil) and the CAGR of the copper demand of the Asia zone is always positive between 2000 and 2011, but it has been decelerating between 2008 and 2011 after an unique growth between 2000 and 2008: (i) 2000 – 2005 CAGR (24.34%), (ii) 2005 – 2008 CAGR (25.71%), 2008 – 2011 CAGR (16.45%). Moreover, the graph "Copper Import: Asia" illustrates how the Asian share of the global copper demand reached its maximum when Asia started having its economic cool down, thus increasing its impact on copper prices.





A similar path is possible to be spotted for zinc demand growth for BRICS net zinc importer (China, India and South Africa) and the aggregate Asia zone. Again, an aggregate 2000 – 2011 CAGR of 11.21% does not leave many doubts about the sign of the health of the zinc demand. However, if you look at the key findings we notice that the average between the CAGR of the zinc demand of BRICS net zinc importer countries and the CAGR of the zinc demand of the Asia zone has been clearly decelerating between 2005 and 2011 after an incredible growth between 2000 and 2005: (i) 2000 – 2005 CAGR (16.24%), (ii) 2005 – 2008 CAGR (4.53%), 2008 – 2011 CAGR (9.50%)²⁶.



Source: Re-elaboration of data available on Trademap

²⁶ We used as source for the imports Trademap (www.trademap.org).

All the graphs and the data we have illustrated so far are related to aggregate data relative to BRICS and Asia. Both of them have two countries in common: China and India. The developing processes of these two countries alone have been able to sustain a steady growth in many commodities prices (in particular for our analysis copper, zinc and thermal coal). In the same way, they were able to make the market collapse when these processes had come to a "temporary end".

For China, we have broken down the period that goes from 1990 till  $2014^{27}$  into 5 pieces (1990 – 1995, 1995 – 2000, 2005 - 2010, 2010 - 2014) and we have analyzed proxy variables both for the economic health of the country (GDP, employment, urbanization) and for the health of copper, coal and zinc intensive industries (energy consumption, telecommunications and transportation).

For India, data were less available and for many industries they were fragmented. For this reason, we decided to focus on the most common proxies for commodity market upturns: high GDP, industrial production (in the graph as "IIP") and inflation²⁸.

#### China Analysis

Macro-variables show a decreasing patter in the health of the country at any level (GDP, employment and urbanization). Overall energy consumption has shown a slowdown and a "coal-oil to natural gas-nuclear, wind" substitution process, meanly driven by lower natural gas price and enhanced renewable generation capacity. Indeed, if we compare CAGRs before 2005 to the 2005 – 2010 CAGR we notice a clear slowdown for oil and coal consumed energy, but a clear increase of the hydro, nuclear, wind and (especially) natural gas consumed energy. Below we provide the graphs that sum up our findings on economic health and coal intensive industries:





Source: Re-elaboration of data available on the databases of the National Bureau of Statistics of China

²⁷ For China data we used as source the National Bureau of Statistics of China, a platform which gives for each year the data related to Chinese macro-variables and data related to many industries, among which we have selected the ones which are more copper, zinc and coal intensive.

²⁸ Following the findings of "*The anatomy of three commodity booms*", by Marian Radetzki.

We can spot the same pattern in copper and zinc intensive industries, such as telecommunications (especially copper intensive) and transportation industries. For the former, all the variables that we have selected are showing a decelerating growth, with some of them reaching a negative growth between 2008 and 2011. The variables which we have selected to proxy the growth of the Chinese telecommunications industry are the following: (i) capacity of long-distance telephone exchanges (expressed in circuit), (ii) capacity of office telephone exchanges (expressed in lines), (iii) capacity of mobile telephone exchanges (expressed in subscribers), (iv) length of copper cable and fiber optics lines (expressed in km) and (v) length of long distance optical cable lines (expressed in km). For the latter, we can see the same "track" in the variables used to proxy the Chinese transportation industry as: (i) number of locomotive railways, for railways, (ii) length of highways and (iii) the expressway for routes.



Source: Re-elaboration of data available on the databases of the National Bureau of Statistics of China

#### India Analysis

Marian Radetzki's paper "*The anatomy of three commodity booms*" illustrates some really interesting findings about the main predictors or contemporaneous evidences of a significant upturn in the commodities market. Briefly, Marian Radetzki shows not only that GDP, industrial production and inflation are positively correlated with the commodity market, but also that high levels of GDP, industrial production and inflation are all common factors to each of the three main commodity booms of the last 70 years (1949 – 1953, 1972 – 1975 and 2003 – 2011). As we mentioned before, since only discontinued data were accessible for Indian industries, we decided to run our analysis on the basis of the findings of Marian Radeztki and use her variables, which instead for India were available for subscribers of "Indiastat", as proxies useful for our analysis. Once more, we can see that the growth of these proxies has been always significantly positive, but if we use our breakdown approach we find that his growth path started decelerating since 2008. Even though for India is less evident that for China and the other BRICS countries, we can still see a decreasing path in the inflation (yet only data until Q1 2011 should be considered) and clear difference in the level of industrial production (IIP) growth between 2004 – 2008 (12.32% average growth) and 2008 – 2011 (5.34% average growth).





Source: Re-elaboration of data available on Indiastat

#### Conclusions

In conclusion, we can say that there were some evidences which could have illustrated a potential cool down of the commodities market, in particular evidences which were coming from BRICS and Asian countries, such as China and India. However, these evidences, which are aggregately reported for simplicity in the outline provided at the bottom of the page²⁹, cannot be considered enough to conclude that this IPO was intentionally perfectly timed in terms of Glencore's equity valuation and in terms of cash out strategy. Why May 2011 and why not end of 2011? A combination of necessities related to the need of new sources of capital (e.g. in order to sustain (i) the strong growth of BRICS countries, (ii) the increase in the demand of the those commodities which Glencore mainly extracts and trades, (iii) the capital intensity evolution of the market, etc.) and the awareness of knowing that Glencore was floating at what potentially could have been the historical peak of the market, led Glencore set its initial public offering in May 2011.



²⁹ The outline sums up all the findings of the paragraph "Luck or Skills" and its sub-paragraphs. These findings were also very useful for the analysis carried out in the last chapter (in which they will recalled) "Post – Merger: Glencore's restructuring".

Ivan Glasenberg, the CEO of Glencore at that time, probably knew that it was the right time to go public. However, there is still a difference between the "right time" and the "perfect time". We assume that the former was in the mind of Ivan Glasenberg and other Glencore's executives. Nevertheless, it is quite unrealistic to assume that Ivan Glasenberg and his crew knew that they were sitting on the highest point of their massive gold pile.

# The Merger: Glencore & Xstrata

## **Pre-Merger**

In the previous chapters, we have already talked about Glencore before the merger with Xstrata. In this paragraph, before moving to the analysis of the merger, we introduce Xstrata pre-merger. Xstrata was founded in 1926 in Switzerland under the name of Südelektra AG with a business model based on infrastructure and energy projects mainly located in Latin America. The relationship between Glencore and Xstrata goes back to 1990's, when Glencore acquired a 34.5% stake in Xstrata's equity and legitimately became one of its major shareholders³⁰. In 1999 Südelektra was renamed Xstrata and the company started to focus on mining activities. Already by the early 2000's, thanks to a rapid strategy of acquisitions and investments, Xstrata was one of the major mining groups in the world. Some of these acquisitions were: (i) the coal assets purchase of the former Enex and Duiker in 2002 for which Xstrata paid Glencore more than \$2.5 billion after a failed IPO, (ii) in 2003 the purchase of MIM Holdings, Australia's largest mining group which was at the time experiencing financial difficulties. To complete this deal, Xstrata paid \$1.7 billion, a really low offer for many analysts, but due to the company's financial status the deal went through. (iii) Falconbridge acquisition, the world's number 3 nickel and zinc producer and one of the world's largest base-metals producers. The alliance between Xstrata and Falconbridge made Xstrata the fifth largest mining company, just behind BHP Billiton, Rio Tinto, Anglo American and CVRD. These acquisitions are just a few examples of the crucial actions that led Xstrata in its path of evolution and growth. In the table below we will see other significant moves:

Company	Price (US\$ bn)	Year	Product
Duiker and Enex Coal	2.5	2002	Thermal coal
MIM Holdings	2.9	2003	Copper, coking coal, zinc
Falconbridge	18.6	2005-2006	Nickel, copper
33% Stake in Cerrejon	1.7	2006	Coal
Elan Platinunm Holdings	1.0	2007	Platinum
Resource Pacific Holdings	1.0	2008	Coking and thermal coal
24.9% Stake in Lonmin	1.8	2008	Platinum

Some of Xstrata's relevant acquisitions between 2002 and 2011

Source: Re-elaboration of Marketline's reports

Thanks to the success of these acquisitions, Xstrata jumped into the spotlight becoming one of the giant mining groups, listing in 2002 its ordinary shares at the London Stock Exchange and the Swiss Stock Exchange with a presence (operations and projects) spread out in more than 20 countries: Argentina,

³⁰ Source: "Investors protest over Xstrata coal deal", by Rebecca Bream and Kate Burgess (2009)

Australia, Brazil, Canada, Chile, China, Colombia, the Dominican Republic, Germany, Mauritania, New Caledonia, Norway, Papua New Guinea, Peru, the Philippines, the Republic of Congo, Singapore, South Africa, Spain, Tanzania, the United Kingdom and the United States.³¹

In terms of business cores, Xstrata's operations at that time were divided in five main business units:

- Alloys: one of the world's largest producers, with operations based in South Africa;
- Coal: largest exporter of thermal coal, with mines in South Africa, Australia and Colombia, projects in the countries mentioned and Nova Scotia and Canada. This unit also managed the group's iron ore business;
- Copper: world's fourth largest copper producer, with main operations in South and North America and Australia;
- Nickel: fourth largest producer of nickel and one of the most important producers of cobalt, with operations in Canada, Dominican Republic, Australia, a refinery in Norway and huge development projects in Canada, Tanzania and New Caledonia;
- Zinc: one of the world's largest miners and producers of zinc, with operations in Spain, Germany, Australia, United Kingdom, Canada and development projects in Australia, Ireland and Canada.

As we can see Xstrata became one of the leading players in each one of the markets in which was operating. As a whole Xstrata reported revenues of US\$ 33.9 billion , EBITDA of US\$ 11.7 billion (growing at a 9 year CAGR speed of 45.5%, from a value of US\$ 0.4 billion in 2002) and equity market value of about US\$ 29 billion (100 times greater if compared with 2001 values).

Besides Xstrata's "predator" strategy, another philosophy that helped the company becoming a mining giant was its emphasis on cost reduction, which is by far one of the most important profitability drivers in the mining industry. Indeed, Xstrata and its commodities competitors are unable to set market prices. Therefore, for a mining player the ability to reduce costs is crucial to achieve higher profitability targets and competitiveness goals. Mainly, Xstrata achieved this cost reduction by focusing on productivity. Decentralized management also helped the company reaching the desired productivity standards by believing in its people, giving them power to take decisions within their commodities segment since they are the ones who know better the local business environment, making them responsible for their actions, in turn motivating them by being involved in every step of the process. This management style is pretty unique in the mining industry, but it turned out to be really effective for the company because

³¹ According to the report "Recommended all-share merger of equals of Glencore International PLC and Xstrata to create unique \$90 billion natural resources group" (2012)

it allowed Xstrata to hire fewer employees based on motivation and quality rather than thousands. Among Xstrata's business lines, without any doubts coal represents the main cost saver, given Xstrata's ability to export enormous volumes of thermal coal, thus allowing Xstrata to take advantage of significant economies of scale. In the table below, we can see how Xstrata's productivity approach helped the company saving hundreds of millions of dollars.



Source: Re-elaboration of Marketline's reports

In order to keep growing, Xstrata also focused on investing in strategic facilities and Greenfield projects. For example, the Antapaccay project (a copper mine and was part of the Tintaya open pit mine purchased by Xstrata in 2006 for the amount of US \$750m³²) in Peru proved Xstrata's ability to create value for its own beyond acquiring existing mines and companies. After five years of study and development of the project, the mine started copper production in November 2012. The first year of operations the mine generated over US \$2.5bn EBITDA, thus recuperating the purchase fee in only 18 months³³.

For the sake of completeness, we provide in the table below Xstrata's major shareholders before the Glencore Xstrata merger³⁴. In the next paragraphs, we will show how the merger changed this structure.

Shareholders	Dec-07	Dec-08	Dec-09
Glencore	34.40%	34.45%	34.38%
Capital Group		5.27%	4.94%
AXA	3.06%	3.06%	
Black Rock		4.21%	3.02%
Qatar Holding			12%

Source: Re-elaboration of Marketline databases

³² Source: Marketline.

³³ Source: data available at "www.mining-technology.com/projects/-antapaccay-copper-mine-peru/".

³⁴ Note that any data of Xstrata prior to 2011 are not publicly available. For this reason we had to rely on various old analyst reports. Here, we refer to Marketline's reports.

## The Deal

In this paragraph, we are going to illustrate the main features of this M&A deal. First, we introduce the deal by explaining its origination. Second, we focus on the terms of the deal and the factors which usually can be the difference makers in any merger, such as the form of payment, synergies and so on. Finally, we analyze the vertical integration generated by the deal, which can be considered the most relevant and unique feature of this transaction.

## The Origination and the Target Selection

Before starting to talk about the results of the vertical integration generated by the merger (from now on, the "**Merger**") between Glencore and Xstrata (from now on, the "**Group**"), we want to focus on how it started, on the main benefits and synergies behind this deal, and on why it took much more time than planned.

The Merger re-opened the apparently closed "era" in which deals used to create commodity/mining giants, such as BHP Billiton and Rio Tinto. The Merger was announced in early February 2012 by the corresponding directors of the firms. At the beginning, the Merger was announced as an all-share merger of equals, whose duration was estimated to be around two or three quarters (expected to be done by Q3 2012). However, the deal did change in the merger process and it has been completed as a pure Glencore's takeover of Xstrata, taking much more time than expected (about 450 days). Besides the form and the terms, what did not change was the substance. Indeed, the deal really created what at that time was considered a mining/commodity titan spread out over more than 50 countries and dealing with more than 90 commodities.

There were many reasons why Glencore wanted this deal to be done. First, the combination could create a US\$ 90 billion fully integrated group with a US\$ 200 billion sales business, which could really take a seat at the titans' table and have a much greater flexibility and bargaining power than an average peer. Second, the coal industry was still living a partial upward scenario, mainly driven by the emerging markets, whose extreme slowdown was not reached yet (just in 2014 started to be clear a slowdown in these countries' growth). Indeed, the coal consumption, after the 2009 small downturn, started again to kick in at CAGR speed of around 5.1% (5.09% and 5.12% respectively in 2010 and 2011)³⁵, which in turn helped Xstrata to register an incredible double-digit growth between 2010 and 2011, both at the EBIT (19.3% growth rate) and at the net income (19.7% growth rate) level. Third, the compatibility between the two groups. After all, the deal started as a merger of equals. Undoubtedly, there was a perfect fit in the integration process (as we mentioned before, Glencore already owned a relevant stake

³⁵ Source: Energy Information Administration, available at "www.eia.gov".

of Xstrata and the vertical integration and collaboration between the two was already significant), which basically gave the chance to the complementary businesses to complete their roles in the supply chain. Furthermore, the two companies had many other features in common (considerable less "relevant"), such as the fact that both Xstrata and Glencore are listed on the London Stock Exchange, both have a low-tax headquarter in Switzerland, sharing a similar competitive management culture, beyond the fact that their CEOs share the same nationality (both Mick Davis, Xstrata's CEO, and Ivan Glasenberg, Glencore's CEO, are from South Africa).

#### Synergies and Benefits

In this paragraph, we provide a complete illustration of all the potential "non-redundant" benefits and synergies that were behind the idea of this deal. What is sure is that a wide set of benefits and synergies could be activated by finalizing this deal. Let us illustrate you what we believe are the most relevant points of this "benefit and synergy list":

- The Merger was clearly creating a new entity, which could create value at each step of the commodities chain, starting from the extraction of the raw materials to merchant activities at an international and really diversified level. Such vertical integration would take years to be made internally by each of the firms. However, time here is not the only asset that was acquired. Indeed, besides the extension of their business processes, the Merger could allow Glencore and Xstrata to share their business experience, network, strategic assets and operational excellence. Thus, the Merger was creating a new group based on an improved and fully integrated business model which ensured more flexibility, an enhanced optionality (a corporate structure which would have allowed the Group to adapt their trade flows quickly and more easily to changes in the demand level or growth) and the joint of complementary project pipelines which could allow higher level of growth, especially coming from the emerging markets;
- The new group would have been the new global leader in many commodities markets both at the marketing and production level. The global leadership would have allowed the Group to exploit enhanced economies of scale and a geographic hedge mainly ensured by their global presence, which in turn would have also ensured the Group to capture market insights via superior market intelligence, information and opportunities not accessible for other market players. In other words, the Merger could create a Group whose operations would have been perfectly established in most of the industrial and emerging markets with more than 150 facilities (including offshore oil facilities mining and metallurgical facilities, farms and agricultural facilities for a net asset value of US\$ US\$69.6 billion) building the new merchant leader in ferrochrome and thermal coal, a new leader in integrated zinc production, the third global copper producer and the fourth global producer of nickel;

- The combination of two firms represented a perfect fit, both in terms of cost structure and apparently financial strategy (later we will illustrate why only apparently). Indeed, regarding the cost structure both firms have shown a clear cost improvement track record, which confirms their ability and will to enhance their operating efficiency each year. Regarding the financial strategy, they have also shown consistent and compatible financial strategies which allowed stronger access to equity and debt markets, and an instantaneous enhancement in Glencore's rating (achieving a "BBB" industrial, from a "BBB" trader);
- Besides the strategic side of the deal, there are many others operational drivers which are worth to be mentioned:
  - i) Improved marketing and trading interfaces and logistical infrastructures;
  - ii) The ability to use Glencore's large fleet of vessels from more and new strategic locations and geographic bases; and
  - iii) Broadened flow of products with more differentiated and diversified products, both in terms of quality and in terms of specifications;

In numbers, these synergies generated about US\$ 2 billion, which were achieved via long-standing benefits and one-off savings. Regarding the formers, Glencore not only estimated additional US\$ 500 million EBITDA³⁶ (on an annual base, which was later downward adjusted to US\$ 450 million), principally coming from the optimization of freights, contract pricing terms, blending opportunities, custom fee procurement and marketing overhead, but also achieved a reduction in credit spreads, due to the repositioning of the enlarged group's credit profile, from a credit "Trading" BBB to an "Industrial" BBB (S&P rating rankings), which ensured a US\$ 145 million savings in terms of financial interests. Regarding the one-off savings, Glencore generated significant cost savings (about US\$ 1.4 billion) resulting from three main phases: (i) closure of Xstrata's head offices in Zug and London, (ii) rationalization of divisional head offices structure, and (iii) on-going operational efficiency among other benefits for example:

- Enlarged marketing activities and volumes across the copper, coal, zinc, nickel and ferroalloys as a result of the mix between the Xstrata's volumes and the Glencore's trading and marketing structure;
- Enlarged volumes ensuring cost savings, which were mainly provided by the exploitation of higher economies of scale at several stages of the production process, especially for Glencore's freight, logistics and procurement;

³⁶ The US\$ 500 million EBITDA added value was computed using Xstrata's and Glencore's historical performances, by implementing an analysis of past marketing margins and Xstrata's and Glencore's corporate budgets, and by assuming upfront costs realized in S2 2012.

- Increased ability to exploit arbitrages in their marketing business given by the opportunity to access to an enlarged geographical structure, improved logistics, a more extensive mix of products and new blending ability;
- Reduced corporate inefficiencies as a result of the removal of redundant expenditures, such as duplicated head office costs and other expenses which are not attributable to a specific business unit.

All these points put together have created a new entity with unprecedented features³⁷, which positioned Glencore in an unpopulated side of the commodities market, as the chart below illustrates:



## Building a Global Commodities Company

The merger between Glencore and Xstrata was completed after 451 days - on May 2nd 2013 - and formed the fourth biggest mining company and the biggest commodity trader. A combined entity which was soon ranked twelfth in the Fortune Global 500 list of the largest companies by revenues in the world. Today, this alliance employs 200,000 people around the world and has operations in 90 locations and 50 countries.

## Ownership and board reconstruction

The Merger had several impacts on the two entities, especially in terms of business model, corporate governance and ownership structure. The next graph shows the main shareholders of Glencore before the Merger (December 2012) and the ownership composition after it (December 2013). As we can see, if we compare the shareholders of Xstrata before the Merger to the final ownership composition, the new company's major shareholders list includes two of Xstrata's oldest owners (Qatar Investments and Black Rock), with a combined stake of 14.15%. Other relevant investors were the Norwegian pension

³⁷ "This (referring to the Merger) would create such a different animal in the space, with huge flexibility and optionality to get value from exploration to delivery of product. No company has that capability", Mr. Mick Davis.

fund NBIM, Scottish Widows, Threadneedle, Standard Life Investments, Schroders, and the US fund Knight Vinke.

Major	Dec-12	Dec-13
Shareholders		
Ivan Glasenberg	15.52%	8.3%
Daniel Mate	5.88%	3.17%
Telis Mistakides	5.84%	3.12%
Tom Peterson	5.16%	2.76%
Alex Beard	4.51%	2.41%
Qatar investments		8.42%
Black Rock		5.73%

Source: Re-elaboration of Athens Journal of Business and Economics³⁸

Glencore has always been a really particular case in the industry in terms of ownership structure. Indeed, a big percentage of Glencore's ownership is concentrated in its management, something really rare in the industry, as we can see in the graph below:



Sources: Re-elaboration of Glencore CEO- Ivan Glasenberg. Miami 15th May, 2012 and GlencoreXstrata Global Metals, Mining and Steel conference. 14th May, 2013

This structure was even further increased by the Merger, bringing Glencore's management to hold 24.86% (from 16.82%) of Glencore Xstrata shares, at which we should add a 10.84% of shares owned by Glencore's employees. Glencore hailed this type of management as *"owners, not caretakers of* 

³⁸ Source: "*GlencoreXstrata. The Profitable and Untethered March to Global Resource Dominance*" by Nina Aversano and Titos Ritsatos.

*assets*". Aside from Ivan Glasenberg, Glencore's CEO who is the individual biggest shareholder with 8.3% of Glencore's shares, other internal owners are the zinc division head Daniel Mate with 3.17%, the copper marketing boss Telis Mistakides with 3.12%, the coal marketer Tor Peterson with 2.76% and the oil division head Alex Beard with 2.41%.

The board also experienced some important changes after the Merger. For example, Simon Murray left as Independent Non-Executive Chairman, Anthony Hayward (Senior Independent Director) also assumed the position as Interim Chairman while looking for a permanent one, Peter Coates, former Independent Non-Executive Director (INED), became Executive Director along Glasenberg, Li Ning left his position as INED and Steven Kalmin also left his CFO duties. Furthermore, the Group welcomed Peter Grauer and John Mack as new INEDs.

The new entity's board did not include Xstrata representatives, Chairman John Bond, Steve Robson, Con Fauconnier, Peter Holley and Ian Strachan who either resigned or voted off. Xstrata's CEO, Mick Davis, and CFO, Trevor Reid, resigned in late 2012, getting millionaire golden parachutes in cash payments (e.g. Mick Davis left the company receiving £14.2 million in cash payments). In conclusion, the fact that the new board was composed exclusively by Glencore's members is one of the clear proves that this deal was a pure takeover of Xstrata, despite the "economics" side which made it look as a "merger of equals" (e.g. similar net income values).

## Vertical integration

Vertical integration has been the reason behind many acquisitions in numerous industries around the world. However, this merger represents the first large-scale test of vertical integration in the mining industry, bringing together a commodities trader and a miner trying to secure their supply of resources. On this matter, the history is against Glencore's and Xstrata's decision. Indeed, the business model targeted by the Merger was in the mind of many large mining companies over the past two decades, and almost the totality of them has left behind their trading divisions as we will review later on.

These companies which tried such vertical integration in the mining industry failed in their model, turning out not to be profitable enough. The reason is easy to understand, given that the profitability of trading companies is nothing compared to the earnings of mining companies. On one hand, for the ones which have tried, it turned out to be too complicated to combine the two different approaches and business models. On the other hand, many did not even try thinking that such a combination was not worth it.

In the next graph, we can clearly see the results of the vertical integration, placing the Group in every single step of the value chain, from exploration to marketing and trading, unlike its competitors which have found success focusing on its core business either as miners or traders.

If Glencore and Xstrata succeeded in their strategy, this alliance could have meant a reshape for the whole industry forcing competitors to follow their lead. The commodities market collapse started in 2014 made quite complicated to evaluate this strategy. Besides the fact that the market so far seemed not to appreciate this business model (Glencore among its peers is the one which suffered the most in the peak of the distress, as we will deeply illustrate in the last chapter), we probably still have to wait for calmer waters to know whether this initiative was a real success or a failure.



Source: Re-elaboration of Glencore-Xstrata South Africa presentation (2013)

## Glencore Xstrata: combined volumes and market positioning³⁹

in the next graphs, we will be able to appreciate Glencore's and Xstrata's stand-alone positioning in copper and zinc before the Merger and the new combined positioning after this alliance. These graphs support the benefits provided in the previous section showing that for both companies the Merger resulted in growth and better positioning in the worldwide commodities industry. Further below, we will review in more details each commodity market share of the Group according to an investigation conducted by the European Commission (from now on "the investigation") whose purpose was to identify any type of position of dominance that would have affected the market and its competitors.

³⁹ The source of the data provided in the tables of this paragraph are based on the reports of the antitrust investigations carried out to find potential excessive levels of concentration. In particular we will refer to the following document "*Case No COMP/M.6541 - GLENCORE / XSTRATA, European Commission*". Therefore, if not specified elsewhere, the data are based on this source.

Market positioning before and after the Merger (million tons)



Source: Glencore Xstrata. Credit Suisse research, 2011

#### Zinc

Zinc is mined as an ore, typically it contains copper, lead, silver and iron. Zinc ore usually contains only 3-11% zinc and is rarely rich enough in zinc to be used directly in a zinc smelter. Therefore, the ore is processed into zinc concentrate. This zinc concentrate is then transferred to a refinery for the production of zinc metal.

For the above reasons, we will divide the zinc analysis into two sections: zinc concentrate and zinc metal.

## Zinc concentrate

Zinc concentrate is transported from mines to smelting facilities across the globe but its price is determined globally based on LME quoted prices which means transport costs do not represent a significant proportion of the total cost of zinc concentrate. In other words, the zinc market can be considered global in scope. Therefore the Merger bargain power does not raise concerns in this commodity market.

The next graph illustrates how Glencore's and Xstrata's 2011 production market shares (in volume) exceeded 10- 20% only on a potential worldwide market excluding Chinese production.

		Worldwide		World Chine	lwide excluding ese production	
	Glencore	Xstrata	Combined	Glencore	Xstrata	Combined
Zinc concentrate production	[0-5]	[5-10]	[10-20]	[0-5]	[10-20]	[10-20]

Indeed, the production market of zinc is really fragmented worldwide. Glencore's and Xstrata's main competitors in this market are Vedata resources 5-10%, Teck 0-5%, China Minmetals Group 0-5%,

Votorantim 0-5%, New Boliden 0-51%, Minera Volcan 0-5%, Sumitomo Corp 0-5% and Chinese state owned enterprises which all together sum up 0-5%.

On the other hand, on the next graph is represented the combined market shares of the supply market in 2011.

	Worldwide			Chine	iwide excluding ese production	
	Glencore	Xstrata	Combined	Glencore	Xstrata	Combined
Zinc concentrate supply	[10-20]	[0-5]	[10-20]	[0-5]	[10-20]	[10-20]

Some of the most important competitors mentioned previously are also active in the supply market, including Trafigura, Transamine, Louis Dreyfus, MRI Trading and Ocean Partners.

According to the investigation conducted by the European Commission the majority of the zinc markets participants did not expect the Merger to have an impact on the global price of zinc concentrate and customers stated that even after the Merger it will still remain enough zinc concentrate suppliers.

## Zinc metal

Zinc is a standardized product which means it can be traded easily because it fulfills numerous customers without being adapted. Among other things, zinc is used for galvanizing, die casting alloy, oxides and chemicals, and in the brass industry.

In the case of zinc metal the European Commission put special attention. The combined market shares of Glencore and Xstrata could be above 40% on the market for the supply of all grades of zinc metal, especially in the European Economic Area (EEA). Indeed, Nyrstar which is one of their main competitors in the EEA, signed an off take agreement with Glencore excluding it from the EEA market, resulting in an even greater share for the Merger. Putting all together, Glencore and Xstrata after the Merger were expected to have a combined market share in excess of 50%.

According to the European Commission there was a risk that the Merger between Glencore and Xstrata could give them certain degree of market control and it would be capable to restrict output in the EEA. The Merger would have such dominance, that the risk of increasing zinc metal prices could not be eliminated not even with pertinent action from competitors and customers. Therefore, for the Commission, the alliance between Glencore and Xstrata raised serious doubts about the degree of power and their consequences to related markets.

## Copper

We will divide this commodity in three market segments: copper concentrate, secondary copper products and copper metal.

## Copper concentrate

The market for copper concentrate is worldwide in scope. The market shares of the Group are shown in the next table:

Production shares 2011	WW	Excl. China	Supply shares 2011	WW	Excl. China
Glencore	[0-5]	[0-5]	Glencore	[5-10]	[5-10]
Xstrata	[5-10]	[5-10]	Xstrata	[0-5]	[10-20]
Combined	[5-10]	[5-10]	Combined	[5-10]	[10-20]

Regarding copper concentrate, the European Commission concluded that the market share of the new merged entity would have not been more than 10-20%. This result considered the projects for mining and concentrate production that were still in development process. Therefore the Merger would not affect the internal market with their operations in copper concentrate.

## Secondary copper products

This market consists of copper blister and spent copper anodes. Glencore's and Xstrata's market shares in the production and supply of secondary copper products are as the next table shows:



The Merger's market share in the production of secondary copper products will remain modest with 5-10%. Other producers in this market are Codelco 5-10%, Jiangxi Copper Company 5-10% and Aurubis 0-5%. Talking about the supply market, Glencore-Xstrata alliance could have a market share of 0-5%, similar to the size of the shares of other suppliers such as China Non-Ferrous Metal mining with 5-10% and Trafigura with 0-5%. Moreover, Xstrata is not active in this market. Therefore, the Merger could not represent a threat for the worldwide market regarding copper secondary products.

## Refined copper

Copper metal is used as an input in various production processes: the production of copper rods (wire and cables), rolled copper products (tubes and sheets) and copper alloys.

On a worldwide market for copper metal that is not further segmented by end-use or grade, Glencore's and Xstrata's market share remains below [10-20]% in production and supply of refined copper as shown in the next table:

Production shares 2011	WW	Excl. China	Supply shares 2011	WW	Excl. China
Glencore	[0-5]	[0-5]	Glencore	[5-10]	[5-10]
Xstrata	[0-5]	[0-5]	Xstrata	[0-5]	[0-5]
Combined	[5-10]	[5-10]	Combined	[5-10]	[10-20]

The European Commission considered the combined market share of the merged company "modest" to raise substantial doubts.

## Lead

Lead typically contains other metals such as copper, zinc and silver. It has to be processed (crushed and grinded) before being floated and filtered to produce lead concentrate (40% to 70% lead). We will divide lead into two markets: lead concentrate and lead metal.

## Lead concentrate

On a worldwide basis the market share of production and supply of lead concentrate remained modest for the Merger.

Production shares 2011	WW	Excl. China	Supply shares 2011	WW	Excl. China
Glencore	[0-5]	[0-5]	Glencore	[5-10]	[10-20]
Xstrata	[5-10]	[0-5]	Xstrata	[0-5]	[0-5]
Combined	[5-10]	[5-10]	Combined	[5-10]	[20-30]

The numbers tell us that there might be a plausible threat is on a worldwide level of supply of lead concentrate if we look at the shares excluding China, market share of Glencore Xstrata would be up to 20-30%. However, the newborn company will face big competitors who are involved both in the production and supply of lead. On a worldwide basis excluding China some of the largest competitors at the production side are BHP Billiton ([10-20]%), Doe Run ([5-10]%), Hindustan Zinc ([0-5]%), Teck Resources ([0-5]%), JSC Gorevsky ([0-5]%), Sumitomo Corporation ([0-5]%) and Goldcorp ([0-5]%).

On the supply side on a worldwide basis the main competitors excluding China are: BHP Billiton with 5-10%, Trafigura, 10-20%, Teck resources 5-10%, Sumitomo Corporation 0-5% and also there are many third party trading companies active in the supply of leading concentrate like Ocean Partners, Transamine, Louis Dreyfus and MRI trading which all together represent a big competition for the new entity. In conclusion, this merger did not raise further concerns in the lead concentrate market.

#### Lead metal

Both Glencore and Xstrata are active in the markets of production and supply of lead metal. Additionally, Glencore owns 32.1% share in Recylex which produces and recycles lead metal and has majority of voting at the company's shareholders meeting. Therefore to calculate the power that the Group would have had in the lead metal market was important also to take into account the operations and market power of Recylex as shown in the next graphs. Note that lead metal is divided according to its purity/grade since each one has different, applications, quality and price.

Dautias	99.7% lead metal		99.985% lead metal		99.99%	99.99% lead metal	
Parties	Volume	Shares	Volume	Shares	Volume	Shares	
	(In KMT)	(%)	(In KMT)	(%)	(In KMT)	(%)	
Glencore		[0-5]		N/A		N/A	
Recylex		[0-5]		N/A		N/A	
Xstrata		[0-5]		N/A		N/A	
Combined		[0-5]		N/A	•••	N/A	

#### Production of lead metal in 2011- worldwide excluding China

#### Production of lead metal in 2011- EEA

Parties	99.7% lead metal		99.985% lead metal		99.99% lead metal		
	Volume	Shares	Volume	Shares	Volume	Shares	
	(In KMT)	(%)	(In KMT)	(%)	(In KMT)	(%)	
Glencore		[0-5]		N/A		[0-5]	
Recylex		[5-10]		[10-20]		[0-5]	
Xstrata		[0-5]		[0-5]		[50-60]	
Combined		5-10]	•••	[10-20]		[50-60]	

Supply of lead metal in 2011- worldwide excluding China

Dautiaa	99.7% lead metal		99.985% lead metal		99.99% lead metal	
Parties	Volume	Shares	Volume	Shares	Volume	Shares
	(In KMT)	(%)	(In KMT)	(%)	(In KMT)	(%)
Glencore		[5-10]		[0-5]		[0-5]
Recylex		[0-5]		[10-20]		[0-5]
Xstrata		[0-5]		[0-5]		[50-60]
Combined		[0-5]		[10-20]		[50-60]

Dautian	99.7% lead metal		99.985% lead metal		99.99% lead metal		
Pulles	Volume	Shares	Volume	Shares	Volume	Shares	
	(In KMT)	(%)	(In KMT)	(%)	(In KMT)	(%)	
Glencore		[0-5]		[10-20]		[0-5]	
Recylex		[5-10]		[5-10]		[0-5]	
Xstrata		[0-5]		[0-5]		[40-50]	
Combined		[5-10]	•••	[20-30]	•••	[40-50]	

Supply of lead metal in 2011- EEA

As the numbers show, the only cases in which the Merger could have a serious impact on the market was the supply overlap between Glencore/Recylex and Xstrata in production and supply of lead metal in the EEA. However, the European Comission stated that the Group would still face huge competition from companies involved in both production and supply process, for example Ecobat 10-20%, KCM 10-20% and Umicore 5-10% and traders such as Trafigura and Traxys.

## Nickel

Nickel is characterized for being really resistant to corrosion and oxidation. Nickel concentrate is processed to obtain nickel matte or nickel oxide, which are refined in order to get finished nickel products.

Since Xstrata consumes internally all of its nickel concentrate production, the company is not involved in the supply market. Hence, the only markets that will be analyzed, in terms of the impacts generated by the Merger, are the production and supply of refined nickel.

Regarding the production of refined nickel, Glencore and Xstrata specialize in producing different purity levels of nickel meaning that there was not a pure overlap in the production activities. Hence, the only market which could be impacted by the Merger was the supply market of refined nickel. Indeed, if we subtract China from the production market the Merger would have a share of 10-20% worldwide. Nevertheless, in this market there are big competitors like Norilsk tih 10-20%, Vale 10-20%, Jinchuan 5-10%, BHP Billiton 5-10%, Sumitomo 0-5%, Anglo American 0-5%, Tsinhshan 0-5% and Eramet 0-5%.

From the supply side, the numbers prove that the Merger could not be in a clear position to influence the refined nickel worldwide price, since customers could switch to other competitors in the market.

W	/orld	wide	sup	рlv
	onia	wide	Jup	piy

Worldwide supply excl. Intra China sales

	Glencore	Xstrata	Combined	Glencore	Xstrata	Combined	
Refined nickel	[0-5]	[5-10]	[5-10]	[5-10]	[0-5]	[10-20]	

## Cobalt

Cobalt is a metal obtained by refining other metals like copper and nickel. Xstrata does not participate in the market of cobalt intermediates so the only market we will focus on is production and supply of refined cobalt.

The merged company could have a combined production share by volume of 10-20%, and both companies specialize in different purity levels of cobalt, thus reducing the doubts about the dominance impact that the Merger could have had on the market given that there was not a pure overlap in the production activities.

As mentioned previously, Xstrata acquired Falconbridge in 2006, an alliance which enabled Xstrata's incursion in the cobalt market. In 2007 Glencore and Xstrata signed a five year agreement covering all of Xstrata's production of nickel, meaning that the relationship between the companies was already extremely close even before the Merger. Furthermore, the agreement signed in 2007 had no effect in the worldwide price, given the significant presence of competition. Hence, the EU Commission concluded there was no reason to believe the Merger could have a significant impact on the market.

	Worldwide supply			Worldwide supply excl. Intra China sales			
	Glencore	Xstrata	Combined	Glencore	Xstrata	Combined	
Refined cobalt	[10-20]	[0-5]	[10-20]	[10-20]	[5-10]	[20-30]	1

## Ferrochrome

Ferrochrome is mainly used in steel production and it is classified according the amount of carbon and chrome it contains: low, medium, high carbon and charge ferrochrome. Glencore does not produce ferrochrome and Xstrata only supplies charge ferrochrome, which is marketed by Glencore so this is the only type of ferrochrome under discussion in this case.

Also in this case, before the Merger it already existed a marketing agreement between Glencore and Xstrata regarding ferrochrome, so it for the European Commission the Merger could not raise doubts in terms of enhanced dominance of the market. In the table below, we provide the share of the Group:

	Suppry shares								
	Glencore		Xstrata			Combined			
	Ww	Ex China	EEA	Ww	Ex China	EEA	Ww	Ex China	EEA
Ferrochrome	[0-5]	[0-5]	[0-5]	[10-20]	[10-20]	[20-30]	[10-20]	[10-20]	[20-30]

Supply charac

Furthermore, there were relevant competitors in this market, which had shares equivalent to the Group's combined market share of 10-20%, such as ENRC with 10-20%, Samancor 10-20%, Ehuj Metallurgical 0-5%, Sichuan Tianghi 0-5% and Hernic with 0-5%.

#### Thermal coal and coking coal

Coal is one of the most affordable and diverse natural resources of energy available and it is divided in two types: (i) brown coal, which is not traded internationally since it is not profitable to do so, neither Glencore nor Xstrata participate in this market and (ii) black coal which is processed to fulfill customer needs. Both companies taking part to the merger are active in this market. Xstrata has mines in Australia, South Africa and exploration permits in Canada. Glencore has mines in Colombia and South Africa. From their respective mines both companies sell to the EEA. Therefore, they do not have mines in in the EEA but they do have a significant customer base in the EEA.

In addition to the division previously mentioned, black coal is also sub-divided into: thermal and coking coal.

#### Thermal coal

This type of coal accounts for 5,294 million MT out of the total black coal production of 6,185 million MT according to data from the World Coal Association in the year 2010 and it is mainly used to produce heat in combustion processes. Thermal coal is often shipped through seaborne routes over large distances, whose costs are typically really low (accounting for less than 20% of the final price). In the investigation, costumers indicated that they can easily switch their purchases between countries. And competitors said they can easily change the destination of their sales, meaning the relevant geographic market is the worldwide market for the seaborne supply of thermal coal. Note that Xstrata had a 33.3% non-controlling interest in a mining operation called Cerrejón in Colombia which had a production capacity of 32 million tones. This operation was owned in equal part to BHP Billiton and Anglo American, which means Xstrata had no control over the Cerrejón operation. Therefore, in the analysis of market share Cerrejón's production capacity is attributed to Xstrata's market share.

Glencore had an exclusive agreement with PT Kaltim Prima Coal and PT Arutmin Indonesia, both companies from Indonesia controlled by BUMI Resources PLC. In simple terms, Glencore provided them with market intelligence and business opportunity. Therefore, Glencore does not have direct control over the produced volumes. For the same reasons, there is no reason to attribute these volumes to Glencore's market share.

Indeed, according to the European Commission the market share of Glencore and Xstrata should only include the volumes they have sold as principals, which means 5-10% for Glencore and 5-10% for Xstrata giving us a combined market share of 10-20% in 2012.

Even though, this new entity created the largest producer of seaborne thermal in the world, the European Commission believed that the market was still fragmented enough with big competitors that could face the new entity power, such as Adaro (Indonesia) with 5-10%, Anglo American (Australia) 0-5%, Arutmin (Indonesia) 0-5%, Banpu (Thailand, Indonesia, China) 0-5%, Berau (Indonesia) 0-5%, BHP Billiton (USA, South Africa, Australia) 0-5%, Cerrejón (Colombia) 0-5%, Drummond Coal (Colombia) 0-5%, GBP (Indonesia) 0-5%, Glencore (Colombia, South Africa) 0-5%, Kideco (Indonesia) 0-5%, KPC (Indonesia) 5-10%, Peabody (Australia, USA) 0-5%, Rio Tinto (Australia, USA) 0-5%, SUEK (Russia) 0-5%, Tanito (Indonesia) 0-5%, Xstrata (Australia, South Africa) 5-10% and others with 40-50% combined.

Regarding port and rail infrastructure it was concluded that Glencore and Xstrata do not have overall control in any facility that could block or restrict exports of thermal coal.

#### Coking coal

This type of coal is mainly used to produce coke, which is then used in the production of steel. Coking coal is usually divided in two segments: hard coal and soft coal.

The Merger's combined market share in the worldwide seaborne supply of coking coal is 5-10% with an increment of 0-5%. Both companies have small market shares and a minimal increment meaning that the alliance could have no significant impact on the market.

In conclusion, the investigation conducted by the European Commission concluded that the only subsector in which the Merger raised serious doubts about power bargains and supply concentration levels was zinc metal business, since at that time Glencore-Xstrata combined entity could reach a market share in excess of 50%, with almost 20 zinc mines and projects from Canada to Burkina Faso and responsible for the production of about 11.5 % of the global supply⁴⁰. In response to these concerns and in order to speed up the negotiation (already delayed more than once as we will illustrate in the next paragraph), Glencore agreed to sell some zinc assets and change the terms of the company's zinc supply contracts⁴¹

⁴⁰ Source: "*Glencore merger set to put shine on dull zinc*", by Jack Farchy.

⁴¹ Source: "Glencore to offer to sell zinc assets", by Alex Barker and Javier Blass (2012)

#### Why It Took Much More

As we have already mentioned earlier, the deal was expected to be done by Q3 2012. However, as always one thing is expectation of an event and another is realization of the event. Mostly, three main problems delayed the Merger.

The first problem was regarding the retention package. The initial proposal comprised £170 million for the 73 Xstrata key executives, including the three Xstrata Executive Directors and the other members of the Xstrata Executive Committee, whose positions were considered critical for the successful integration of the two businesses. The £170 million package was rejected by the shareholders and in June 2012 Xstrata and Glencore began the process of negotiation. The second problem was the takeover price. The initial offer was 2.8 Glencore's shares for each share of Xstrata. This bid was rejected especially by Qatar Holding (from now on "Qatar"), opposition which in turn slowed down the negotiation. Qatar was Xstrata's second largest shareholder at that time, owning 12% of Xstrata. Qatar was aiming for an increase in the offer, and proposed a starting exchange share ratio of 3.5 to support the deal. Eventually, Glencore agreed to raise the offer from 2.8 to 3.05 of its shares for every Xstrata share and to reduce the package to £140 million. With these terms finally the deal went through⁴²

The third problem was the inevitable interests of the regulators, whose attention was soon caught by the fact that a world leading trader of commodities was about to merge with a leading producer of the same commodities. For many global competition authorities and even for the European Commission this deal was in many ways not trustful. To have an idea of the scale of the company that was about to be created is worth to mention that the combined entity would have accounted for about 2.1 per cent of the FTSE 100 index⁴³. Also, this deal, in the history of natural resources, represented the fifth largest takeover, being compared with mega-mergers like Exxon and Mobil, BP and Amoco, Chevron and Texaco and Total and Elf that transformed the oil industry in the late 1990s and early 2000s⁴⁴. As we illustrated earlier, the Merger caught special attention from the European Commission which concluded that the Merger raised serious doubts about power bargains and supply concentration levels was zinc metal business, forcing Glencore to sell some zinc assets in order to continue with the Glencore-Xstrata negotiation, which was concluded few months after the arrival of the European Commission's approval.

⁴² Source: "Glencore increases Xstrata mega-merger offer, by Josephine Moulds (2012).

 ⁴³ In other words, Glencore-Xstrata's size at that time was expected to be more than twice as large as the "average"
FTSE 100 companies. Source: "An overview of the Glencore Xstrata merger", by Georgi Korchev.

⁴⁴ Source: "Glencore finishes takeover of Xstrata", by Javier Blas.

# The Sum of the Parts Exercise

#### Placing the Merger into the History of Commodity Deals

The commodities industry has seen many relevant deals in the Agriculture sector, the Metals & Minerals sector and above all in the Energy sector. These deals usually involve mid/big-cap companies, given that these sectors are highly capital intensive due to the enormous infrastructure and facilities which are necessary to run these businesses, which most of the times are operated internationally or globally. For these reasons, giant deals have been quite "common" in the history of this market and started more than a century ago, at the time of the "actual birth" of the natural resources industry. The merger between Glencore and Xstrata takes part to these kind of deals and legitimacy, with an overall enterprise value of about US\$ 90 billion, is to be included in the list of what can be considered the giant deals of the history of this industry. The deal started (2012) and it was completed (2013) in a period of high activity in the field of M&A deals related to the commodity businesses, as the charts below illustrate.



Source: Re-elaboration of data available on Mergermarket's databases; Note: main average statistics are expressed in US\$ billion

We have selected M&A deals whose target firm was either involved in agri-businesses, or in metals & minerals businesses (both at the mining and at the marketing/trading level), or the energy businesses. However, this deal has something really particular that the majority of the other deals did not have: full vertical integration. Yet, there were some companies which tried to go throughout this verticalization process. We recall the following attempts⁴⁵: (i) Peabody Energy, one of the top global thermal coal

⁴⁵ Source: "*Glencore and Xstrata deal could reshape industry*", an article published on the Financial Times by Javier Blas (07/02/2012).

miners, partially went throughout this process by building an internal trading department; (ii) Japanese industrial and financial business conglomerates tried this kind of mixed business model; (iii) Metallgesellschaft and British Metal Corp, both top metal trading houses, tried to build a "trading and mining" business; (iv) Pechiney, an aluminum miner based in France, tried to implement an internal trading department for non-ferrous metals in the 1970s; (v) Anglo American tried to implement some trading activities (even if it was not an "in-house arm" since it was run by Minorco, a company partially owned by Anglo American via a strategic stake in Philipps Brothers, which in turn was a top commodities trader between the 1950s and 1970s).

However, the majority of these attempts either did not have a long life or turned out to be quite not profitable (or not enough). Hence, even if Glencore's and Xstrata's decision to go through this process is something which is not unique in the history of the commodities industry, the size of this process is a "one of a kind" piece. Indeed, all the attempts involved much smaller sized firms, with respect to the Merger. Then, if "*historia magistra vitae*" why going against history? The main problem with this kind of integration is that there is a significant difference between the profitability of a trading business and the profitability of a mining business, with the latter having much higher margins. However, the model is not by construction a failure, it is just hard to build a sufficiently profitable integrated entity and the only way to do this is "*to assemble a strong trading business*" and not to start from scratch (the latter was a common factor of the previous failed attempts carried out in the industry), as Mick Davis explains⁴⁶. Glencore and Xstrata believed that via their infrastructures, facilities, volumes and global presence could actually "assemble a strong trading business".

## The Sum of the Parts Valuation

In this paragraph ,we want to see whether the value at which the Merger was completed was in line with implicit market values. In order to do so, we have used the same "sum of the parts" method already used for the IPO valuation. Again, we have considered Glencore as the sum of its Agriculture business, Energy business and Metals & Minerals business. The data which were used as input for our valuation were picked from the dataset which we have shown and illustrated before. However, since we wanted to find "comparable" deals in order to have deals which could help us to give an expected implicit market value of the combined entities, we have applied some filters which we sum up in the outline provided in the next page.

⁴⁶ "It is bloody difficult to build up [a trading arm] from scratch", Mick Davis (Xstrata's CEO in 2012).



Hence, by filtering the dataset for target and bidder firms which were involved in Glencore's and Xstrata's main businesses, and by applying other filters, such as size filters in order to find deals which are somehow comparable to the Merger, we were left out with 191 deals, made of 33 deals for Agriculture⁴⁷, 80 deals for Energy and 78 deals for Metals & Minerals. For these deals we have collected⁴⁸ their main multiples available in order to have a significant set of comparable transaction multiple to be used for the valuation. Finally, we have computed the average and the median values of each multiple for each deal and we got the following time series:





⁴⁷ Given that the average size of the M&A deals for the Agriculture was about US\$ 600M, we had to be more flexible for the Agriculture in terms of size in order to have a significant number of deals which could proxy average market multiples for Glencore's Agriculture arm.

⁴⁸ We have used as main source the Mergermarket's platform. We thank KPMG for allowing us to use the platform.

In the graphs, we are showing median values since for the valuation we have used median values to mitigate the effect of some outliers which were many standard deviations above the mean. With same fashion (and source, see footnote n. 48) we have collected all the premia for each deal and we have computed for each year the overall median value and for each segment. The table below provides the results:

Premia	Agricultural	Motals & Minorals	Enei	Overall		
Year	Agricultural	INICIAIS & IVIIIICIAIS	Oil&Gas	Coal	Mean	
2005	14.60%	10.30%	18.30%	na	14.40%	
2006	8.40%	24.40%	27.40%	1.20%	15.35%	
2007	21.70%	15.20%	5.70%	29.10%	17.93%	
2008	15.85%	8.90%	8.30%	13.02%	11.52%	
2009	10.00%	36%	16%	34.60%	24.15%	
2010	18.60%	13.50%	12.90%	7.50%	13.13%	
2011	16.55%	17.70%	21.90%	21.10%	19.31%	
2012	14.50%	3.20%	28.50%	15.20%	15.35%	
2013	19.80%	5.55%	19.90%	17.39%	15.66%	

Then, we have multiplied the expected Glencore's EBITDA for 2013 of each segment, which was already accounting for synergies which were expected to generate an extra US\$ 500 million at the EBITDA level, by the median EV/EBITDA multiple⁴⁹ corresponding to the same segment. Finally, we have summed the values by weighting each partial value for the corresponding weight of Glencore's segment EBITDA (e.g. Agricultural EBITDA/Total EBITDA and so on) and to the overall value we have added the median premium observed in the market between 2012 and 2013 (the selected premia are highlighted in blue in the table provided above).

Glencore's Segments	Glencore's EBITDA E2013	)	Median EV/ EBITDA E2013	Weighted Partial Value
Agricultural	\$568	$\mathfrak{m}$	12.1x	\$221
Ţ				÷
Metals&Minerals	\$9,034	$\approx$	10.0x	\$59,893
Τ				÷
Energy	\$4,232	$\mathfrak{s}$	8.9x	\$12,649
Note: (i) values in million; (ii) EBITDA has been selected since historically it has always				
snown chiciphies Geneore in a more accurate way				\$84,158

⁴⁹ EBITDA has been selected since its multiple historically it has always priced Glencore in a more accurate way.

This method yields a value of about US\$ 84 billion, which tells us that Glencore's effective pricing was representing about a 6.5% premium on the expected market price. Note that expected Glencore's EBITDA for 2013 already includes US\$ 0.5 billion EBITDA (which represented the expected synergies value at the EBITDA level). A reason for this high premium can be found in the high growth rate which Glencore has shown in the years before, increasing its revenues to an unbelievable value of US\$ 232 billion, 30% more than the aggregate revenues of its main mining peers (Vale US\$ 46,767, BHP Billiton US\$ 53,860, Rio Tinto US\$ 51,171, Anglo American US\$ 29,342). A double-digit 2011-2013 CAGR (11.8%) in revenues compared to negative CAGR of the market could justify (Vale: -11.8%, BHP Billiton: -2.9%, Rio Tinto: -8.1%, Anglo American: -2.0%) some extra premium with respect to the value yielded by the median market values.

# Post – Merger: Glencore's restructuring

The graph below illustrates quite clearly how Glencore not only lost most of its equity market value in the last years, but also constantly underperformed the overall mining market (here represented by the index FTSE 350 Mining Index, from now on the "Mining Index"). However, if on 19th of May 2011 (date of Glencore's IPO) you had invested US\$ 100 in the spread between Glencore and the Mining Index and you had cashed out your investment on the 31 of December 2014, this strategy would have yielded no profits or losses. Nonetheless, we cannot say the same thing for the following twelve months, which coincide with the most distressed months for the commodity market, when values of a Glencore stock and the Mining Index reached about 60% divergence with Glencore touching its historical bottom price at 80-90 pence per share.



Source: Re-elaboration of data available on Bloomberg terminal

The mail goal of this chapter is to examine the data and to try to find some plausible reasons to understand why Glencore's equity market value plunged in the last years, and especially to explain why Glencore significantly underperformed the mining industry between 2014 and 2015.

Before starting to dig into data, in the next paragraph we first give you the macroeconomic background in which Glencore, and the entire commodity market, sailed in the last years, which we believe in necessary to deeply understand what happened to the commodity market, and especially why it happened.

## A Distressed Background⁵⁰

#### The Commodity Industry and the Macroeconomic Background

The global conditions in the last years have been mainly driven by economic weaknesses, volatile financial markets and the unpredictability of a recovery trend. For instance, in 2015 World GDP has grown at 2.5%, percentage that is still quite below its past 15 year average. GDP that has been backed by the partial recovery of some advanced economies, whose GDP turned into positive for the first time after several years, and has been lowered by the deterioration of the of the conditions of some of the emerging markets. Especially, there was a strong worsening of South Africa's and South America's deficits, which was followed by a shrinkage of domestic consumption/demand, higher and higher inflation "supported" by a sharper and sharper depreciations in local currencies.

Lately, China has been a big protagonist. Its big role has mainly been due to the its strong financial market turbulences, kept up by negative prospects of a decrease in the economy's growth and the continued Yuan depreciation, which in turn led to a significant decrease in the imports. Decrease that depressed even further the economies which are main China's trading partners and those economies somehow subject to foreign exchange rate risk with China, such as Australia, Brazil, Chile, and Mexico. Downward outlook pressures which led to an oversupply and sell in mineral commodities markets (aluminum, coal, copper, lead, nickel, zinc) yielded by a lack of demand and usage of such commodities, especially in the Chinese industry and Chinese construction sector, which are both highly dependent on the mentioned raw materials.

To complete the picture, oil prices stood at the minimum level of the last 10 years, after a literal collapse in the prices. The drop in price has been mainly driven by the fear of a deeper oversupply. Fears that were enforced after Iran has seen taking away its sanctions. Fact that enhanced the possibility of a further oversupply scenario driven by a further increase in the supply. Clearly, the oil price collapse has almost shattered some commodity exporters, such as Australia, Chile, Colombia, Peru, Russia and South Africa.

Good news came from the United States, which achieved a GDP growth of 2.5%, confirming its recovery, which has been made possible by an increase in employment (4.9%) that in turn increased the internal/domestic consumption. Good news that allowed the Fed to stop its expansionary monetary policy (QE) and start a tightening monetary policy. However, a very erratic stock market together with

⁵⁰ This paragraph is heavily inspired on EIA reports, and on financial statements of commodity firms as ENI, Glencore, and Glencore's main mining peers (Anglo American, BHP Billiton, Rio Tinto and Vale).

a flatter YC and strong uncertainty in the prolonged depression in the commodity markets and Chinese economy gave some food for thoughts for the hypothesis of a potentially "imminent" recession. Signs that shacked the Fed's monetary tightening policy at least until the end of 2016.

The situation in the Euro Area has been quite different. The combined depreciation in the Euro and commodities prices, with the former mainly caused by the extension of the European QE, enabled the Euro Area to just reach its forecasted growth of 1.5%, slightly above the 2014. However, the real "*tallone d'Achille*" for the Euro Area remains the almost zero-inflation levels, which does not promise any pompous for at least the next two-three years, maybe achieving the 2% target by 2018. Situation that should be quite alarming at least from a macroeconomic point of view, considering that this time cutting deposit rates to -0.15% was barely enough to contrast the recession. Next recession, especially if temporally close, a further cut is almost sure that would not be enough to contrast a recession. The graph below illustrates directly this idea for the US economy, but it does as well for the ECB whose policy effects have been very similar to those of the Fed below shown:



Source: Re-elaboration of lectures slide of Eric Jondeau (HEC Lausanne)

The circles are highlighting three main financial events that required an expansionary monetary policy. The first circle is pointing at 1987, which required a drop in the interest rate to 3.5% level. Level that went back to higher percentages once the market has reached a stable recovery. The second circle is underlining the IT bubble burst. Again, this huge collapse of the financial markets required a prompt action of the Fed, which indirectly decreased the rates to 2% levels, which went back to the previous years' average after the recovery. The third and last circle is highlighting the Great Financial Crisis (GFC),

which, as we all well know, made the Fed proceed with a strong expansionary QE that led the shortterm deposit rates to a 0% level. Just in the second half of 2015, we could start seeing an increase of the short-term deposit rates, which are approaching the more "positive side" of the curve.

From the graph and the analysis should be quite obvious that the Fed, as well as the ECB, whose policy effects have been very similar to those of the Fed just described, has already completely worn the QE tool. Indeed, another sharp drop in the short-term deposit rates would bring the interest rates to more and more negative levels. However, this tool has a structural limit which is given by the simple cost of holding cash. In other words, the tool that so far has been viewed as the most efficient and fast solution to contrast a recession, unfortunately seems to be at the end of its days, and most likely other tools will have to be chosen/found.

Employment is another very important parameter that well describes the Euro Area conditions. Indeed, even though in relative terms the employment has improved, in absolute terms the unemployment rate still stays at (11.4%) significantly far levels from the pre 2008-2009 levels (8%). Similar considerations are possible for both private consumption and investment.

Japan is not much different. The country is facing a heavy environment, mainly dominated by the drop in consumption and production, and the adoption of negative short-term deposit interest rates (-0.1%), which in turn had a downward pressure on inflation levels, which are expected to stay at very low levels (Bank of Korea forecasts 0.8% for 2016). Moreover, Bank of Japan adopting a negative short-term interest rates policy had as a main effect the drop in medium/long-term treasuries securities' promised yield, which consequently gave birth to a disinvestment risk for the Japanese debt.

Better performances and higher growths are observable in the main emerging economies (2.7%). However, these statistics are far below the previous years' statistics (4.4% in 2014). Again, the main drivers are the collapse of the commodities markets and the sharp Chinese slowdown. To complete the quite negative background, other important natural factors for emerging markets, such as debt, interest rates and exchange rates, did not help much. Indeed, unsustainable levels of debt, high interest rates, and extreme volatility in the exchange rate, all together worsened the outflow of (foreign and non) capital both from a pure investment and corporate investment point of views. In this sense, Brazil and Russia are really good examples.

The former, with an estimated 3.7% drop in GDP (2016), and a current inflation of about 11% (2015-2016), is carrying out a 9.3% budget deficit of GDP. Moreover, the political uncertainty, especially caused by weak and poor coordination between the Brazilian government and the Congress and the inability of cutting public spending and making the necessary strategic reforms, such as reforms for the pension

structure. Also, this economic condition does not find any support in the central bank, which, instead of giving stimulus to the economy, keeps on carrying out a tightening monetary policy with the purpose of controlling the current inflation risks, by targeting a 6.5% inflation within the end of 2016, so making a recovery for Brazil even more unlikely.

The latter (Russia) has seen a contraction in its GDP and is expecting a further contraction of 3.7%. Basically, this was inevitable and mainly caused by the collapse in commodities prices (especially in energy commodities, such as oil prices). Indeed, Russia plays a huge rule in these markets, being the most relevant exporter of natural gas, 1st producer of oil and having the 2nd largest coal reserves in the world. Conditions that were even more exasperated by the shocking 60% depreciation in the ruble and by an inflation rising to double-digit levels.

Among other countries in Latin America, Chile, Colombia and Peru are showing the worse prospects of growth. The former registered a GDP growth of about 2% in 2015, just half of what on average its growth used to be in the recent years. The reason for this halving comes once again from the commodities markets. In fact, Chile was significantly damaged by the drop in the price of copper, which represents about half of the country's overall exports, accounting for about 11% of its GDP. By construction, a drop in exports came from a lower level of imports coming from other countries, among which China, together with Brazil, represented the main change (China is the primary Chile's trading partner). Other important facts are very high level of inflation, a common factor in Latin America's countries, and relatively lower consumption level and demand.

Colombia is not exempt from this negative outlook. Indeed, its GDP dropped from 4.6% in 2014 to 2.8% in 2015. About 50% of total exports in Colombia are related to oil, and not surprisingly this significant exposure to the oil market costed the country a drop in its GDP growth. Lack of growth that severely affected the fiscal balance, which turned into its negative side (-4.1%) from a positive level (2.3%) in 2014, stressing the overall economic condition and lowering the chances for a quick recovery.

These GDP deceleration paths affected Peru as well. The main protagonist if Peru's GDP deceleration has been the decline in gold and copper mining activities, which in turn were directly caused by the drop in their prices. However, Peru is showing some hope for a positive outlook (2016), which, supported by a very recent increase in mining activities, driven by a better outlook for gold and copper prices and an expected growth in the construction industry, is going to show significant advancements/improvements in the near-mid future.

#### Back to the Demand and Supply Lecture

The price of almost all the commodities collapsed in 2015. This drop was mostly due to the broadening gap between demand and supply. The resulting drop in prices is easily explained by the bottom line of economics and finance:



Demand-side factors in the collapse included mainly the slowdown in global economic growth, especially in China and the emerging economies, and concerns for environmental constraints (COP21). Nevertheless, if the explanation is pretty straight forward, the reasons behind this widening divergence is everything but limpid. The bricks below represent what we think are the main fuels that sparked the "commodity" fire on the demand side:



Supply-side factors were high investments, marginal investor behaviors and technology shocks. In particular, the supply-side of oil had as the main protagonists the USA's and Canada's shale oil production, a consequential increase in production by some of the OPEC countries and the Saudi Arabia-Iran-USA oil fight. All these factors contributed to increase the volume of oil production in 2015 and consequently to reduce the oil price.

The USA's and Canada's increase in oil production has mainly come from the boom in the fracking processes to extract shale oil (also known as Kerogen shale), which in particular led the United States to be ranked as the first country in the world for oil production, with 13,973,000 barrels a day. In addition,
this drop in oil prices was also supported by a significantly increasing oil production in some of the OPEC countries, with Saudi Arabia and Iraq playing the biggest roles. On one hand, Saudi Arabia unwilling to decrease oil production to maintain their market share and to make unsustainable any further oil production, especially coming from new unconventional processes. On the other hand, Iraq increased its oil production by around 250,000 barrels/day since Q4 2015. Volumes that have been even further increased by the return of Iran in the game, after the annulment of Iranian sanctions in early 2016. Supplementary increase that has been targeted to potential extra volumes of more than 500,000 barrels/day.

All these variables together yielded a systematic collapse in the Brent price of around 60% (cumulative) for the last two years, reaching the bottom in Q4 2015 (around US\$ 30 a barrel) and closing the year at US\$ 36 a barrel. Drop which has not been overlooked and that created a sharp increase in the volatility of the financial markets, whose players' main objective has been to minimize their exposure to the commodity markets by hedging and selling their positions on these assets, which started to be viewed as risky assets, which in turns created new downward pressures on commodity prices.

Downward pressures on the Brent that in conjunction with the downturn in industrial activities, the global warming and the COP21 jointly led to the decline in the price of other energy commodities, such as gas and coal.

Coal prices dropped by 33% from the end of 2014 (US\$ 71.3/metric ton) to the 2015 (US\$ 47.9/metric ton). Depreciation mainly due to demand-side factors, such as (i) the fact that the overall energy demand growth was about to turn negative since many of the countries which had led the growth in past years were currently facing a significant economic deterioration, and (ii) other factors linked to regulations and constraints on production/consumption for environmental reasons.

This price contraction which was shared by the gas prices. Nevertheless, the overall impact on this segment of the energy market has been less significant. This has mainly come from an improvement in the technology used in power generation by gas sources, which gave some room for a positive outlook. This enabled the gas prices to have as maximum drawdown of about 15% so far in 2016, after falling in Europe to 32.2 pence/therm in 2015 from 48.4 pence/therm in 2014.

Moreover, it is worth to underline that the COP21 and the significant climate changes (e.g. global warming) will likely lead the future global energy market to be focused on renewable sources of energy, allowing a higher and higher penetration of renewable in the energy market, which, from our point of view, will be the main competition in the market in a medium-long term future.

# A Distressed Giant: fundamentals and Glencore's "control" variables

Glencore went through very hard times mainly caused by the fact of operating in a distressed market and economic background, mainly driven by the emerging markets where Glencore owns the majority of its assets. Glencore's equity price dropped by 80% in the last years, in particular between Q2 2014 and Q2 2015 when Glencore's share price has "free fallen" from 350 pence to a value of about 80 pence:



Source: Bloomberg terminal

Given this background is interesting to investigate whether and how Glencore reacted to these events. In particular we want to focus on Glencore's tools, from now on "control variables", and on the shocks which forced Glencore to react, from now on "exogenous variables".

Before all else, Glencore reacted to the "free fall" by trying to reduce the speed at which it was falling. Specifically, Glencore, after buying up assets near the peak of the commodities boom (including the "US\$ 29 billion" all-share deal for Xstrata Plc started in 2012) was seeking to reduce debt to stave off a potential credit rating cut and to sell underperforming non-core/non-strategic assets.



Source: Glencore's annual and semi-annual reports

In a second moment, Glencore tried to react to the market collapse by optimizing its capital structure in order to achieve a stronger financial positions and some short term savings to cover the loss of margins. To give the big picture of Glencore's strategy, the following bullets try to summarize all Glencore's actions implemented to minimize the risk of a default:

- Glencore refinanced its revolving credit (RCF) of US\$ 8.45 billion with a new deal of a value of US\$ 7.7 billion extending the maturity to May 2018 and keeping the same convenient clauses for Glencore, such as the absence of collaterals and covenants (banks included in the deal were (i) ABN AMRO, (ii) Bank of Tokyo Mitsubishi, (iii) HSBC, (iv) ING, (v) Santander, etc.);
- Glencore deferred some non-strategic investments, thus reducing Capex from US\$ 8 billion to US\$ 6 US\$ 6.5 billion and implemented several sales of non-performing assets to cash in some assets (e.g. Glencore sold precious metals assets to Franco-Nevada, a Canada-based firm, for US\$ 500 million) in order to reduce Glencore's debt by paying out a part of it;
- Glencore did not pay a final dividend for 2015, which saved about US\$ 1.6 billion, while about US\$ 800 million were saved in 2016 from the suspension of the 2016 interim dividend, for total savings of US\$ 2.4 billion;
- A total of 1,307,794,600 new Glencore's ordinary shares have been placed to existing and new institutional shareholders and certain directors and employees of Glencore at a price of 125 pence per new share, raising gross proceeds of approximately US\$ 2.5 billion (about 10% of Glencore's market capitalization at that time).



Given the set of tools used by Glencore to mitigate its default risk, it is interesting to see whether these actions did actually have an impact on Glencore's default probability. We decided to show this relation by implementing an extended version of the Merton Model, from now on "the Model", to compute Glencore's probability of default in a five year window.

# A Distressed Giant: shocks and "exogenous" variables

In the previous paragraph, we focused on Glencore's "control" variables. Indeed, all these variables, such as assets and capital structure, can be considered "endogenous" variables or directly controllable by Glencore. Now we want to analyze external shocks, or "exogenous" variables, which cannot be

controlled (or just partially controlled) by Glencore. We decided to focus on specific commodity prices, on Glencore's default probability and finally on Glencore's dynamic exposures to these variables.

## Defining the Variables under Exam: selected commodities

Based on our findings (refer to the first chapter "The IPO: the birth of a giant" and to the next paragraph "Quantifying Glencore's Static Commodity Exposures") we selected copper, zinc and coal as Glencore's main commodity exposures. The World Bank's database was the only one to provide access to not discontinued (and reliable) time series of copper, zinc, and coal spot prices (since May 2011). However, the data is available only at monthly frequency. Therefore, we were forced to make the analysis with monthly data. Note that the analysis on Glencore's default probability (see next paragraph) is on a daily basis, because in this case the data we needed was available daily and the other semi-inputs which were necessary also could have been estimated at a daily basis.

What is really interesting is that these three commodities not only were and are Glencore's main commodity exposures⁵¹, but also are the commodities which have fallen the most together with oil and iron ore related products and that still today are showing that a non-completely safe track. On one hand, the growth of the demand for cocking coal, thermal coal and iron ore still today has a negative sign. On the other hand, the market balance (demand minus supply) of other base metals, even though their demand has gone back to show positive growth rates, either is close to zero (e.g. copper) or is negative (e.g. zinc). Below the graphs⁵² illustrate the issue for all Glencore's main commodities:



Source: Glencore's Global metals, mining, & steel conference. Miami 10th May, 2016

⁵¹ Glencore's exposures to these commodities is more than the double than the average in the mining industry.

⁵² Source: Glencore's Global metals, mining, & steel conference. Miami 10th May, 2016

## Quantifying Glencore's Static Commodity Exposures

In the paragraph "Luck or Skills: Glencore fundamentals" a fundamentals analysis told us that Glencore's is more exposed to copper, coal and zinc than any other peer was. Our final goal is to estimate dynamic exposures of Glencore to the commodities market and compare them with peers' commodities exposures. However, the model we are going to use (see paragraph "Quantifying Glencore's Dynamic Commodity Exposures") is quite sophisticated and running this model on 93 commodities for Glencore and for each of its peers could be an independent research. For this reason, we want to see if an econometric analysis and our fundamental analysis speak the same language. Then for simplicity, we run the dynamic exposure analysis on the commodity which resulted significant, in terms of Glencore's exposure, in both the analyses.

Hence, we have constructed an index which proxies agricultural products, energy products, and metals and minerals products. The indices are a simply average of the monthly spot prices⁵³ of the following components:

Agriculture Index: (i) Beverages: Cocoa, Coffee, Tea; (ii) Fats and Oil: Palm oil, Soybean meal, Soybean oil, Soybean; (iii) Grains: Barley, Maize, Rice, Sorghum, Wheat; (iv) Other Food and Raw Materials: Sugar, Cotton; (v) Fertilizers: Phosphate Index (average of Diammonium Phosphate, Phosphate Rock, Potassium Chloride and Triple Superphosphate), Urea;

Energy Index: (i) Coal; (ii) Crude Oil (average of UK Brent, Dubai Fateh, US West Texas); (iii) Natural Gas (average of Europe, US and Japan liquefied natural gas);

Metals & Minerals Index: (i) Aluminum; (ii) Copper; (iii) Iron Ore; (iv) Lead; (v) Nickel; (vi) Steel (average of cold-rolled coil/sheet, hot-rolled coil/sheet, rebar and wire ord); (vii) Tin; (viii) Zinc; (a) Gold; (b) Platinum; (c) Silver.

Then, using Glencore' closing share price and these indices with the same monthly frequency, we have computed monthly returns for the four series and we have run a constrained OLS regression. The idea is similar to a "style analysis", which in practice is used to proxy hedge fund returns. Here, we use the same technique to see which index proxies Glencore in the most accurate way. The idea is a minimization problem which can be divided in three main steps: (i) to replicate the OLS regression algorithm by creating a new variable ( $e_t$ ) which is defined as the error term of a regression; (ii) to set the

⁵³ Source: World Bank databases.

betas as parameters (a, b, c) of our minimization problem; (iii) to constrain the minimization problem, by forcing the parameters to sum to  $one^{54}$ . The results we got are summed up by the outline below:



This analysis confirmed us what we have found with the fundamental analysis, i.e. Glencore can be accurately proxied by Metals & Minerals and that no other combination can proxy Glencore better than the stand alone Metals & Minerals related products. Hence, we will focus our dynamic exposure analysis, provided in the paragraph "Quantifying Glencore's Dynamic Commodity Exposures", on Glencore's main Metals & Minerals related products: base metals as copper and zinc.

## Quantifying Glencore's Dynamic Commodity Exposures

In this paragraph, we will estimate Glencore's dynamic exposures to the commodities market, by first running rolling window betas and then by filtering these estimations via a tailor made Kalman Filter.

Even though the Kalman filter (invented by Rudolf E. Kálmán) started to have some applications in the economic and financial fields "recently", this type of algorithm has been used for the past 50 years (in 1969 was the main smoothing tool in the Neil Armstrong's navigation system which brought the Apollo to the moon) in many other fields and it is one of the most common tools for the optimization of GPS devices, laptop trackpads, videogames and smartphones. The reason behind its success is linked to its optimality in the estimation process. The main application of the Kalman filter in economic and financial fields are estimation of parameters and smoothing of noisy data.

⁵⁴ A constrained on the positive sign of the parameters is possible as well. However, Glencore is by construction long on these commodities and there is no chance that a combination of short positions can proxy better Glencore than a combination of long position.

We needed the Kalman filter for its latter main financial application. Indeed, commodities prices are strongly unstable and most of the times these series have "statistically undesirable" features (as being close to integrated processes of order one, having seasonality and so on). These features make the estimation of OLS parameters really unstable. Moreover, our estimations (as we will show later) were very noisy, since when we estimate the relation between Glencore's share price return and the return of a single commodity price series it is very likely to include in the parameter estimation hidden factors which are not purely driven by the relation under exam. The Kalman filter allows to smooth these series, by linearizing the problem and transform it into a linear dynamic system from which is possible to make interesting inferences on the smoothed state-space "coordinates" of the parameter under exam.

#### The Kalman Filter Model⁵⁵

The Kalman filter technique is nothing but solving recursive equations of a state-space model, whose main variables equations are made of latent variables and observable variables, defining a given state in which the observations are in. Usually, the main hypothesis of the model is that the state variables are a Markov process of first order⁵⁶. The general recursive equation system is illustrated in the Appendix (click here "Post – Merger: Glencore's restructuring").

## Filtering the Rolling Betas

In order to filter a process, we need the dynamics of the process. However, an OLS regression would just yield a single parameter, which can just draw a point on our state-space grid. In order to draw a trajectory of the parameter, we need the entire dynamic evolution of the parameters and the main features of its generating process. Hence, we have run rolling window OLS estimations on more than 1,000 observations and with a rolling window of 100 observations. In this way, we have obtained estimations at each point in time (about 1,000) without problems of estimations in terms of convergence to the true estimation given that our windows allow 98 degrees of freedom (we have estimated the beta by not imposing an intercept equal to zero). However, since the estimation was really unstable and noisy as expected, we had to apply some filtering to "remove" the noise from the trajectory of the estimated beta in order to have left what comes the closest to true smoothed dynamics of the relation. In order to do so, we not only need to solve recursively the system of equation, provide in the Appendix (see "Post – Merger: Glencore's restructuring"), but also we have to find the solutions which minimize the noise. In other words, we run a optimization problem on the set of equations

⁵⁵ This sub-paragraph and the following ones are heavily based on the derivations provided by Michael Rockinger (HEC Lausanne) in his applied econometrics lecture notes (*"The Kalman Filter"*, 2004).

⁵⁶ Given that any Markov process of order higher than one can be transformed into a Markov process of order one by augmenting the state parameters, we can assume a firsts order Markov process without losing generality.

illustrated. There is more than one way to do run this optimization problem, but since we feel comfortable with maximum log-likelihood we followed this approach. One of the cons of maximum log-likelihood is that sometimes may not be easy to compute the log-likelihood function. However, the log-likelihood of this problem is already known:

$$l_t = -\frac{N}{2}\ln(2\pi) - \frac{1}{2}\ln|F_t| - \frac{1}{2}v_t'F_t^{-1}v_t$$

Again, this optimization problem can be solved with different software, since we are comfortable in using MATLAB we have run it with this software. We cannot provide the MATLAB code we used for copyrights reasons⁵⁷, but we believe that the outline provided below sums up the structure of the problem and its steps quite clearly:



However, one of the cons (probably the only one) of the Kalman filter is the necessity of knowing the real process that is generating the trajectory. Hence, in order to filter the noise of the rolling betas estimations, we need to know the beta process (its data generating process). After some tests (e.g. Augmented Dickey Fuller Test) we believe that the best proxy of the beta processes can be a "pure" Random Walk (RW) without drift⁵⁸.

⁵⁷ We thank Eric Jondeau (HEC Lausanne) for helping us building this model, by providing us with some advice and coding structures to fit a maximum log-likelihood approach to this set of equations and our assumptions.

⁵⁸ This assumption fits perfectly for the zinc beta time series. Indeed, the AR(1) parameter for the zinc beta is about 1 (1.005), i.e. an integrated process of order 1, and its intercept is basically null (0.004). It fits less the copper beta time series, given an AR(1) parameters of 0.895. However, given its standard error of 0.09 we cannot reject that the real process is an integrated process of order one, i.e. a Random Walk without drift.

Given this assumption, together with the assumption of time invariance of the latent matrices (assumed for computational simplicity), the state model can be written as follows:



Below we provide the results yielded by running our model on the estimated Glencore's share price return rolling betas on the first difference of copper and zinc spot prices. The model has succeeded in smoothing the estimated trajectory of Glencore's equity exposures to the copper and zinc.



## Defining the Variables under Exam: time variant Merton default probability

In the previous paragraph, we have selected observable variables which accurately proxy Glencore's exposure to the commodities market. Here, we want to properly proxy Glencore's default probability. The main difference between this analysis and the previous one is that default probability is not observable. Hence, we had to estimate Glencore's default probability. In order to do so, we started from the idea of a standard Merton Model, and we added some "non-standard" procedures that we believe can enhance the quality of the estimation, yielding a dynamic and time varying estimation.

#### The Merton Model

The Merton Model is an application of the famous Black-Scholes formula used to calculate the theoretical pricing of European put and call options. Basically, the model adapted the Black-Scholes formula to consider the estimation of the market value of the assets of a firm and its volatility. For simplicity, we provide the Black-Scholes formula below:

$$C(S,t) = S_t N(d_1) - e^{-r(T-t)} XN(d_2)$$

$$d_{1} = \frac{\ln\left(\frac{S_{t}}{X}\right) + \left(r_{free} + \frac{\sigma^{2}}{2}\right)(T-t)}{\sigma\sqrt{T} - t}; d_{2} = d_{1} - \sigma\sqrt{T-t}$$

where "C(S, t)" is the value of the European call option, " $S_t$ " is the value of the underlying stock, "K" is the strike prince, "r" is the risk free rate, "T" is the maturity of the option, "t" is "today", and "N(.)" is the cumulative standard normal distribution function.

The Merton Model uses the same framework but it changes the variables included in the formula in order to yield the market value of the asset and its volatility of a public firm as follows:

$$\begin{split} V_E &= V_A \, N(d_1) - e^{-rT} X N(d_2) \\ \sigma_E &= \frac{V_A}{V_E} N(d_1) \sigma_A \\ d_1 &= \frac{\ln\left(\frac{V_A}{X}\right) + \left(r_{free} + \frac{\sigma_A^2}{2}\right) T}{\sigma_A \sqrt{T}}; d_2 &= d_1 - \sigma_A \sqrt{T} \end{split}$$

where " $V_E$ " is the current market value of the firm's equity, " $V_A$ " is the current market value of the firm's assets value, " $\sigma_E$ " is the volatility of the firm's equity, " $\sigma_A$ " is the volatility of the firm's assets, X is the book value of the firm's liabilities and "T" which represents the firm's debt maturity.

Finally, the most important intuition of the Merton Model is related to the probability of default. Indeed, since the equity can be seen as a call option on the firm's assets with a strike price represented by the value of the firm's debt, the "default point" is related to when the value of company's asset falls below value of the debt. In other words,  $N(-d_2)$ , which in a pure option framework represents the probability that the stock price (future firm asset value in the Merton framework) will not breach the strike price (distance to default or DD in the Merton framework) in the future, in the Merton framework represents the probability of the firm's default ( $p_t$ ):

$$DD = \frac{\ln\left(\frac{V_A}{X}\right) + \left(r_{free} - \frac{\sigma_A^2}{2}\right)T}{\sigma_A \sqrt{T}}$$
$$p_t = N\left(-\frac{\ln\left(\frac{V_A}{X}\right) + \left(r_{free} - \frac{\sigma_A^2}{2}\right)T}{\sigma_A \sqrt{T}}\right)$$

However, the Merton Model makes basic assumptions such as: (i) all options are European and are exercised only at the time of expiration; (ii) no dividends are paid out; (iii) market movements are unpredictable (efficient markets); (iv) underlying stocks' volatility and risk-free rate are constant.

#### An extended dynamic version of the standard Merton Model

Our model wants to extend the static and time invariant model by "feeding" the model with time-varying measures and by combining the Merton Model and some econometric tools, which can allow us to generate Glencore's daily probability of default time series, i.e. in a vectorial form. Moreover, we would like to take advantage of a model that, unlike the Merton Model, already takes into consideration heteroscedasticity in the time series, given that in our case Glencore's equity value time series shows strong heteroscedasticity. Thus, in order to have an adequate "tailor made" default model, first we have checked for time dependency both at the first and at the second moment levels and we have found that Glencore's equity features can be reconducted to the following main properties:





Therefore, in order to proxy Glencore's volatility we decided to run an Autoregressive model – AR(n) – to take into account a time varying mean and to run a Generalized Autoregressive Conditional Heteroskedasticity model – GARCH(p, q) – to take into account the heteroscedasticity. After some statistical checks, we decided to go for the simplest version of the model, i.e. an AR(1) – GARCH (1, 1), to proxy Glencore's equity volatility. This model allows us to capture both mentioned properties in a very efficient way, unlike a mere standard deviation computation which in particular is not able to capture time varying features.

One alternative could have been to use rolling windows standard deviation estimations. However, rolling window estimations only reduce the issue as illustrated below:



In the figure below, we illustrate the results of using a AR(1) - GARCH(1,1) model, so that the reader can easily appreciate the significant improvements in terms of Glencore's daily volatility time variant features:



# The Model Specification: a dynamic AR(1) – GARCH(1,1) Merton Model

In this paragraph, we want to illustrate step by step the logic and the mechanics of the Model. In order to implement the steps iteratively, we have run the entire model, illustrated below, by implementing a loop in MATLAB which recursively iterated the Model to yield directly a vector containing the entire time series of the estimated time varying Glencore's default probability.

All the following steps were included in the loop:

### First step: estimating an AR(1) – GARCH(1,1)

Input: Daily Glencore's equity value (share price - closing price)

$$\begin{aligned} r_{E,t} &= \varphi r_{E,t-1} + \varepsilon_t \\ \varepsilon_t &= \sigma_{E,t} z_t; z_t \sim iidN(0,1) \\ \sigma_{E,t} &= \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \end{aligned}$$

Output: Daily time varying Glencore's equity volatility

#### Second step: solving a non-linear system of equations

Input: (i) Daily Glencore's equity volatility; (ii) Daily Glencore's equity value (mkt cap)

$$V_{E,t} = V_{A,t} N(d_{1,t}) - e^{-r_t T_t} X_t N(d_{2,t})$$

$$\sigma_{E,t} = \frac{V_{A,t}}{V_{E,t}} N(d_{1,t}) \sigma_{A,t}$$

$$d_{1,t} = \frac{\ln\left(\frac{V_{A,t}}{X_t}\right) + \left(r_{free,t} + \frac{\sigma_{A,t}^2}{2}\right) T_t}{\sigma_{A,t} \sqrt{T_t}}; d_{2,t} = d_{1,t} - \sigma_{A,t} \sqrt{T_t}$$

Output: Daily Glencore's assets value and volatility

#### Third step: computing the probability of default

Input: (i) Daily Glencore's equity volatility; (ii) Daily Glencore's equity value (mkt cap); Daily Glencore's assets value and volatility

$$p_t = N\left(-\frac{\ln\left(\frac{V_{A,t}}{X_t}\right) + \left(r_{free,t} - \frac{\sigma_{A,t}^2}{2}\right)T_t}{\sigma_{A,t}\sqrt{T_t}}\right)$$

Output: Daily time varying Glencore's probability of default

#### Analyzing The Impact of the Exogenous Variables on Glencore's Equity and Default

Now that we have introduced the variables and the models we have used to estimate them, in this paragraph we are going to illustrate and comment the results we got for Glencore's exposure both in terms of commodities market (e.g. Glencore's dynamic copper exposure) and for Glencore's default exposures (e.g. the dynamics of Glencore's default probability).

#### Commodity Exposures

As we have said many times, Glencore's main commodity products are the products whose prices dropped the most (e.g. copper, zinc, coal, iron ore, oil) and we will show in the paragraph "Comparing Results: Glencore vs Peers" these exposures were much higher than the exposures of Glencore's peers.



As the graphs above show, Glencore's equity return has always had a relevant relation with the first difference of the copper spot price. However, it is interesting to see that Glencore's exposure to copper has been steadily increasing in time, reaching its maximum exactly in the middle of the distressed market, when the copper reached its maximum-drawdown (refer to the Appendix – "Post – Merger: Glencore's restructuring"- to see the definition of the maximum drawdown) of about 54%. Incredibly, during the distress a drop in the copper spot price of 1% had an even greater average impact on Glencore of about 1.2%. A similar path can be spotted for dynamics of the Glencore's zinc exposure. With the same fashion, Glencore's zinc exposure reached its maximum during the distress, when the zinc spot price reached its maximum-drawdown of 37%.



#### Implied Default Probability

The intuition of the Merton Model is really simple and at the same time genius. Indeed, with the few ingredients, already estimated as shown in the paragraph "Defining the Variables under Exam: time variant Merton default probability", this model allows us to understand the dynamics of the "probability of default" of any firm. As in any option, we mainly need a strike price, an underlying asset and its market value, and its volatility. The only two differences in this case are that the market value of underlying asset had to be estimated and that the strike price is changing over time, in our case semester by semester. In this framework, we enter into the default zone, when the underlying asset (the market value of Glencore's total asset) and the strike price (Glencore's financial debt) equal or when they get close enough (e.g. at a one or two underlying asset's standard deviation distance). As the graph below shows, this case has been reached just twice, and in both cases it happened during the peak of the distress, when basically Glencore's equity collapsed from an initial value of 548 pence per share to 80 pence – 90 pence per share. In 2015 we recorded the highest Glencore's probability of default, about 83%, and as expected this shocking number was reached when the asset to debt ratio reached its historical minimum (1.07). After few months, this ratio reached again the border line to the default zone, by touching values around 1.1. However, this time even if the difference between 1.1 and 1.07 is not significant, Glencore's default probability "only" reached values around 40% (just half of the one of the previous time). The reason is to be found in Glencore's total assets volatility, which was much lower than the previous time (just one third of the volatility of the first time).



Hence, on one hand during the distress Glencore's default probability was highly impacted, especially by a collapsing equity value, by sales of non-strategic assets, which in turn reduced the value of Glencore's total assets, and by a financial debt which for months remained at unsustainable levels. On the other hand, the merger with Xstrata seems not to have had an impact⁵⁹ on the default probability. How is this possible if one of the main drivers of the default probability is financial debt, and Xstrata's financial position was very high? The reason has to be found in how Glencore defined its net financial position. Indeed, Glencore in its financial statements reports its net financial position following non-standard way to define it. Instead of defining its net financial position as "current borrowings plus non-current borrowings minus cash minus cash equivalents", Glencore defines its net financial position as follows "current borrowings plus non-current borrowings plus non-current borrowings plus cash minus cash equivalents (marketable) securities minus readily marketable inventory". While commodities sold with agreements to repurchase is not a significant account, Glencore's readily marketable inventory is a giant account, which is mainly made of inventories whose risk is fully hedged and whose market is widely available⁶⁰. These accounts put together in the last year have represented the majority of Glencore's inventories (about US\$ 21 billion. Hence, even if Glencore had to absorb Xstrata high levels of "standard" net financial position (about US\$ 17 billion), this account has been offset by an increase of readily marketable inventory and of the overall value of the assets.



This non-standard measure is a real difference maker. Indeed, if instead of using standard IFRS measures of Glencore's net financial position we consider Glencore's definition provided in its financial statements, we can get completely different results for the default probability. In order to make this difference clear, we have estimated Glencore's default probability by assuming two different extreme

⁵⁹ The highlighted jump you note in the graph, happened between May and July 2013, is due to the Merger. However, this jump is just temporary since is due to a difference between the frequency of the availability of financial debt accounts and the other variables. Indeed, while the latter variables are estimated daily via the Merton Model illustrated before, the former is an input which is available just with a semester frequency when Glencore reports its semester results (Glencore does not report quarterly on these kind of accounts).

⁶⁰ An example of the components of this accounts are those LME approved inventories, usually aluminum and copper, which Glencore holds in LME warehouses.

scenarios: (i) 100% cash and (ii) 0% cash. In the former scenario, we see all the accounts which are considered by Glencore as available for sale as pure cash. In the latter scenario, we have assumed that none of those accounts is a cash equivalent, ending up showing Glencore's gross debt. Refer to the Appendix for further details (we provide other estimations under the two different assumptions, see "Post – Merger: Glencore's restructuring").



## Default Dynamics and Relations

In the previous paragraphs, we have first estimated and then analyzed Glencore's default probability. In this paragraph, we analyze the relations between Glencore's estimated default probability⁶¹ and Glencore's observed equity return and the AR(1)-GARCH(1,1) volatility which was estimated and illustrated in the previous paragraph.

## Default Probability – Equity Return

For the sake of completeness, we report the results of three different estimation ((i) OLS, (ii) rolling window OLS and (iii) Kalman filtered rolling window OLS). The OLS estimation yielded a -0.25, which means that if Glencore's share price goes up/down by 1.00%, then Glencore's default probability on average goes down/up by 0.25%. However, this estimation is true just on average and usually "on average" in the commodities industry does not work properly, given the strong instability of the variables. In this sense, the rolling window OLS estimation are a very useful tool since it helps us to have some dynamics of the relation. However, the estimation, as expected, is very noisy and not "robust" to temporary sharp drop or jumps in one of the variables. After filtering the series via the Kalman filter

⁶¹ We have done the same analysis for other relations as well. Since this is not the main object of this thesis, we decided to report only the results of for the default probability. However, in the Appendix (see "Post – Merger: Glencore's restructuring") we also provide the results for the implied CDS spread.

illustrated in the paragraph "The Kalman Filter Model", we got really interesting results in terms of the dynamics of the relation, which cannot be observed "purely" by running a simple OLS regression, and in terms of smoothness and robustness (to sharp temporary changes in the series), which was not achieved with rolling window estimations.



The results tell us that, even if Glencore's average relation between its default probability and equity return is significantly different from zero, Glencore's default probability and Glencore's equity return basically have been uncorrelated⁶² until the distress of the commodities market and that thereafter they have been highly negatively correlated, with a minimum of -0.33 in 2015, i.e. each time that Glencore's equity went down/up by 1.00%, Glencore's default probability increased/up by 0.33%.

# Default Probability – Equity Volatility

Contrarily to what we have seen for the relation between its default probability and its equity return, the relation between Glencore's default probability and Glencore's equity volatility not only is stronger on average, but also is always significantly different from zero.

This means that even during period of "calm" market, there is still a positive (0.13) relation between equity volatility and default probability, i.e. for each 1.00% increase in equity volatility Glencore's probability of default increases by 0.13%.

⁶² These findings are easily explained by the fact that usually equity return and default are uncorrelated. However, in moments of distress theoretically the equity should start acting as debt and then much more correlated with CDS spreads, bonds yields and consequentially default probability. This means that investors started to view Glencore's equity as almost pure debt in the middle of the distress.



Once again, a simple OLS regression would have been misleading in terms of overvaluation of the relation and it would have lost a relevant information related to the "switching process" fashion dynamics of the relation between the default probability and equity volatility. As the graph above shows, the maximum value of the relation was reached during the peak of the distress, when Glencore's financial debt and asset where so close that a small increase in the volatility was able to increase more than proportionally the level of default probability.

#### **Comparing Results: Glencore vs Peers**

So far we have looked at Glencore's individual main drivers and its dynamic exposure to them. We started by showing (see the beginning of the chapter "Post – Merger: Glencore's restructuring") how Glencore constantly underperformed the mining the market, which we have proxied with the FTSE 350 mining index. Now, we want to understand whether Glencore underperformed constantly its main mining peers – Anglo American (AAL), BHP Billiton (BHP), Rio Tinto (RIO) and Vale (VALE) – and, if it is the case, which are the main factors which contributed the most to make that happen. Our findings tell us that Glencore did underperform its main mining peers in terms of equity return performance, especially during the peak of the commodities market distress. The graph below kills any doubt and shows how clearly suffered from a higher drop in its equity value compared to its main mining peers:





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In the following paragraphs, we will show and explain why Glencore did suffer more than its main mining competitors. Indeed, after an accurate three level analysis (commodities market exposure, capital structure and operating profitability) run on Glencore and its main mining peer, we have found that Glencore was characterized by the worst conditions at each of the three examined levels. First, in the next paragraph, we start showing and comparing Glencore's commodities exposures and the commodities exposures of Glencore's main mining peers. Then, in the following two paragraphs we will analyze and compare their capital structure and their operating profitability in terms of margins, i.e. the other two factors which believe mainly explains the gap between Glencore and its main mining competitors.

## Commodity Market Exposure

As for equity portfolios is useful to know their correlation with the dynamics of the equity market, here it is useful to know the correlation of commodity players' equity with the dynamics of the commodities market. The analysis is exactly the same but the fact that in the former case we represent the equity market with equity indexes, calling their linear relation "beta", while in the latter case we represent the commodities market with commodities spot prices and we do not have a name for the proxy of their linear relation (which from now on we will also call "beta" for simplicity). Also, the intuitions and the implications are the same: if an equity portfolio/the equity of a commodities player has an extremely high beta, it means that this portfolio/commodities player reacts sharply even to small shocks in the equity/commodities market. In other words, high levels of beta tell us that an investment in the equity of a high beta commodities player is a much more volatile and risky investment than taking positions on the equity of a low beta commodities player.

However, finance theory tells us that most of the times higher risk can imply higher potential return. As we have shown before, Glencore with respect to the average mining industry has higher levels of copper, thermal coal, zinc and oil. Unfortunately for Glencore, we have seen as still today these commodities are the ones (above all copper and thermal coal which ironically in turn are Glencore's main commodities exposures) which suffer the most from a weak demand growth and negative market balance framework. In order to show the magnitude of the difference between Glencore's dynamic exposures to these commodities and the dynamic exposures of Glencore's main peers to the same commodities, we have estimated rolling betas for each peer and each commodity. Then, we have filtered them with the same Kalman filter technique we have illustrated in the previous paragraphs - "The Kalman Filter Model" and "Filtering the Rolling Betas" - in order to make possible and easier the comparison between Glencore and Glencore's main mining competitors. On the next page, we report some of the main results we got from this analysis:

## Greater Exposure to Copper



Greater Exposure to Zinc



## Financial Debt Position

If the drop in price of Glencore's main commodities controlled Glencore's equity collapse, Glencore's financial debt position controlled Glencore's "falling speed". Recently, especially during 2014 and 2015, Glencore had by far the worst leverage ratio profile (defined as net financial position on market capitalization). As the histograms reported on the next page show, Glencore had higher levels of leverage if compared to the mean/median leverage of mining players⁶³ operating in any other commodities sub-sector in which Glencore operates (Agriculture, Energy, Metals & Minerals).

⁶³ The reader can refer to the Appendix – "Post – Merger: Glencore's restructuring" – to see which companies we have selected and included in the analysis. Note that this list of the same companies we have often used to proxy the three sub-sectors of commodities market.



As you can see, Glencore's leverage was more than three times the Metals & Minerals average leverage, and it was more than twice the overall average leverage (defined as the overall mean of all the three segments). This aggressive capital structure was definitely worsened by the acquisition of Xstrata completed in 2013, given Xstrata's high levels of financial debt. However, Xstrata just worsened Glencore's capital structure. Glencore has always had a more aggressive capital structure, given his private

partnership structure, a "philosophy" which never changed in the mind of Glencore's executives who still today represent a significant share of Glencore's share ownership distribution. A comparison between the time series of Glencore's Standard & Poor's (S&P) corporate debt rating compared with the series of Glencore's peers (pre-Merger and post-Merger) illustrates the difference in the capital structure quite clearly, as shown from the figure below:



## **Profit Margins**

Another reason why the distress had a stronger impact on Glencore's equity, compared to the impact on the equity of Glencore's main peers, was the level of Glencore's profit margins. Indeed, Glencore's profit margins, the average of Glencore's "Cost of Goods Sold/Revenues" ratio ⁶⁴ in the last years is about 97.5%, are by far lower than both Glencore's mining peers, as the graph "COGS/Revenues: Glencore vs Main Mining Peers" shows, and lower than the average profit margins of Glencore's marketing peers⁶⁵.

⁶⁴ Note that profit margins are equal to one minus the "Cost of Goods Sold/Revenues" ratio.

⁶⁵ The graph "COGS/Revenues": Glencore vs Merchant Industry" illustrates the comparison between Glencore and commodity merchants. For the comparison we used: Noble Group, Trafigura, Bunge Limited, Cargill and COFCO.

Very structural low profit margins can be a relevant issue in case of a distressed market, since it means that while the absolute dollar value of the revenues is going down Glencore might be left with no leverage on Cost of Goods Sold (COGS), moving together with value of sales, whose margin is given by a fixed mark-up window plus/minus a 1% "flexibility".



In conclusion, the entire commodities industry went through a free fall during the peak of the distress. However, we have seen that Glencore felt much more than its main peers. The reasons are to be found in Glencore's exposures (proxied by Glencore's rolling filtered commodity betas) to the commodities that had suffered from the worst price drop (e.g. copper and thermal coal), financial leverage (proxied by the "D/E" ratio) and profit margins (proxied by the "COGS/Revenues" ratio). In other words, Glencore felt much more than other commodities players (higher betas) at a higher speed (higher leverage) and without a parachute which could soften the fall (Glencore's lower profit flexibility due to thinner "margin buffers").

# Comparing Glencore's Targets with Actual Performances

# Glencore's Announced Targets

The best way to analyze Glencore's announced targets is to directly let the announcements speak for themselves. In order to do so, we have selected an announcement of Ivan Glasenberg, current Glencore's CEO and main shareholder. His words introduce perfectly what can be considered Glencore's main focuses of the last two-three years:

"Our rigorous focus on debt reduction, supply discipline and cost efficiencies enabled Glencore to record a robust performance in difficult market conditions. Our diversified portfolio, based around a core of Tier 1 assets, combined with our highly resilient marketing business, underpins our ability to continue to be comfortably cash generative at current and even lower commodity prices."⁶⁶

⁶⁶ This quote has been extrapolated from Glencore's official document "*Preliminary Results Report- 2015*" (refer to page 124 of this document).

The main points of this quote sum up and explain briefly the main goals of Glencore in the mid-long term horizon. These goals can be graphically summarized as follows:



Glencore announced that it was willing to refinance its RCF⁶⁷ of US\$ 8.45 billion with a new deal of a value of US\$ 7.7 billion, in order to extend the maturity until May 2018 and to keep the same features of their previous contracts that did have very convenient clauses for Glencore, such as the absence of collaterals and covenants. Banks including ABN AMRO, Bank of Tokyo Mitsubishi, HSBC, ING and Santander would have been the entities on the deal. Always on the debt side, Glencore announced in Q4 2015 (and promptly started by the implementation of some deals, such as the sale of gold and silver for US\$ 500 million⁶⁸) a debt reduction for an amount of US\$ 10bn. Overall, all the targets converged to one of the main Glencore's announced commitment, which was first to maintain their corporate debt rating of BBB-/Baa3 (to be considered the minimum acceptable rating level) and then to achieve a BBB/Baa rating. In order to achieve such debt and rating targets, Glencore announced its main initiatives which would have been able to sustain their planes. Among these initiatives, Glencore targeted an EBIT of US\$ 2.5 billion, deferrals of some non-strategic investments, and more disciplined allocations of capital, allowing a CAPEX range of "US\$ 6 billion – US\$ 6.5 billion" from previous levels close to US\$ 8 billion.

## How It Went

In order to compare what was announced to what was actually achieved, let us give you the list of Glencore's main initiatives which Glencore has carried out to react to the distressed environment:

- To cut off part of its production which was not performing marginally, so to accommodate lower levels of demand with lower levels of productions especially for its coal production in South Africa Optimum and in Australia;
- To carry expansionary initiatives at Mopani and Katanga which allows a significant reduction in operating costs. Glencore estimated that these programs will reduce by more than US\$ 2.5 billion, US\$ 1.7 billion plus US\$ 1.65 billion respectively at Mopani and at Katanga;

⁶⁷ Revolving credit facility.

⁶⁸ Deal that was carried out with Franco-Nevada, a Canada-based firm that operates in the gold mining market.

- To complete the sales Glencore's G-Rail infrastructure to an Australian player for AU\$ 1.14 billion;
- To complete the sale of aggregate 49.99% stakes in Glencore Agriculture for US\$ 3.124 billion (40% stake plus 9.99% stake respectively to Canada Pension Plan Investment Board and British Columbia Investment Management Corporation);
- To complete the sale of an interest in the Ernest Henry copper-gold operation to an Australian player for AU\$ 880 million;
- To complete a long-term streaming agreement between a Glencore's 100% owned subsidiary (Narila Investments) and Franco-Nevada Corporation. This agreement, as the company official announcement states is *"for delivery of gold and silver calculated by reference to copper produced at the Antapaccay mine, located in Peru"*. The agreement was closed with a US\$ 500 million advance payment to Glenore for the closing of the agreement.

In short, Glencore's main targets in terms of debt reduction were (i) a reduction of financial debt by US\$ 10 billion by 2015-2016 and (ii) to reach US\$ 20 billion net financial debt by 2016-2017. If we consider the US\$ 8.5 net reduction of debt achieved between January 2015 and December 2015, the net debt reduction confirmed by Glencore's 2016 half-year report and the initiatives illustrated above, we see that Glencore achieved results even better than those Glencore was committed to. The graph below illustrates the overall big picture of Glencore's results compared to its announced targets:



## Glencore Xstrata: what we expect⁶⁹

In this paragraph, we are going to focus on what we believe are going to be the potential future paths on which Glencore will choose to walk. First, we start with presenting expectations for the overall company. Then, we move to analyze the outlooks for the expected macro-background relevant for Glencore.

## Glencore's Challenges

Now it is should already be clear what Glencore is and which Glencore's goals are. However, we would like to make also clear what the main challenges and potential "red flags" are. We now know that though Glencore has several strengths, such as horizontal and geographical diversification and a strong market position, the commodity giant in the near future will have to deal with an incredibly high volatility of the commodity market and the instability of the global economy. The high volatility as always is made of what we can call opportunities and what we can call threats. Let us start with the potential "good news".

## External Opportunities: coal demand

Future coal demand is one of the few factors that contributes to a potential positive outlook for the company. Indeed, increasing coal demand gives Glencore the chance to expand its volumes in a moment when Glencore really needs it. Coal demand is a central factor for Glencore. Indeed, coal represents the main source of power, generating about 40% of the world's electricity demand and the second-largest energy source as we explain deeply earlier. The current outlook, given by the International Energy Agency (IEA, refer to footnote n. 69 for the sources of entire paragraph), clearly forecasts the mentioned growth, stating that coal demand is going to show a 2.1% CAGR₂₀₁₅₋₂₀₁₉, reaching 9 billion tons/year. The main causes of this increase in demand will be strongly linked to India, which is expected to be the second largest consumer of coal by 2019 (if COP21 will allow it). Other emerging countries, such as Vietnam and Indonesia, are showing other significant growth potentials for Glencore in the next years.

## External Opportunities: copper demand

Another expected source of growth for Glencore is the future copper demand. Indeed, the global demand for copper will be strengthened by some emerging markets, such as Asia (China and India), and some developed countries, such as USA, Germany and Japan. In Asia, China is the main consumer of refined copper, and their demand/consumption accounts for about 40% of entire global consumption. Obviously, the current condition of the country in the last year has not supported growth in the industry, but now Chinese expectation consumption is showing an upward pattern that will reach 10mt by 2020

⁶⁹ The main sources and inspiration of this paragraph are the annual reports of Glencore and of other commodities players, the reports of the International Energy Agency (IEA) and reports of Marketline (mainly *"Company profile: Glencore Xtrata plc."*, Marketline (2014)).

from the current 1.7mt. Similar expectation in growth are coming from Japan, whose copper consumption is expected to get to 1.3mt in 2020 (with a current value of 1.2mt at the end of 2015) and from India, whose consumption is expected to get to 5.2mt in 2020 (with a value of 4.2mt at the end of 2015).

## Internal Opportunities: partnerships

Moreover, there are some "internal" opportunities on which Glencore can also rely. One of them is by all means the existence of a significant number of strategic business partnerships, which not only have been able to increase Glencore revenues, but also have been able to create important synergies. Moreover, these partnerships are continuously updated and new alliances are built, especially through joint venture agreements. Recently, the most important were closed with "Peabody Energy", "Iberian Minerals", and "El Capitan Precious Metals". While these three agreements were related to respectively production and purchase of coal and iron ore were located mainly in Europe (especially Spain), the agreement reached with "Blackthorn Resources" represents one example of relevant investments done by Glencore in emerging markets. Indeed, this agreement consisted in the purchase of Blackthorn Resources' share in the Perkoa joint venture in Burkina Faso and their linked exploration licenses. The license alone involved an outflow of about US\$ 12.0 million. All these partnerships, and the other partnerships not mentioned above, have yielded a significant and positive impact on Glencore's revenues and we do expect to generate them again in the next years, providing new business for the company (especially the lately completed combined acquisition by Glencore and Qatar Holdings of 19.55 of "Rosneft", the biggest Russian oil company)

## Internal Threats: operational risks

Glencore is facing several subcategories of operational risks, especially for its segment Metal and Minerals. These risks are by construction coming from the nature of the sectors in which Glencore mainly operates (mining above all). Risks that can have a huge impact not only on the company's profitability, but also on Glencore's reputation and brand image, especially when failing in assessing risks may lead to fatalities in Glencore's plants and mines⁷⁰. More generally, the risks that Glencore faces everyday start with extraction issues and end with the time marketing of their products, including security, political, social (maximizing employee's health/safety and limiting environmental impact) and technical risks. Furthermore, Glencore faces other sources of risk for activities that precede the realization and delivery of the product. We are referring to risks which include mine development and especially mine closure. Problems that are going to be much more and more at the center of Glencore's decision making processes, given the highly upward sloping expected value of CO₂ emissions and the

⁷⁰ Just in 2014 in Glencore's plants and mines 16 fatalities occurred.

higher expected costs coming from the closure of mines. Furthermore, the new Paris requirements will have significant impacts on Glencore's main production, especially due to the downward pressures on thermal coal forced by the new requirements. The graphs below show the impact in terms of expected demand based on the estimation provided by the International Energy Agency (IEA) in its world economy outlook (WEO):





Source: Glencore's Analyst Presentations and IEA WEO (2014)

#### External Threats: currency exchange rates

If the international profile of the Company can be considered a strength from a diversification point of view, being an international player comes with its risks. Obviously, one of them is directly linked to currency exchange rates, and this even more important for a company which is operating in many emerging countries. If we then add that some of those countries, where Glencore is currently operating, lately suffered from a systematic drop in their currency relative value, such as the cases for Brazil and especially Russia, we easily conclude that unfavorable changes in value for strategic currencies can have a very important impact on Glencore's expenses/losses. In 2014 we can see an example of this scenario, with Glencore recording currency exchange rate losses for more than US\$ 850 million. Given the macrocontext, it is easy to imagine highly volatile currency markets, which in turn can make Glencore incur new losses due to unexpected changes in currencies values.

## External Threats: an industry subject to new and more stringent regulations

Glencore's activities include a very broad number of operations, which range, as we have explain deeply, from generation to treatment. These activities are clearly linked with emission of toxic substances and different type of wastes. Inevitably, these activities are directly subject to a wide web of regulations, such federal, local and state (domestic and foreign), which put many restrictions on them. Furthermore, these laws are probably becoming more and more restrictive for the mining sector, and in general on all the sectors Glencore is in (Metals and Minerals, Energy and Agricultural). The company needs to

conduct its operations in compliance with many laws, here we report the most important acts and regulations:

- Resource Conservation and Recovery Acts;
- Clean Air, Clean Water Acts and Toxic Substances Control Act;
- REACH⁷¹ regulation for chemicals.

Notice that the above regulations are updated continuously and every time, and each update comes with more and more stringent rules. The violation of these laws may end in increasing the expenses for the Company, which would worsen the already poor performance ratios achieved lately. Obviously, Glencore, as any other company, is also subject to anti-trust and financial markets' regulations, which regulate any important deal (deals which can have an impact of Glencore's dominance of the commodities markets, such as the case with the European Commission linked with the Merger) to which Glencore decides to take part.

## The Expected Background

For sure, what Glencore cannot directly control are other exogenous factors, such as the macroeconomic and the geopolitical backgrounds. However, what Glencore can do is to hedge against macro-risks and, when it is possible, to take advantage of the high volatility of the commodities markets throughout trading arbitrages. What we believe are going to be the main factors are the volatility in the energy industry, China's economy evolution and the critical situation in the Middle East. Even though the former is probably already clear to the reader, we would like to give some more details to draw a complete picture. The factors that will "feed" the volatility in the energy industry mainly come from the oil market instability, which is supported by the following facts and events:

- Iran's reserves went back into the game. The number are definitely not irrelevant given that these reserves amount almost as Saudi's;
- Saudi Arabia's threats of discretionary lowering the price at which oil is sold. Note that Saudi Arabia has the lowest cost to extract oil. Indeed, their break-even is about US\$ 20 a barrel. Basically, lowering the price of oil to US\$ 30 a barrel (initial threat), or even below US\$ 30 a barrel, it would threat the exit of several countries from the oil market;

Note that the first two points are well linked. In fact, several times Saudi Arabia has announced that it will not stop producing at below average prices until Iran does not sign a favorable agreement;

⁷¹ Registration, Evaluation, Authorization and Restriction.

• Furthermore, in 2017 a marginal cost "war" is going to start. This war initially will be driven by those countries that can afford to sell at below average prices, which obviously will have as main result a drop in price of oil. Some countries will be forced to exit the market, which, after a while, will in turn slowly increase the oil price. For instance, Venezuela could be one of those exiting the market. Even if Venezuela is the first country in terms of reserves, it would not be able extract much oil because their reserves are mainly in the water, which makes it much harder and more expensive the extraction. Therefore, prices are likely to go back up for a while in the short-medium term. Why just for a while? What we believe is that it will not be possible to go above the average marginal cost of some oil producers, such as USA and Canada, which at end of 2015 were basically out of the game for their higher extracting marginal costs. Indeed, in these countries many producers stopped extracting and started to wait for better prices (since the last quarter of 2015), in order to get better marginal revenues.

To sum up, prices are probably going up for a while until they reach the average break-even of the USA and other main producers, which now are below break-even given the fact that they are mainly investing in unconventional production which is much more expensive than other types. Once it will be reached the break-even, the oil price is destined to go back to lower levels for the new supply starting to kick in. This circular process will lead to high volatility in the oil price, whose "cap" is represented by some kind of average of the marginal cost of extracting oil for unconventional producers, and whose floor is represented by US\$ 20 a barrel, which equals the lowest extraction cost (Saudi's). All these factors are going to influence the mining industry as well, which is highly correlated with the Energy and the Utility Industries (for example coal and oil are historically correlated). The figure below sums up what we believe is the big pictures the big picture of Glencore today and in the next future:

## Threats

- Operational Risk
- Currency Risk
- Stringent Regulations
- Future CO2 Costs

# Weaknesses

Lawsuits

- Litigations
- •Limited Solvency Position

## Strengths

- Geographic
   Diversification
- Diversification via 93 commodities
  Strong purchasing power
- •Highly vertically integrated

#### **Opportunities:**

- Copper demand expected to go back to positive growth
- Coal demand expected to go back to positive growth

# Appendix

## Introducing the Black Box: a snapshot of Glencore

For this chapter the reader can find all the details directly in the main body.

# The IPO: the birth of a giant

#### CAPEX of the Overall Market (refer to page 19)

**Cumulative CAPEX** 

Overall Supply (% increase)



#### Source: Re-elaboration of data available on Glencore's analyst presentation

## Comparable List & Beta Computation (refer to pages 26 and 27)

			Metals&Mine	erals			
Peers	Stock Exchange	Ticker	Levered Beta	Leverage Ratio (D/E)	Headquarter	Tax Rate	Unlevered Beta
Rio Tinto PLC	LSE	RIO	1.77	6.7%	London	26.0%	1.68
Vale SA	NYSE	VALE	1.52	23.7%	Rio de Janeiro	34.0%	1.32
Osisko Mining Corp	ТО	OSK	0.51	0.0%	Toronto	28.0%	0.51
Anglo American	LSE	AAL	1.55	19.4%	London	26.0%	1.35
Antofagasta	LSE	ANTO	1.68	29.2%	London	26.0%	1.38
BHP Billiton LTD	LSE	BHP	1.46	6.7%	Melbourne	30.0%	1.39
Alcoa Inc	NYSE	AA	0.69	78.0%	Pittsburgh	40.0%	0.47
Alumina LTD	ASX	AWC.AX	0.60	1.3%	Melbourne	30.0%	0.59
Teck Resources LTD	NYSE	TECK	1.96	41.5%	Vancouver	28.0%	1.51
Freeport - McMoran Inc	NYSE	FCX	2.15	80.9%	New Orleans	40.0%	1.45
Mean							1.17
Median							1.37

			Energy				
Peers	Stock Exchange	Ticker	Levered Beta	Leverage Ratio (D/E)	Headquarter	Tax Rate	Unlevered Beta
Royal Dutch Shell	LSE	RDSA	0.98	20.7%	London	26.0%	0.85
British Petroleum	NYSE	BP	1.08	27.0%	London	26.0%	0.90
Exxon Mobil	NYSE	XOM	0.92	4.9%	Irving (USA)	40.0%	0.89
ENI	MI	ENI	1.00	51.2%	Rome	27.5%	0.73
Kinder Morgan Inc	NYSE	KMI	0.75	85.9%	Huston	40.0%	0.49
Enbridge Energy Inc	ENB	ENB	1.50	0.0%	Calgary	28.0%	1.50
ENEL	MI	ENEL	0.42	86.7%	Rome	27.5%	0.26
China National Petroleum Corporation	NYSE	SNP	1.42	18.2%	Beijing	25.0%	1.25
Chevron Corporation	NYSE	CVX	1.31	17.4%	San Ramon (USA)	40.0%	1.19
Total SA	NYSE	TOT	0.87	24.5%	Courbevoie (FR)	33.3%	0.75
Sinopec Shanghai Petrochemical Company LTD	NYSE	SHI	0.93	5.5%	Beijing	25.0%	0.89
Mean							0.88
Median							0.89

Agricultural								
Peers	Stock Exchange	Ticker	Levered Beta	Leverage Ratio (D/E)	Headquarter	Tax Rate	Unlevered Beta	
Monsanto	NYSE	MON	1.11	6.1%	Saint Louis	40.0%	1.07	
Syngenta AG	NYSE	SYT	1.03	24.3%	Basilea	18.3%	0.86	
Du Pont	NYSE	DD	1.31	99.0%	Wilmington (USA)	40.0%	0.82	
American Avanguard	NYSE	AVD	0.78	36.6%	Newport Beach	40.0%	0.64	
Wilmar International LTD	OTC	WLMIF	1.83	72.8%	Singapore	17.0%	1.14	
Archer Daniels Midland	NYSE	ADM	1.10	24.5%	Minneapolis	40.0%	0.96	
Alico Incorporated	NYSE	ALCO	1.17	88.6%	Fort Myers (USA)	40.0%	0.76	
Agrium	NYSE	AGU	0.70	40.9%	Calgary	28.0%	0.54	
Bunge LTD	NYSE	BG	0.99	49.5%	Bermuda	0.0%	0.66	
Adecoagro	NYSE	AGRO	1.01	48.1%	Luxemburg	28.8%	0.75	
Mean							0.82	
Median							0.79	

1. Weights - Q4 2010 (Listed 19/05/2011)						
Segments EBITDA Weight						
Metals&Minerals	\$ 3,269.00 67.					
Energy	\$	829.00	17.04%			
Agricultural	\$	766.00	15.75%			
Total	\$	4,864.00	100.00%			

Unlevered Beta Leverage Ratio (D/E) Headquarter Tax Rate Levered Beta

Glencore's Implied	1.06	40.0%	Baar	18.31%	1.41
Beta Range	1.20	40.0%	Baar	18.31%	1.59

#### WACC Computation (refer to pages 26 and 27)

For the WACC computation, we have used the following formula:

$$WACC = \frac{D}{(E+D)} * R_d * (1-\tau) + \frac{E}{(D+E)} * R_e$$

where D stands for net financial position, E stands for market capitalization, Rd stands for cost of debt (computed in the main body), and Re is computed assuming a simple Capital Asset Pricing Model, whose structure is recalled below:

$$R_e = R_f + \beta_{mkt} * (R_{mkt} - R_f)$$

which gives the following results:

$$R_e = [11.5\% - 12.6\%] = 3.1\% + [1.41 - 1.59] * 6\%$$

Again for coherence we have assumed a 10 Year US government bond as a risk free asset for the period under analysis (3.1%), and we have used the long term market premium (which is stable around a value of 6%) as our market benchmark.

Glencore IPO Valuation: 2010 multiples (refer to page 28)



Formulas MAX DD (refer to page 29)

 $Drawdown \ at \ t = DD_t = \max_{0 \le \tau \le t} R_\tau - R_t$ 

 $R_t = cumulative \ return \ at \ t$ 

Maximum Drawdown at  $t = max(DD_1, ..., DD_T)$ 

 $t=1,2,\ldots,T$ 

Running Maximum at  $t = RM_t = max(P_1, ..., P_t)$ 

 $P_t = price \ at \ t$ 

## The Merger: Glencore & Xstrata

For this chapter the reader can find all the details directly in the main body.

## Post – Merger: Glencore's restructuring

Kalman Filter: the system of equations (refer to page 78)

$$a_{t|t-1} = T_t a_{t-1} + c_t$$

$$P_{t|t-1} = T_t P_{t-1} T'_t + R_t Q_t R'_t$$

$$\widetilde{y_{t|t-1}} = Z_t a_{t|t-1} + d_t$$

$$v_t = y_t - \widetilde{y_{t|t-1}}$$

$$F_t = Z_t P_{t|t-1} Z'_t + H_t$$

$$a_t = a_{t|t-1} + P_{t|t-1} Z'_t F_t^{-1} v_t$$

$$P_t = (I_m - P_{t|t-1} Z'_t F_t^{-1} Z_t) P_{t|t-1}$$

Formulas MAX DD (refer to page 84)

$$Drawdown \ at \ t = DD_t = \max_{0 \le \tau \le t} R_\tau - R_t$$

 $R_t = cumulative \ return \ at \ t$ 

Maximum Drawdown at  $t = max(DD_1, ..., DD_T)$ 

t = 1, 2, ..., T

Running Maximum at  $t = RM_t = max(P_1, ..., P_t)$ 

 $P_t = price \ at \ t$ 

Default Assuming 0% Cash (refer to page 88)



Default

Default Assuming 100% Cash (refer to page 88)





# Implied CDS Spread and Equity Return (refer to page 88)



## Leverage Ratio Comparison (refer to page 93)

Agriculture Industry	Leverage Ratio (D/E)
Monsanto	6.1%
Syngenta AG	24.3%
Du Pont	99.0%
American Avanguard	36.6%
Wilmar International LTD	72.8%
Archer Daniels Midland	24.5%
Alico Incorporated	88.6%
Agrium	40.9%
Bunge LTD	49.5%
Adecoagro	48.1%
Mean	49.0%
Median	53.3%

Energy Industry	Leverage Ratio (D/E)
Royal Dutch Shell	20.7%
British Petroleum	27.0%
Exxon Mobil	4.9%
ENI	51.2%
Kinder Morgan Inc	85.9%
Enbridge Energy Inc	0.0%
ENEL	86.7%
China National Petroleum Corporation	18.2%
Chevron Corporation	17.4%
Total SA	24.5%
Sinopec Shanghai Petrochemical	5.5%
Mean	31.1%
Median	20.7%

Mining Industry	Leverage Ratio (D/E)
Rio Tinto PLC	6.7%
Vale SA	23.7%
Osisko Mining Corp	0.0%
Anglo American	19.4%
Antofagasta	29.2%
BHP Billiton LTD	6.7%
Alcoa Inc	78.0%
Alumina LTD	1.3%
Teck Resources LTD	41.5%
Freeport - McMoran Inc	80.9%
Mean	28.7%
Median	30.9%

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## DEPARTMENT OF ECONOMICS AND FINANCE

CHAIR OF FIXED INCOME, CREDIT AND COMMODITIES MARKETS

# GLENCORE PLC: DECODING A BLACK BOX

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## Abstract

## Glencore PLC: decoding a black box

## Introduction: a snapshot of Glencore

"The biggest company you never heard of", these are the words used by Reuters⁷² to define Glencore and likely are also the words you will say after reading our clinical study on Glencore, if (as we assume) this is the first time you hear about this commodities titan. To be honest, as the majority of the readers, before starting this study we did not know much about Glencore, and this is surprising since Glencore is a firm whose revenues are higher than the aggregated revenues of Google, Credit Suisse, Nike, and Telstra. Not by chance, Glencore's US\$ 200 billion average revenues (2011-2015) brought Glencore to be listed in the "Fortunes Global Top 15". Hence, how did we get to write this clinical study? Certainly, the commodities market is one of the most relevant, yet opaque, entities in the field of business and economics. However, there are many systematic and important markets which could be interesting to analyze. Why the commodities industry? and in particular why Glencore? The answers to these questions are actually linked and consequential. The commodities market caught our attention for the distressed and the volatile background which had characterized (and still today characterizes) this industry. The global conditions in the last years have been mainly driven by economic weaknesses, volatile financial markets and the unpredictability of an overall recovery trend. For instance, in 2015 world GDP has grown at 2.5%, percentage that is still quite below its past 15 year average. On one hand, the 2.5% gross domestic product (GDP) growth has been "backed" by the partial recovery of some advanced economies, whose GDP growth turned into positive for the first time after several years. On the other hand, the GDP growth has been lowered by the deterioration of the of the conditions of some of the emerging markets. In particular, there was a strong worsening of South Africa's and South America's deficits, which was followed by a shrinkage of domestic consumption/demand, higher and higher inflation "supported" by sharper and sharper depreciations in local currencies. In this sense, China has been a big protagonist as well. Chinese big role has been due mainly to the its strong financial market turbulences, kept up by negative prospects of a decrease in the economy's growth and the continued Yuan depreciation, which in turn led to a significant decrease in the overall imports and in particular of many raw materials, which were mainly used in the development of the country in terms of industrialization and urbanization, developments which are highly intensive in several commodities (especially intensive in raw materials such as copper, zinc and thermal coal). This background and downward outlook pressures led to a lack of demand and industrial need of mineral commodities markets (aluminum, coal, copper, lead, nickel, and zinc). Ironically, these markets were the ones which,

⁷² "The Biggest Company You Never Head of", by Eric Onstad, Laura MacInnis and Quentin Webb (2011).

until few months before the collapse of the market, had been the main drivers of an incredible decade of growth of the entire commodities market, which had led main commodities players to make extraordinary CAPEX (Capital Expenditure) investments in order to increase their produced and traded volumes to keep up with a literally exploding demand. However, these investments yield their results in terms of operations, on average, after 3-5 years. Unfortunately for the commodities players, China downturn (and, as we will show later, the overall slowdown of the Brazil's, Russia's, India's, China's and South Africa's - from now on, BRICS - economic and industrial production growth) started when almost the entire industry reached its maximum supply capacity. Indeed, as we will illustrate later, main commodities players implemented significant investments, especially in terms of assets (e.g. plants, software, and so on), especially between 2005 and 2011. If we put together this information together with a three-to-five "investment duration", we know that roughly between 2008 and 2014 miners and traders were ready to supply their full potential. Here we go back to the simple, yet evergreen, supply-demand lecture: high supply and low demand equal a price drop. In this case, given the magnitude of the gap between demand and supply, the drop turned out to be a price collapse, which in turn brought to the collapse of the entire commodities market.

As said earlier, this background caught our attention and brought us to investigate the reasons behind this collapse and to try to shed some lights on the overall dynamics of this opaque market. So now we know why the commodities industry. Yet, why Glencore? Our interest in the dynamic of the commodities market and the interest in the commodities collapse brought Glencore to our attention. Indeed, many analysts in February 2015 – i.e. at the time when we started to think about potential topics – could not be 100% sure to make a safe statement by saying that Glencore would have survived on this high distress market, which drove Glencore's equity market value to 80% of its initial public offering value (back in 2011). Hence, we were really interested in carrying out a quantitative and qualitative investigation on the main factors which brought Glencore to be about to default. However, Glencore was not the only one to be highly affected by the distress. Then again, why Glencore and not Noble Group or Trafigura or other commodities miners and/or traders which also went through tough moments? The reasons are to be found in Glencore's business model. In order to make the reader understand why Glencore's business model was the real difference maker for our decision, it is beneficial to quickly illustrate how the commodities market is structured and how Glencore operates in this market. The commodities industry can be proxied with two main dimensions - (i) sectors and (ii) business lines – which in turn can be split into:

(i) Sectors: (a) Agriculture (e.g. crops, seeds), (b) Energy (e.g. coal, oil and gas products), (c) Non-Precious Metals and Minerals (e.g. copper, zinc), (d) Precious Metals (e.g. gold, silver); (ii) Segment: (1) Industrial activities (e.g. production, processing), (2) Marketing activities (e.g. logistics, transportation), (3) Financial Trading (e.g. contango, rolling futures).

If you read any article related to Glencore, Glencore's definition is something like "Glencore is the most globally integrated and diversified player in the commodities industry", which sounds very imperious. However, it cannot be deeply understood until someone puts you in front of the data. Here are the data:

GLENCORE	Agriculture	Energy	Metals&Minerals
	(a)	(b)	(c+d)
Industrial activities (e.g. production, processing)	Handling of originating and handling of grain, pulses, sugar rice, cotton vegetables oil, protein meals and biodiesel	Coal Mining and oil 🗸	Mining activities for Copper, zinc, lead, nickel, ferroalloys, alumina&aluminium
Marketing activities (e.g. physical trading)	Processing and marketing grain, pulses, sugar rice, cotton vegetables oil, protein meals and biodiesel	Supplying and shipping thermal coal (utilities), coking coal (steel producers), oil, refined products and natural gas	Copper, zinc, lead, nickel, ferroalloys, alumina&aluminium and iron ore
Financial	Represents a small	Represents a small	Represents a small
Trading	percentance of	percentance of Glencore's	percentance of Glencore's
activies (e.g.	Glencore's business,	business, whose	business, whose
derivatives	whose maximum VaR _{5%} is	maximum VaR5% is about	maximum VaR5% is about
strategies)	about US\$100	US\$100	US\$100

The grid above is showing how Glencore is basically operating at each single step of the supply chain of each sector of the commodities industry, from mining activities to the physical and pure trading activities. In other words, Glencore is the only firm in the world which is significantly present on each single square of the above illustrated grid, playing a leading role in the international commercial trade and in the mining industry (see figure on page 4 of the main body to compare Glencore with its peers).

Hence, our attempt to understand the features of Glencore is almost equivalent to understand the dynamics of a central, yet opaque, market which is often in the limelight of the news and despite that is never deeply explained, and as a matter of fact making the market look like a black box. For these reasons, we have decided to shed some lights on this black box and to investigate its dynamics by carrying out a clinical study on Glencore. Our clinical study includes Glencore's entire recent history starting from Glencore as a private partnership entity, going through its IPO, its giant US\$ 90 billion merger with Xstrata (from now on also the "Merger") and ending with a qualitative and quantitative analysis of its distress and consequential financial debt and overall group restructuring process, whose main initiatives started in 2014 and "ended" recently in 2016.

## The IPO: a birth of a commodities giant

Glencore was founded by March Rich, also known as "the king of oil", in the 70's under the name of Marc Rich & Co AG. In its early days, Glencore was focused exclusively on physical marketing of commodities (mainly focused on minerals, metals, non-ferrous and ferrous, and crude oil), and so it was for the entire decade, when the deals carried by the commodities trader were only related to M&A activities meant to enlarge and diversify its marketing business. Today, Glencore is a leading commodities player with average revenues of US\$ 200 billion, strategic asset with a value of about US\$ 130 billion involved in each step (mainly exploration, extraction, production, blending, optimization, marketing activities) of the supply chain of several commodities (e.g. copper, thermal coal, zinc, etc.) and spread out all around the world (see from page 5 to page 14 in the main body for the main results of our research and we provide the results of our investigation that enabled us to quantify in a detailed way Glencore's strategic asset breakdown in terms of geographies, activities and so on⁷³). In order to get to this point, Glencore went through a quadruple-digit growth which ended with an IPO in May of 2011. However, you may ask yourself "why such a giant, which has spent almost 40 years of its life as a private partnership in the shadow of a blurred industry, would be willing to go public?" Generally, there are many reasons why a company should be willing to go public. For example, a listed company may have some benefits such as (i) sources of capital much more easily accessible, (ii) lower cost of capital, (iii) markets are more confident in a listed company because of the enhanced availability of data, fast accessibility to market values and so on. Anyhow, there must be some reasons to make these points real pros of listing. For instance, it is true that listed companies on average have an easier life in collecting additional capital, but, if a company does not need extra sources of capital, it is really unlikely that a private structure, used to work in a partnership frame, would be willing to dilute its ownerships and voting rights for some extra capital which is not effectively needed. Therefore, "why did Glencore list?" becomes, first "did Glencore need additional capital?", then "did Glencore need additional liquidity?" and finally "if yes, were these needs in line with the interests of Glencore's executives?" What we found made us answer "yes" to each of the previous questions. Let us tell you why. The period that goes from 2002 to 2010 is a period that is characterized by a strong positive demand shock in the commodities markets. The entire world was speeding up its growth, both in terms of GDP and in terms

⁷³ The main sources used in our investigations were a Bloomberg terminal and official transport trackers databases. For the mining division, Bloomberg's function "BMAP" was sufficient to find and then quantify the resources and reserves located in each of Glencore's 66 coal mines, 184 Metals & Minerals mines, 12 smelters, 46 refineries and 4 storage facilities. For the marketing division, again we have used the "BMAP" function, which allowed us to look for marketing facilities (e.g. locomotives, vessels) and to filter for the assets directly owned by Glencore. In this way, we have been able to get identifiers (usually a number for each asset) which we used to track their average commercial activities. For example, for vessels we used the IMO number (International Maritime Organization) of each vessel as unique identifiers, which we have inserted in maritime trackers to trace Glencore's vessels route.

of industrial production. Most of this growth was driven by Asian developing countries, which kept growing almost with double-digit percentages for about 6 years (especially between 2003 and 2005). The urbanization, industrialization and general development of these countries, and above all the size of these events, came guite unexpectedly for the commodities players, which were not ready to handle such a shock, used to a "just-in-time inventory policy". Inevitably, if you put together a supply-side not ready to adapt to new levels of demand and a demand-side which is growing at double-digit rate speed, the only possible result is a significant increase in commodities prices, which is exactly what happened. For many of the commodities players this background was an once in a life train, and many of these players, some of them sooner and some of them later, did everything was possible to accommodate the upturn. In order to do so, we would expect to find steadily growing assets (especially in terms of noncurrent assets) to support higher production levels, higher investments in intangible assets, and an overall enhanced capital intensity. The charts provided in the main body (see page 19 and 20) tell us exactly this story. Glencore's main peers between 2002 and 2010 put great effort in expanding their asset base, increasing the percentage of non-current assets, extremely intensifying their investments in intangible assets (e.g. software and licenses) and significantly enhanced their capital intensity (we have proxied suing ratios such as "Capital Expenditures/Employment"). It is important to note that all these investments were made before Glencore's IPO, which took place only in 2011. Now imagine that you are the Glencore's CEO back in 2010-2011. This is what you see: (i) incredible double-digit growth rates in the market, (ii) many macroeconomics indicators (e.g. GDP, industrial production, inflation) saying that your company is in the middle of an upturn, and (iii) steadily higher growth in demand for commodities especially coming from the extraordinary growth of the Asian developing countries. Then, add that all your biggest mining competitors, which at that time were all listed, have proved that they are serious about trying to accommodate the upturn in the market by making significant investments in terms of non-current tangible and intangible assets. Given this background, we are quite sure that many of you would have thought to try to do the same: following your competitors, accommodating new levels of demand and growth in order to not be left outside alone. Finally, for those of you who were positive on following your competition, now it is time to actually follow the market and make several investments in terms of marketing infrastructure, production plants and so on. However, these investments are really expensive and your company (at that time) had just US\$ 1.4 billion liquidity in its pockets. Hence, the problem becomes "where do we get the money?". Definitely, selling non-strategic assets in order to buy more strategic ones could be a possibility, but the point is not to have only better assets, the point is to make investments to enable your company to have higher levels of production and to build an infrastructure which is able to handle higher volumes to be traded and a more globalized international trade market. If you take into account that your company already has a significant portion of financial debt, higher than anyone else's in the market, and that Glencore's brand at that time is increasing in value each single day, you might end up with just three words: initial public offering. Obviously, we cannot know whether Ivan Glasenberg, the actual Glencore's CEO at that time, really had this pattern in mind. However, we know that Glencore did list in 2011 and we have data that seem to confirm our beliefs. Indeed, the data are confirming that (see page 21 and page 22 of the main body for further details):

- Glencore was already trying to increase their assets between 2008 and 2010. However, Glencore started growing its non-current assets at its peers' speed between 2011 and 2013;
- Even though Glencore did not adopt IAS 38 until the year of its IPO and therefore we have a limited time series starting from 2011, we can still see an incredible growth in Glencore's investments in intangible assets (2011 – 2013 CAGR: 380%), whose main accounts were warehousing, port rights, licenses and software expenses;
- Glencore's intensity of capital steadily increased since 2009 until 2013, which again looks very
  familiar and similar to the process through which most of Glencore's main peers had gone
  before Glencore (some of them, e.g. Vale and Rio Tinto, four-five years before and other later,
  e.g. BHP Billiton, just one year before).

Therefore, it is plausible to state that in 2011 Glencore went public in order to have a faster and an easier access to sources of capital necessary to go through a sustainable and strong growth in terms of volumes produced and traded. Was this the only reason? Absolutely not. Definitely, there were at least two other reasons to go public at that time:

- To get enough liquidity for the planned merger with Xstrata: the merger was completed as an all-equity merger, i.e. no additional liquidity was necessary for the deal. However, the liquidity was necessary to handle Xstrata financial debt. Indeed, Glencore itself already had a relevant exposure to financial debt (about 104% book leverage⁷⁴), and the acquisition of Xstrata meant also the acquisition of Xstrata's financial debt, which was very substantial as well (about 40% book leverage, with a US\$ 17,407 million of net financial debt);
- To implement a cash out strategy for some of Glencore's investors: Glencore was sold from Marc Rich, its founder, in 1994 to its management via a management buy-out for about US\$ 600 million. Glencore's equity was officially valued at a range of 480 pence 580 pence per share, which put together with the numbers of share issued at that time (and to be issued for the IPO) gave an expected equity market value of about US\$ 60 billion. A 10,000% return (in 16 years) is something way above any imagination in any type of investment. Moreover, IPOs and

⁷⁴ Book leverage is defined as book value of financial debt on book value of equity. Glencore before the merger with Xstrata had US\$ 35,526 million of financial debt and an equity book value of US\$ 34,173 million.

M&A deals are usually the most common and efficient forms of exit strategies for investors. Even though only part of the investors decided to cash out their shares⁷⁵, the IPO in few hours made 500 Glencore's employees millionaires and some of Glencore's executives, Ivan Glasenberg included, billionaires.

However, there is always the other side of the coin. If 2011 was the best moment to go public for Glencore, not necessarily it had to be the best moment to invest in Glencore⁷⁶. Hence, we tried to understand whether an initial opening share price of 548 pence could have been considered a good investment at that time. In order to do so we have focused on Glencore's fundamentals and on their corresponding dynamics. Our findings are summarized in the following outline:



The graphs we present in the main body (see from page 29 to page 40) illustrate some of the evidences which could have used to spot a potential cool down of the commodities market, in particular evidences which were coming from BRICS and Asian countries, such as China and India. However, these evidences cannot be considered enough to conclude that this IPO was intentionally perfectly timed in terms of Glencore's equity valuation and in terms of cash out strategy. Why May 2011? A combination of necessities, related to the need of new sources of capital (e.g. in order to sustain (*i*) the strong growth of BRICS countries, (*iii*) the increase in the demand of the those commodities which Glencore mainly extracts and trades, (*iii*) the capital intensity evolution of the market) and the awareness of knowing that Glencore was floating at what potentially could have been the historical peak of the market (actually it was the historical peak, (see page 30 of the main body), made Glencore set its initial public offering in May 2011. Ivan Glasenberg, the CEO of Glencore, at that time probably knew that is was the right time

⁷⁵ In the global offer of shares (1,250,000 shares), 261,026,766 shares were available by the selling shareholders. ⁷⁶ We have also invested this topic in two different ways: (*i*) a multiples valuation which yielded an expected lower share price than the official opening share price; (*ii*) a backward Discounted Cash Flow approach to check which assumptions were necessary to get the official opening price. We believe that these assumptions (a minimum 17%-18% CAGR for the mid-term) are not consistent with our findings especially related to the BRICS' health. Refer to the second chapter of the main body for further details.

to go public. However, there is still a difference between the "right time" and the "perfect time". We assume that the former was in the mind of Glencore's executives. Nevertheless, it is quite unrealistic to assume that Glasenberg and his crew knew that they were sitting on the highest point of their gold pile.

# The Merger: Glencore & Xstrata

The relationship between Glencore and Xstrata goes back to the 1990's when Glencore acquired a 34.5% stake in Xstrata's equity and legitimately became one of its major shareholders. Xstrata was founded in 1926 in Switzerland under the name of Südelektra AG with a business model based on infrastructure and energy projects located in Latin America. Xstrata jumped into the spotlight after its IPO in 2002 and after a series of strategic acquisitions which in 2011 positioned the Swiss miner as one of the leading miner groups in the world. This mining giant had projects and operations, spread out in more than twenty countries and mainly related to the extraction and production of alloys, copper, nickel, zinc and coal, generating US\$ 33.9 billion revenues and a US\$ 11.7 billion EBITDA (growing at a 9 year CAGR speed of 45.5%, from a value of US\$ 0.4 in 2002) and enabling the Swiss miner to increase its equity market value to about US\$ 29 billion (100 times greater if compared with 2001 values). Besides Xstrata's acquisition strategies, the company achieved its success by focusing on a decentralized type of management which made Xstrata save several millions of dollars each year. No need to say that these features and track records caught Glencore's attention, which in turn became a serious interest in realizing one of the greatest deals ever completed in the commodities market.

The merger between Glencore and Xstrata (from now on also the "Merger") was announced in early February 2012 by the corresponding directors of the firms. At the beginning, the Merger was announced as an all-share merger of equals. However, the deal did change in its terms, eventually completed as a pure Glencore's takeover of Xstrata, and its duration, taking much more time than expected (451 days, two semesters more than expected). The Merger was clearly creating a new entity which could create value at each step of the commodities supply chain, from the extraction of the raw materials to merchant activities at an international and highly diversified level, unlike its competitors who have found success focusing on its core business, i.e. either as miners or as traders. If Glencore and Xstrata succeeded in their strategy, this alliance could have meant a reshape for the whole industry forcing competitors to follow their lead. The commodities market collapse started in 2014 made quite complicated to evaluate this strategy. Besides the fact that the market so far seemed not to appreciate the vertical integration (Glencore among its peers is the one which suffered the most in the peak of the distress, as we will deeply illustrate in the last chapter), we probably still have to wait for calmer waters to know whether this initiative was a real success or a failure. Note that such vertical integration would take years to be made internally by each of the firms and that the Merger represents the first large-scale test of vertical integration in the mining industry. Indeed, it brings together a commodities trader and a miner trying to secure their supply of resources. The new entity allowed them to exploit enhanced economies of scale and a geographic hedge mainly ensured by their global presence. These and other synergies generated a positive impact (about US\$ 2 billion) both in the terms of one-off savings and in terms of long-term benefits. Regarding the long-lasting benefits, there were two main sources of benefits: (*i*) operational synergies initially expected to generate additional US\$ 500 million EBITDA (on an annual base, which then was downward adjusted to US\$ 450 million), principally coming from the optimization of freights, contract pricing terms, blending opportunities, custom fee procurement and marketing overhead, and (*ii*) a reduction in credit spreads, due to the repositioning of the enlarged group's credit profile, from a credit "Trading" BBB to an "Industrial" BBB (referring to S&P rating rankings), which ensured a US\$ 145 million savings in terms of financial interests. Regarding the one-off benefits, Glencore generated significant cost savings (about US\$ 1.4 billion) resulting from three main phases: (*i*) closure of Xstrata's head offices in Zug and London, (*ii*) rationalization of Divisional Head Offices structure, and (*iii*) on-going operational efficiency.

Furthermore, the Merger had several other impacts, especially in terms of business model, corporate governance and ownership structure. However, Glencore has always been a really particular case in the industry in terms of ownership distribution. Indeed, a big percentage of Glencore's ownership has always been concentrated in its management (something really rare in the industry, see page 48 of the main body), which was even further increased by the Merger, bringing Glencore's management to hold 24.86% (from 16.82%) of Glencore Xstrata shares, at which we should add a 10.84% of shares owned by Glencore's employees. Glencore hailed this type of management as "owners, not caretakers of assets". However, the Merger introduced new major shareholders, which includes two of Xstrata's oldest owners (Qatar Investments and Black Rock), with a combined stake of 14.15%. The board also suffered some changes. However, the fact that the new board was composed by Glencore's members was a clear proof that this deal ended up as a pure takeover, even though the economics made it look as a "merger of equals" (e.g. similar levels of net income).

As we mentioned before, the deal took much more time than expected. It was planned to be done by the end of Q3 2012. However, it was completed only on May 2nd (2013). This delay was caused mainly by three reasons. The first problem was regarding the retention package. The initial proposal comprised £170 million for the 73 Xstrata key executives. This amount was rejected by Xstrata's major shareholders and only in June 2012 Xstrata and Glencore began the process of negotiation. The second problem was the takeover price. The initial offer was 2.8 Glencore's shares for each share of Xstrata. This bid was

rejected especially by Qatar Holding (from now on "Qatar"), in turn slowing down the negotiation. Qatar was Xstrata's second largest shareholder at that time, owning 12% of its stake, meaning that its support was crucial for any intended deal between Glencore and Xstrata. Qatar was aiming for an increase in the offer, and proposed a starting exchange share ratio of 3.5 to support the deal. Eventually, Glencore agreed to raise the offer from 2.8 to 3.05 of its shares for every Xstrata share and to reduce the package to £140 million, and the deal went through.

The third problem was, the attention brought by the fact that a world leading trader of commodities was about to merge with a leading producer of almost the same commodities. For many global competition authorities and even for the European Commission this deal was in many ways not trustful. The European Commission was particularly concerned about the power that the combined entity would have had over the European zinc market. Indeed, the two entities represented two giant of the commodities market at that time, and their combined entity created a titan which today is the forming the world's fourth biggest mining company and the world's biggest commodity trader (see from page 50 to page 59 of the main body for further details in terms of combined volumes). Hence, the European Commission conducted an investigation in order to detect any type of position of dominance that would have affected the market and its competitors. This investigation concluded that the only sub-sector in which the Merger raised serious doubts about power bargains and supply concentration levels was the zinc metal business, since at that time Glencore-Xstrata combined entity could reach a market share in excess of 50%. In response to this concerns and to press forward the delayed negotiation, Glencore agreed to sell some zinc assets and change supply contracts in order to complete the deal.

## Post-Merger: Glencore's restructuring

A drop in the equity market value of Glencore between 2014 and 2015 was definitely inevitable, given the distressed macroeconomic background, the BRICS' slowdown and the consequential commodities market collapse. As Glencore, Glencore's main peers and the entire mining market collapsed. However, Glencore's equity felt much more than anyone else's equity (see page 66 and page 90 of the main body). Once again, we asked ourselves "*why*?". We have analyzed this topic from different angles. Here we report the results of what we have found, for further details refer to the fourth chapter of main body (in particular further details on the derivation of the result refer to the paragraphs: (*i*) "Filtering the Rolling Betas" and (*ii*) "The Model Specification: a dynamic AR(1)-GARCH(1,1) Merton Model").

Glencore carried out many initiatives which we believe have augmented the exposure to an overall collapse of the commodities market and amplified the magnitude of a potential equity collapse:

- First, Glencore was involved in a long diversification process, which led the company from a "simple" commodities trading house to the most globally diversified player in the market, with a coverage of more than 90 commodities. A priori, in "normal" scenarios, diversification is everything but something can be considered harmful in terms of default probability, since it is a process that enables any company to be less dependent on single factors/industries, thus reducing the risk of default triggered by the collapse of specific factor/industry. However, this is not a "normal" scenario. Glencore did diversify its business, but the diversification process involved sectors which are included in the same market, i.e. the commodities market. In 99% of the cases, this kind of diversification can still give a partial beneficial effect, given the positive correlation yet not unitary between these commodities sectors/subsectors. The problems show up when a company incurs into the 1% of the cases, the black swan of the commodities market, when agricultural products, energy products, minerals and metals all collapse at the same time. Unfortunately for Glencore, the more unlikely scenario is exactly what happened.
- Second, Glencore went through a geographic evolution which brought the commodities giant to be more and more "Oceania and Asia intensive". Indeed, firstly Glencore's trades have been year-by-year more concentrated in the Asian market, secondly Glencore went through an extensive process, started in the 1990's with Glencore's first acquisition of a stake in Xstrata, which brought Glencore to merge with Xstrata and to be strongly exposed to the Oceania's economies, which in turn are extremely exposed to Asian countries economic health. This is especially true for China, since the "Red Dragon" alone accounts for about 20% of the thermal coal exported by Oceania. Growth of the importance of geographies as Oceania and Asia, in terms of volumes traded, meant higher exposures to Asia developing countries, which were the countries which triggered the commodities market collapse between 2014 and 2015.
- Third, Glencore's business has become more and more "industrial intensive", which brought Glencore from a pure trading house to the most globally integrated player in the commodities market. Crucial in this process was again the Merger and other minor acquisitions, which gave Glencore an extremely sophisticated network of mining facilities and other downstream assets. As we early said for diversification, a priori there are not clear cons in starting a vertical integration process. On the contrary, if well managed there the chance to build an unique entity in the mining market, which can benefit from significant synergies by creating a perfect infrastructure which efficiently could connect exploration and extraction activities, to trading activities and arbitrage strategies. However, industrial activities are much more correlated to changes in the commodities prices, given that a miner is structurally long on its inventories, besides some hedging strategies that can be implemented.

The described evolution of Glencore's business model and the related "diversification" processes enhanced Glencore exposures to the commodities collapse verified in 2014-2015, by becoming more positively correlated to the industry (more industrial intensive), more exposed to a systematic collapse of the industry (covering more products, lately reaching 93 commodities) and by making deals and investments in companies (e.g. Xstrata) and business lines (e.g. thermal coal and copper) which were more dependent on BRICS' economic health and growth.

If these were the factors which enhanced Glencore exposure to a systematic collapse of the commodities market, definitely they were not the only reasons why Glencore has been more affected than its main peers have. In order to understand why, we have examined Glencore and compared Glencore to Glencore's main peers on several levels. Here we report the factors which can be considered the difference markers in this analysis: (*i*) capital structure, (*ii*) fundamentals, (*iii*) business profitability.

#### Capital Structure

If the drop in the price of Glencore's main commodities controlled Glencore's equity collapse, Glencore's financial debt controlled Glencore's "falling speed". In 2015, Glencore had by far the worst leverage ratio profile (defined as net financial position on market capitalization). Glencore had higher levels of leverage if compared to the mean/median leverage of players operating in any other industry in which Glencore operates (Agriculture, Energy, Metals & Minerals). Glencore's leverage was more than three times the Metals & Minerals average leverage, and it was more than two times the overall industry leverage. This aggressive capital structure was definitely worsened by the acquisition of Xstrata completed in 2013, given Xstrata's high levels of financial debt. However, Xstrata just worsened Glencore's capital structure. Glencore has always had a more aggressive capital structure than its mining peers given his private partnership structure, a "philosophy" which did never change in the mind of Glencore's executives who still today represent a significant share of Glencore's equity ownerships. This aggressive capital structure and the Merger drove Glencore to the default zone, touching incredibly high level of default probability (with a peak of about 87%⁷⁷). A comparison between the time series of Glencore's S&P corporate debt rating compared with the series of Glencore's peers (see page 93 of the main for a more detailed comparison) illustrates the difference in the capital structures quite clearly, with Glencore having an average rating of BBB/BBB-, a much worse corporate debt rating if compared

⁷⁷ In the main body (see from page 78 to page 80), we provide the outline of the model we have used to estimate Glencore's default probability dynamics. Moreover, in the main body (see from page 86 to page 88) you can find an interesting finding. The peak of 87% default probability has been yielded by using IFRS measures of net financial position. However, if we use Glencore's non-IFRS measure of the net financial position, which includes other accounts (e.g. it considers readably marketable inventories as cash), the chance of a default are basically set to zero in the selected "Merton Model background".

to the average corporate debt rating of its main mining and trading peers (e.g. BHP "A+", Cargill "A", "BBB+/A-" and so on).

## Commodities Exposure

Unfortunately for Glencore, Glencore's main products (in order copper, coal, zinc, oil, and iron ore in absolute terms) coincides with the commodities whose prices dropped the most. As we can see from graphs provided in the main body (see page 91 and page 92), Glencore had really high exposures to highly distressed markets not only in absolute terms, but also in relative terms given that Glencore had much higher exposures to these commodities (in particular copper and thermal coal) than any other player in the market⁷⁸. Furthermore, if you add that these exposures have increased steadily until the overall collapse, we can be quite confident in saying that this is one of the factors which brought Glencore's equity market value to fall more than anyone else's equity market value in the commodities industry.

## **Business Profitability**

Another reason why the distress had a stronger impact on Glencore's equity was the level of Glencore's profit margins. Indeed, Glencore's "Cost of Goods Sold/Revenues" ratios, whose average in the last years was about 97.5%, are by far lower than the ratios of Glencore's mining and trading peers (see page 94 of the main body for a comparison between Glencore and the overall industry and between Glencore and is main peers). Structural low profit margins can be an issue in case of a distressed market, since it means that while the absolute dollar value of the revenues is going down, Glencore is left with no leverage on Cost of Goods Sold (COGS), which basically move together with the value of sales, whose margin is just given by a fixed mark-up window plus/minus a 1% "flexibility".

In conclusion, the whole commodities industry went through a free fall during the peak of the distress. However, we have seen that Glencore felt much more than the industry and its main peers. The reasons behind what happened are to be found in Glencore's exposures (proxied by Glencore's rolling Kalman filtered commodities betas) to the commodities that had suffered from the worst price drop (e.g. copper and thermal coal), financial leverage (proxied by "Debt/Equity" ratios) and profit margins (proxied by "COGS/Revenues" ratios). In other words, Glencore felt much more than other commodities players (higher betas), at a higher speed (higher financial leverage) and without a parachute which could soften the fall (lower profit flexibility due to thinner "margin buffers").

⁷⁸ In the main body (refer to the paragraphs "The Kalman Filter Model" and "Filtering the Rolling Betas"), we provide the model we have implemented on MATLAB to compute the dynamics of the exposures of Glencore and Glencore's peers. In few words, the model implemented is a Kalman filter, which is assuming an underlying pure random walk (without drift) process, applied on rolling window OLS estimations, which were used to proxy Glencore's dynamic exposures to copper and other commodities related products.