LISBON
SCHOOL OF
ECONOMICS &
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UNIVERSIDADE DE LISBOA

MASTER OF SCIENCE IN
FINANCE

MASTERS FINAL WORK
PROJECT

EQUITY RESEARCH:
RIO TINTO PLC

TIM WINKENS

NOVEMBER 2020

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SUPERVISOR:

PEDRO NUNO RINO CARREIRA VIEIRA

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Abstract

This work aims to present a company valuation of Rio Tinto Plc elaborated with ISEG´s Finance Master Work Project. It follows the equity research format recommended by the CFA Institute (Pinto, Henry, Robinson & Stowe, 2010).

Rio Tinto Plc was chosen because it is one of the major players in the mining industry and operates in several countries around the globe. The author had a previous interest in the mining industry.

This research is issued considering all publicly available information on the company as of September 30th, 2020. The Discounted Cash Flows method was used to achieve the target price.

The final recommendation is REDUCE, with a target price of $62.23/sh 2021YE and an upside potential of 3.0% as of September 30th, 2020 but with high risk. The recommendation is supported by an expected revenue growth over the forecasting period as well as higher cost efficiencies and therefore higher margins, especially in the iron ore product group.

There are several significant risks to the price target, especially due to the current COVID-19 pandemic, which could affect the company on an operational level as well as through a dampening of the global macroeconomic outlook. Further risks are a contraction of demand by the steel industry and tensions in the Sino-Australian relations.

JEL classification: G10; G32; G34.

Keywords: Equity Research; Valuation; Mergers & Acquisitions; Mining Industry; Rio Tinto Ltd.

Resumo

Este trabalho visa apresentar uma avaliação da empresa da Rio Tinto Plc elaborado com o Projeto de Trabalho Mestre de Finanças do ISEG. O trabalho segue o formato de equity research recomendado pelo Instituto CFA (Pinto, Henry, Robinson & Stowe, 2010).

Rio Tinto Plc foi escolhida porque é um dos principais players na indústria mineira e opera em vários países ao redor do globo. O autor já antes se interessava pela indústria mineira.

Esta pesquisa é conduzida considerando todos os dados sobre a empresa que estão disponibilizados ao público até ao dia 30 de setembro de 2020. O método dos Cash Flows descontados foi utilizado para estimar o preço-alvo.

A recomendação final é REDUCE, com um preço-alvo de $62.23/sh 2021YE e um potencial positivo de 3,0% a partir de 30 de setembro de 2020, mas com alto risco. A recomendação é apoiada por um crescimento esperado da receita durante o período de previsão, bem como maiores eficiências de custos e por conseguinte, margens mais elevadas, especialmente no grupo de produtos de minério de ferro.

Existem vários riscos significativos para o preço alvo, especialmente devido à pandemia atual COVID-19, que pode afetar a empresa a um nível operacional, bem como através de um amortecimento das perspectivas macroeconómicas globais. Outros riscos são uma contração da procura na indústria siderúrgica e as tensões nas relações sino-australianas.

Classificação JEL: G10 ; G32; G34;

Palavras-Chave: Equity Research; Avaliação de Empresas; Fusões e Aquisições; Indústria mineira; Rio Tinto Ltd.

Acknowledgements

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Also, I would like to thank my family and friends whose assistance was a milestone in the completion of this project, especially my mother Ursula, who has always believed in me, and my girlfriend Naiara, who has always supported me. Without the people around me this project would not have been possible.

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Rio Tinto Plc

Reduce

High risk

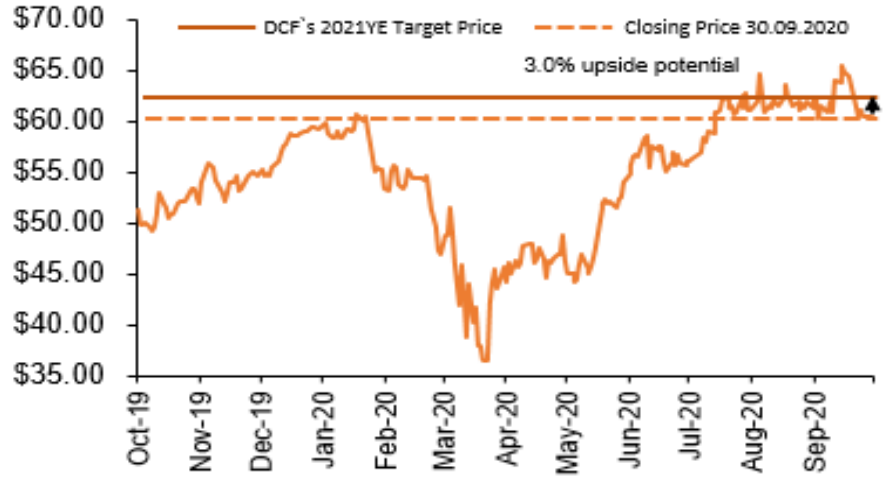
November 2020

New York Stock Exchange

1. Research Snapshot

(2021YE Price Target of $62.23; 3.0% Upside Potential; High Risk; Final Recommendation: REDUCE)

Figure 1 - Historical share price & price target



Source: Nasdaq, the author

The final recommendation for Rio Tinto Plc stands for reduce with a 2021YE target price of $62.23 using the DCF valuation method and an upside potential of 3.0% in comparison with the closing price of $60.39 on September 30th, 2020, but with high risk.

We expect a drop of sales revenue by 7% this year but a growth of 2.4% CAGR for the forecasting period from 2020F-24F to $44,138m in 2024F. While the market conditions show a very high degree of uncertainty, and the industry is very competitive, in our opinion management has done a good job with its focus on the value over volume strategy by divesting from non-performing assets, high investments in new technologies and focusing on cost efficiencies.

Of the four product groups this strategy has increased the importance of the iron ore business, contributing 56% in FY2015 and 72% in FY2019. We think that in the future the iron ore product group share will increase even further, especially with the opening of the Koodaideri mine, expected at the end of 2021F to substitute other depleted mines, when cash costs for one ton of iron ore, currently between 14-15$/wmt, are expected to be lower than 14$/wmt. A side effect of focusing on the business with the highest EBITDA margin of 72% is a less diversified enterprise and the high dependency on just one commodity. Iron ore demand depends solely on the steel industry, which is currently struggling with overcapacities. A sensitivity analysis has shown that a 15% contraction of the forecasted iron ore prices ceteris paribus would lead to a 26% reduction of the target price. Therefore, the high-risk assessment.

EBITDA is expected to increase by 3.3% CAGR during the forecasting period and EBITDA margin to increase from 43.45% in 2020F by 159 basis points to 2024F. In the long run prospects for the mining industry, with the depletion of ore reserves, are modest. We considered this with a terminal growth rate of 0% in the DCF model which has a big impact on the valuation.

Table 1 - Analyst's Risk Assessment

Low	Medium	**High**

Our risk assessment reflects the uncertain economic circumstances, especially due to the COVID-19 pandemic, the intense competition and the high dependency on one commodity.

Source: The author

Table 2 - Market Profile Rio Tinto

Market Profile	
Closing price	$60.39
52-week high	$65.43
52-week low	$36.42
Shares outstanding	1.26bn
Market Capitalization	$76.09bn
BV per share	$24.25
Dividend yield	5.13%
ROE	17.04%
P/Sales	2.39
P/E	13.88
P/BV	1.94

Source: Nasdaq, Yahoo Finance

Table 3 - Price Targets

Valuation Method	YE2021 Target Price	Upside Potential
DCF	$62.23	3.04%
DDM	$43.65	-27.71%
Multiples	$67.34	11.51%

Source: The author

2. Business Description

Rio Tinto plc, a London-based company, registered in England and Wales, forms together with Rio Tinto Limited, which is based in Melbourne, the dual-listed Rio Tinto Group. The group is one of the world's major mining companies with consolidated sales revenues of $43.2bn, an underlying EBITDA of $21.2bn and 46,500 employees in 36 countries and 120 locations.

In 1873 a British-European Syndicate won an auction for an ancient copper mine named Rio Tinto, Spanish for red river due to the coloring of the nearby river caused by the mining activities and therefore high concentrations of iron and heavy metals in the area. Shortly afterwards the company Rio Tinto was formed and named after the mine. In 1925 the company began investing in other locations and in 1954 it sold 2/3 of their shares of the Rio Tinto mine to invest in other projects. Like many of other major mining companies, the Rio Tinto Group grew through M&As.

In 1905 the company Consolidated Zinc. was founded to exploit zinc and silver ores in New South Wales, Australia. While Rio Tinto needed funds to invest in its worldwide projects Consolidated Zinc. was in the contrary position having the resources but lacking investment opportunities. In 1962 the companies merged forming RTZ (The Rio Tinto - Zinc Corporation) with a subsidiary CRA (Conzinc Riotinto of Australia).

While RTZ developed projects all over the globe CRA focused on Australasia. In 1986 the interest in CRA fell below 49% and both companies were managed independently. In the 1990s CRA started looking for an international expansion but then it would compete directly with RTZ, it´s major shareholder. The idea came up to merge as equals and the dual-listed structure would be beneficial for its shareholders. In 1995 the companies merged to RTZ-CRA and two years later the entities were renamed: RTZ into Rio Tinto plc and CRA into Rio Tinto Limited both together were called Rio Tinto or Rio Tinto Group

Although two different legal entities the DLC Merger Sharing Agreement ensures that both function as one economic entity. The agreement set dividends, votes and capital distribution at an Equalization Ratio of 1:1, which could be changed in special cases, i.e. stock splits.

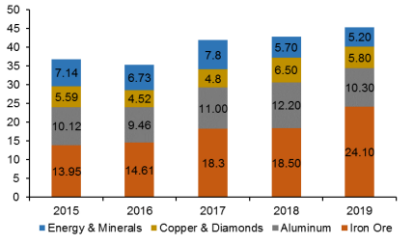
Business Segments

The organizational structure is set by four product groups: **I. Iron Ore, II. Aluminum, III. Copper & Diamonds, IV. Energy & Minerals** and two functional groups **V. Grow & Innovation** and **VI. Commercial** highlighting the importance of these areas.

I. Iron Ore

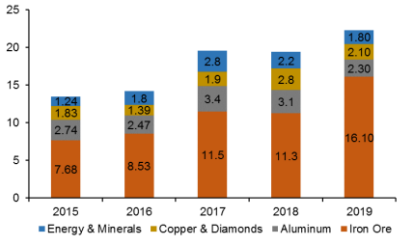
Iron ore is the primary component in the production of steel. The iron ore group contains 16 integrated mines with 4 port terminals connected via 1,700km rail network in the Pilbara region of Western Australia, while the Rio Tinto Group possesses further iron ore mines in Guinea and Canada. These belong to the Energy & Minerals group due to organizational responsibilities. In 2019 the salt business was moved from Energy & Minerals to the Iron Ore Group for the same reason. We will present the salt business in the descriptions and calculations of the old product group. In Nov 2018, the funding of Koodaideri, a $2.6 billion-high-technology mine, was approved, which once completed, can process 43m tons of iron ore per year and will substitute depleted mines. It will also become a production hub with a 166km rail line connecting it to the existing network.

Figure 2 - Rio Tinto Group revenue by product group



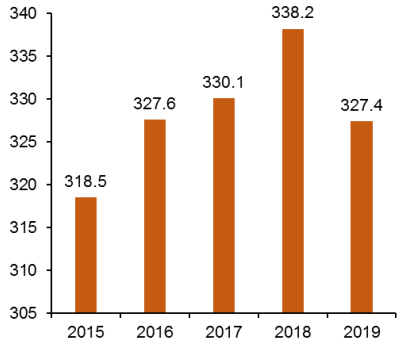
Source: Company data

Figure 3 - Rio Tinto Group EBITDA by product group



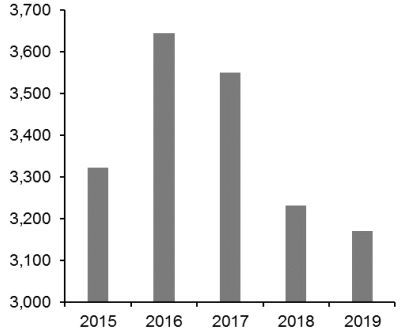
Source: Company data

Figure 4 - Pilbara shipments in million mt (100% basis)



Source: Company data

Figure 5 - Aluminum production in thousand mt (Rio Tinto share)



Source: Company data

II. Aluminum

Aluminum is produced from a mineral called Bauxite, which is first refined to Alumina. The Rio Tinto Group possess a vertically integrated production with 5 bauxite mines in Australia, Brazil and Guinea, 4 Alumina refineries in Australia, Brazil and Canada and 14 aluminum smelters in Canada, Australia, New Zealand, Iceland and Oman.

III. Copper & Diamonds

Copper is a metal which due to its excellent properties to transmit electricity and heat is used mainly in the energy sector. Rio Tinto is invested in three mines in the US, Mongolia and Chile. The mine in Mongolia has one of the biggest worldwide copper reserves. But the project of the Oyu Tolgoi mine is delayed due to geological challenges like ground instability.

Diamonds are used from jewelry to high-tech production. Rio Tinto is invested in two diamond mines with 100% in an underground mine in Argyle (Australia) and in an open pit and underground mine in Diavik (Canada) with a 60% interest. The group also produces gold, silver, molybdenum and other by-products

IV. Energy & Minerals

The Energy & Minerals group contains a variety of products: titanium dioxide, rutile and zircon; borates; iron ore concentrate and pellets; and uranium. It operates 10 mining sites in 6 countries. The products are used in different industries from healthcare to aerospace. In 2018 it sold its last interests in coal and in 2019 it sold Rössing Uranium in Namibia.

V. Growth & Innovation

With 2,200 employees the Growth & Innovation group is involved in the entire lifecycle of the assets of Rio Tinto from the exploration of minerals and the development, optimization and closure of mines. It offers technical expertise and project management skills to the product groups. In 2019 it spent $2.1bn on capital projects. It plans to deliver $1.5bn in additional cash-flow every year from productivity improvements from 2021.

VI. Commercial

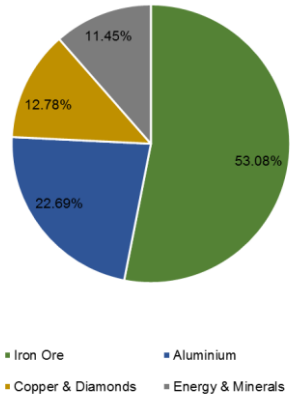
The Commercial group interacts with the product groups, suppliers and customers. In 2018 the different departments of Sales & Marketing, Marine & Logistics, and Procurement were combined into this group to bundle its activities and thereby strengthen its capabilities and obtain better market insights. The Commercial group is headquartered in Singapore with satellite offices in Frankfurt and Chicago and other offices worldwide.

Rio Tinto owns 17 shipping vessels, which are managed and crewed by its partners, and charters around 230 vessels of different sizes and types at any time making it one of the largest dry bulk shipping businesses by volume worldwide.

Operations Analysis (Key Drivers of Profitability)

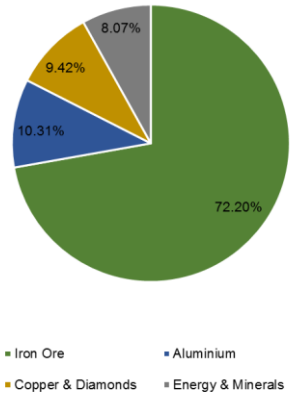
The biggest part of Rio Tinto´s revenue comes from the iron ore group with 53.1% and contributing 72.2% to its EBITDA, enjoying with 72% the highest margins. By contrast, the aluminum group delivers 22.7% of the revenue but only 10.3% of the EBITDA with a margin of 26%, suffering from high electricity prices for the smelters in Australasia. Copper & Diamonds delivered 12.8% of the revenue and decreased its margins from 47% in 2018 to 41% in 2019 mainly due to continuing activities at areas of the pits with lower-grade ore at all three copper mines, partly offset by higher throughput, while Energy & Minerals with 11.5% share of Rio Tinto´s revenue decreased its margins from 41% in 2018 to 37% in 2019, due to a one time effect of the coal assets sale in 2018. Volumes except for Uranium improved in 2019. Without the coal business in 2018, EBITDA in 2019 was 41% higher.

Figure 6 - Share of revenue by product group in 2019



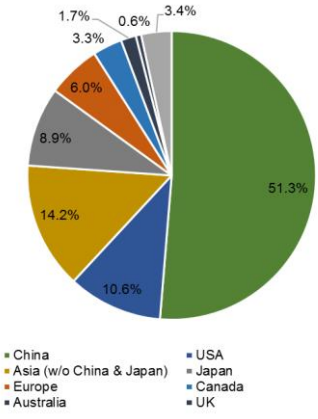
Source: Company data

Figure 7 - Share of EBITDA by product group in 2019



Source: Company data

Figure 8 - Sales Revenue by Destination 2019



Source: Company data

Most revenues are created in Asia (67%) with China alone accounting for 51.3% of the revenues, followed by the US (10.6%), Asia (w/o China & Japan) (14.2%) and Japan (8.9%) as the biggest customer markets.

Company Strategy

During the boom of the Chinese economy from 2003-13 efficiency went down due to high demand of commodities and therefore high prices. Since then prices have dropped and increasing productivity is the focus of Rio Tinto as well as other companies in the mining industry. There are several projects going on which are aimed to gain in $1,5bn in additional cash-flow every year from improvements in productivity from 2021.

The Mine of the Future™ program was launched 2008 and includes:

- **Operations Center** in Perth which remote controls the mines, ports and railway system with real-time data to optimize production, maintenance and logistics processes
- **Autonomous haulage systems (AHS)** with more than 130 autonomous trucks, which are guided by GPD defined routes.
- **Automated drilling system (ADS)** first successful test in 2018 and now the company has already 26 autonomous drills.
- **AutoHaul®** Automatization of the transportation of iron ore to the port terminals. The project started in 1Q2017 and was for the first time fully operational in 2019.

The Koodaideri mine in Western Australia, called the first intelligent mine by the company, will make extensive use of advanced automatization, big data and data analysis starting from late 2021. All processes of the mine will be mirrored in the Operations Center in Perth with real-time simulation which enables instant decision making. The mine has 70 design innovations additional to the ones already used in other Rio Tinto´s mines.

Environment and Climate Change

Mining is a high energy and water consuming process which leaves a big impact on the environment it operates. Mining industry is often criticized for this. The company states that it recognizes that as a corporate citizen it is part of the community and can only exist on the goodwill of society. It therefore takes care for society´s issues of today where it affects the group and communicates the steps it takes. It publishes an annual Sustainable Development Report and February 2019 was the first time it published a Climate Change Report. It aims to deliver the materials for the necessary transformation of the economy as well as to minimize the impact it has on the environment.

Rio Tinto reduced its carbon footprint by 46% in comparison to 2008 (18% if excluding divestments) and is thereby accomplishing its self-set goal of a 24% reduction in 2020. At the annual general meeting (AGM) of Rio Tinto Limited 37% of shareholders voted for setting binding emission scope 3 targets, which involves reducing the emission by its customers too, as other mining giants like Vale or BHP have already done. The company rejects setting scope three targets and has only set scope one and two targets so far (15% reduction of net emission by 2030).

Dividend Policy and Buy-Back Programs

Rio Tinto determines its dividends in US-Dollar but pays except for the ADR-holders the dividends in Sterling for Rio Tinto plc shareholders and in Australian-Dollar for Rio Tinto Limited shareholders. Shareholders of the plc can also opt to be paid in Australian-Dollar and of the Limited to be paid Sterling. Shareholders can also choose to reinvest their dividends via a Dividend Reinvestment Plan.

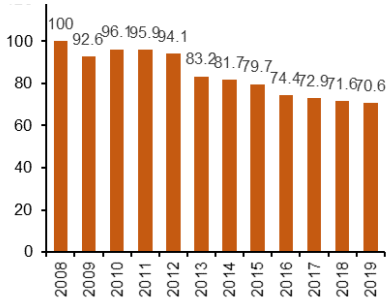
In 2016 Rio Tinto announced a flexible shareholder return policy. The goal is to pay 40%-60% of the underlying earnings in dividends in the long run. Each

Table 4 - EBITDA Margins of business segments

EBITDA Margins	2019	2018
Iron Ore	72%	68%
Aluminium	26%	32%
Copper & Diamonds	41%	47%
Energy & Minerals	37%	41%

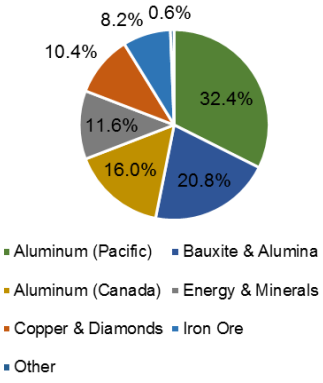
Source: Company data

Figure 9 - Rio Tinto´s greenhouse gas emissions intensity (Indexed relative to 2008)



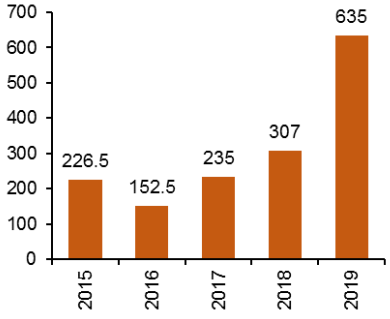
Source: Company data

Figure 10 - Group-wide scope 1 & 2 carbon emissions (CO2e) by product group



Source: Company data

Figure 11 - Ordinary dividends paid in US- Cents

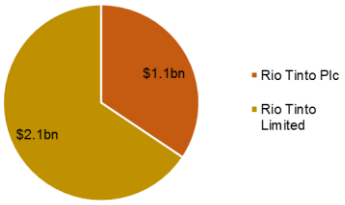


Source: Company data

time the dividends are determined by the board under consideration various factors like the global economic outlook, price trends of the different commodities and the right balance between reinvestment and payout. The dividends consist of interim (semi-annual) and final as well as special dividends.

In recent years, the Rio Tinto Group has had several share buy-back programs to distribute the proceeds of disinvestments to its shareholders. The 2019 program aimed to distribute appr $3.2bn of its coal business post-tax sale. $2.1bn are used for off-market transactions of Limited shares and $1.1 for on-market transactions of plc shares, started at 28.02.2019 and was completed at 29.02.2020

Figure 12 - 2019 share buy-back program

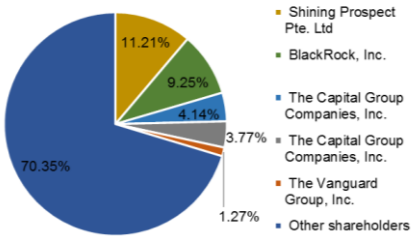


Source: Company data

Shareholder Structure

Today the largest shareholder of the Rio Tinto Group is the state-owned Chinese aluminum producer Chinalco (Aluminum Corporation of China) via its Singapore-based entity Shining Prospect Pte. Ltd. This is a consequence from the prevention of the hostile takeover attempt of the Rio Tinto Group by its competitor BHP Billiton. in 2007-8. European and Chinese steelmakers, as well as regulators feared too much power over raw materials concentrated in one company. Chinalco bought a 12% stake in Rio Tinto Plc (9% Group) in 2008 and wanted to increase its stake even further which worried the Australian government regarding takeover of Australian enterprises by Chinese ones. Therefore, the government and Chinalco agreed on maintaining a 14.99% maximum cap in the Plc. During the last years, through the various share buy-back programs the Chinalco share increased further and is currently at 14.53%.

Figure 13 - Rio Tinto Group voting power



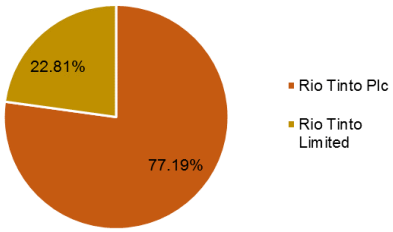
Source: The company, the author

According to the Australian Corporation Act 2001 and UK Disclosure and Transparency Rules shareholders which fulfill one of the following criteria must notify the companies:

- Rio Tinto Plc: share with voting rights of 3% or more
- Rio Tinto Limited: Voting power of 5% or more

A list of the companies who have notified the Rio Tinto Group that they fulfill the above listed criteria can be seen in table 5.

Figure 14 - Rio Tinto Group shares by Limited and Plc



Source: Company data, the author

Table 5 - Companies who have provided a notice about reaching the share thresholds

Rio Tinto Plc	Number of shares	Percentage of capital
BlackRock, Inc.	127,744,871	10.17%
The Capital Group Companies, Inc.	67,470,318	5.37%
Shining Prospect Pte. Ltd	182,550,329	14.53%
The Capital Group Companies, Inc.	61,365,180	4.88%
Rio Tinto Limited	**Number of shares**	**Percentage of capital**
BlackRock, Inc.	22,870,305	6.16%
Shining Prospect Pte. Ltd	Voting power of more than 5% comes through Rio Tinto Plc shares	
The Vanguard Group, Inc.	20,623,906	5.56%
Rio Tinto Group	**Combined number of shares**	**Voting power**
BlackRock, Inc.	150,615,176	9.25%
The Capital Group Companies, Inc.	67,470,318	4.14%
Shining Prospect Pte. Ltd	182,550,329	11.21%
The Capital Group Companies, Inc.	61,365,180	3.77%
The Vanguard Group, Inc.	20,623,906	1.27%

Source: Company data, the author

3. Management and Corporate Governance

As a dual-listed company, Rio Tinto follows the UK Corporate Governance Code (2018 version) (the Code) as well as the ASX Corporate Governance Council's Corporate Governance Principles (3rd edition) (the ASX Principles). Both, the Code and the ASX Principles, have a set of rules which do not have to be followed entirely but any deviation must be disclosed and explained. Additionally, Rio Tinto plc is listed at the New York Stock Exchange (NYSE) with American Depositary Receipts (ADRs). Therefore, any differences to the listing standards at the NYSE must be reported as well.

The management of Rio Tinto plc and Rio Tinto Limited acts as if it would be one entity. It is comprised of a common Board of Directors, an Executive Committee and several Committees of both branches to support them. The members of the Committees are also members of the Board of Directors and the Executive Committee.

The Board of Directors is responsible for the vision and strategy of the Group. It´s chairman Simon Thompson was appointed in March 2018 as an independent member. Ten of the twelve members of the board are independent. The independent non-executive directors (NEDs) usually meet with the chairman at the start or end of each board meeting without the executive directors in order to discuss any issue in private. The Board of Directors has four Committees: **I. Audit, II. Remuneration, III. Nominations and IV. Sustainability**. The Executive Committee oversees the day-to-day management, hereby it is supported by the following Committees: **I. Investment, II. Risk Management, III. Ore Reserve Steering, IV. Disclosure, V. Closure,** in the performance of his duties.

In May 2020 Rio Tinto destroyed two ancient caves at the Juukan Gorge to access iron ore deposits despite opposition from the Aboriginal traditional owners. After a global public outrage and pressure from investors, the company announced that chief executive Jean-Sébastien Jacques will leave the company end of March 2021 or earlier if a successor is found, as well as executive members Chris Salisbury and Simone Niven, both end of 2020.

Executive Remuneration Structure

The current remuneration policy was passed at the AGM in 2018 as required by UK regulation and is valid for 3 years. The executive remuneration contains a base salary and a short- and long-term variable part linked to individual and corporate performance. The group describes its five priorities as: safety, people, cash, partnerships and growth. Individual goals are set to align with these priorities.

The Short-Term Incentive Plan (STIP) sets annual performance goals The STIP contains a cash element and a deferred share element (each 50%). In 2020 climate change-related objected will be included in the STIP for the first time. The Long-Term Incentive Plan (LTIP) measures total shareholder return (TSR) relatively against the EMIX Global Mining Index and to the MSCI World Index (each 50%).

For the company it is important to provide a balanced renumeration mix: For the chief executive 83% of the maximum renumeration is performance based (70% in deferred shares) and for the other executives 82% of the maximum renumeration is performance based (69% in deferred shares) through the STIP and LTIP. Malus and claw-back provisions exists for the STIP and LTIP which the remuneration committee can apply if the company was damaged by actions of an executive member. We think that these policies work well to align executive rewards with the interests of the shareholders.

Table 6 - Board of directors

Name	Position
Simon Thompson	Chairman
Jean-Sébastien Jacques	Chief executive
Jakob Stausholm	Chief financial officer
Megan Clark AC	NED
David Constable	NED
Simon Henry	NED
Sam Laidlaw	NED
Michael L'Estrange AO	NED
Hinda Gharbi	NED
Simon McKeon AO	NED
Jennifer Nason	NED
Ngaire Wood CBE	NED

Source: Company data

Table 7 - Executive committee

Name	Position
Jean-Sébastien Jacques	Chief executive
Jakob Stausholm	Chief financial officer
Bold Baatar	Chief executive, Energy & Minerals
Alf Barrios	Chief executive, Aluminium
Vera Kirikova	Human Resources Group executive
Steve McIntosh	Froup executive, Growth & Innovation Group and Health, Safety and Environment
Simone Niven	Corporate Relations Group executive
Barbara Levi	Group General Counsel
Chris Salisbury	Chief executive, Iron Ore
Arnaud Soirat	Chief executive, Copper & Diamonds
Simon Trott	Chief commercial officer

Source: Company data

Table 8 - 2019 renumeration outcome

Jean-Sébastien Jacques (Chief Executive)

Actual remuneration in k£ 2019		
Fixed		**Percentage of maximum**
	1,484	100%
STIP		
	1,701	74.8%
LTIP		
	2,611	67.9%
Total		
	5,796	76.2%

Source: Company data, the author

4. Industry Overview & Competitive Positioning

Economic Outlook

Global growth has a negative outlook due to the worldwide raging Covid-19 pandemic. The IMF has updated its April´s world economic outlook report in June and revised it´s figures. Now, worldwide growth is projected with a steeper decline in 2020F with -4.9% (April: -3.0%) and a slower recovery in 2021F with 5.4% (April: 5.8%). There is a high level of uncertainty in these projections, this is also why the IMF has stopped to forecast for a longer period than two years for now.

Advanced economies are expected to decline by -8.0% this year and recover by 4.8% in 2021F while emerging markets & developing economies are expected to decline by -3.0% in 2020F and recover by 5.9% in 2021F. Economies with declining infection rates will have a slower economic recovery as anticipated before as businesses have to implement new workplace safety measures and hygiene practices which affects productivity, while for economies who are struggling to manage infection rates further lockdowns will have a deep negative economic impact.

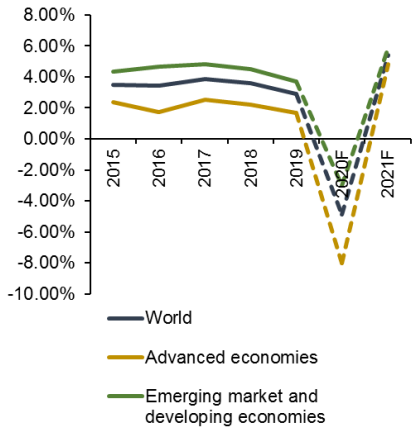
Reactions of governments were similar across different economies: At first a time lag in implementing an adequate response followed by unprecedented actions in recent history like general lockdowns and rapid economic stimulus packages to soften the impact on businesses and people. There is the possibility that there will be a second wave of infections in fall 2020.The OECD has therefore made country projections for future economic developments with two equally likely scenarios: a single-hit scenario, assuming that the lockdowns in the first half of 2020 were enough to bring new infections under control, and a double-hit scenario, assuming that a second lockdown will be required in the second half of 2020 to bring the pandemic under control. We will use the projections in our country analysis.

China

China is by a big margin the most important market for commodities. Of the sales revenues of Rio Tinto in 2019 China was with 51.3% the biggest customer market (2018: 44.6%). The country achieved a real GDP growth of 6.1% in 2019. This figure is line with the consequent slowdown of growth in recent years, see figure 12 and this trend is expected to continue as the Chinese economy is maturing and transforming into a service economy see figure 13. Due to Covid-19 economic growth is expected to be 1.2% in 2020F but a catching-up effect of 9.2% is expected in 2021F.In the long run we can expect a further slowdown in growth in a normalized trend.

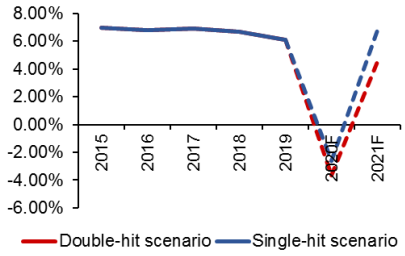
The first time the Covid-19 virus was identified, was in the city of Wuhan in the Hubei province. After a failure to contain the virus earlier, the city was put under two and a half months and the province under a two-month lockdown. These drastic measures have helped to confine the spread so that half of the counties in China did not have any cases. Tourism and manufacturing were hit hard while IT and financial services benefited from the measures. Companies in affected regions and industries received government support via VAT and income tax reductions. The virus outbreak coincided with the Chinese New Year, which meant that many workers who were visiting their families for the public holidays could not return immediately to their workplaces afterwards, affecting especially the manufacturing industry. Should a second wave of infections occur, due to the workers most likely residing at their workplaces at the time, the impact therefore should not be as dramatic as before.

Figure 15 - World GDP Growth



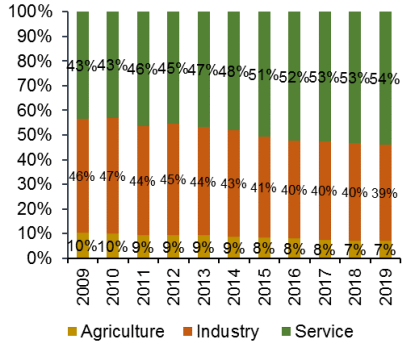
Source: IMF

Figure 16 - China GDP Growth



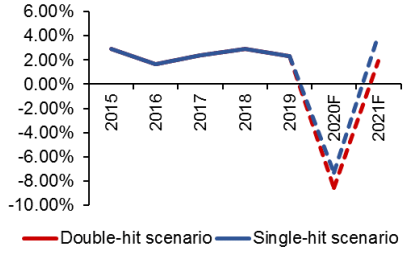
Source: OECD

Figure 17 - Distribution of Chinese GDP



Source: Statista

Figure 18 - United States GDP Growth



Source: OECD

USA

The measures to confine COVID-19 have caused an unprecedented increase in unemployment in the USA. More than 20m jobs were lost within a month more than during the financial crises in 2008 or the Great Depression. Fiscal measures aimed at alleviating the impact, like one-off payments and additional unemployment payments, amount cumulatively to more than 20% of GDP. While mostly school and bars remain closed other industries can operate with restrictions. The goal is to substitute these non-pharmaceutical interventions with testing and contact tracing until a vaccine or an effective treatment will be developed.

Euro Area

The Euro Area has been led into a major recession due to the lockdown measures. The service industry was the hardest hit sector but also manufacturing, especially in areas relying heavily on international supply chains were severely affected. First quarter GDP fell by around 3.5% quarter-on-quarter, the largest contraction ever recorded. First responses to the pandemic were taken mostly at the national level including the closure of borders between EU countries for non-essential travel. Some areas even faced capacity issues in hospitals at the outbreak´s peak. Since April, the number of new infections went down in most countries.

The European Commission has proposed a European recovery plan which should be funded by common debt issuance. Before the crisis, the idea of joint debt was rejected by the fiscally strong member countries, but resistance has weakened since then. Projections show that in both scenarios southern economies in the EU will contract heavier, at the same time these countries have fewer fiscal possibilities which threatens further divergence in the Euro Area if no concerted effort is taken.

Unlike China which will attain its pre-pandemic real GDP level even in the double-hit scenario by the end of 2021F und like the United States, the Euro Area will not reach its pre-crisis level even assuming the single-hit scenario by the end of 2021F.

Australia

Australia is not important as a costumer market but as the location of production for Rio Tinto´s highest profit contributor, the iron ore segment. The country has experienced severe drought, widespead bushfire and Covid-19 this year ending 29 years without a recession. Australia has been less affected by the pandemic than other countries, mainly due to its geography, the distance and accessability to other countries as well as their low population density. Federal and state governments announced that they will support the country´s economy with several programs: - direct fiscal support (amount equal to 8% of their GDP) and – temporary wage subsidies called the “JobKeeper” program (amount equal to 3 1/2% of their GDP) and further measures. A second outbreak would probably have a lesser impact due to continuing international travel restrictions and the country´s health system capabilities.

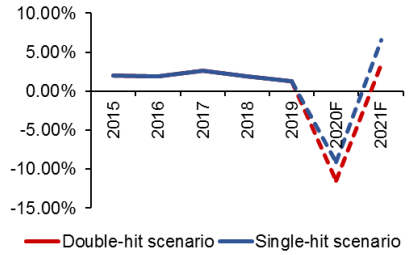
Mining Industry

The company operates in the mining industry and with a few exceptions like diamonds the products are commodities that are traded at stock exchanges with a few big players as suppliers in the world markets.

In the short-term the Covid-19 pandemic will challenge the operational processes of the mining companies and will result in a higher uncertainty about demand and prices. In the long-term the mining industry will face four megatrends: energy shifts, digitalization, urbanization, and globalization.

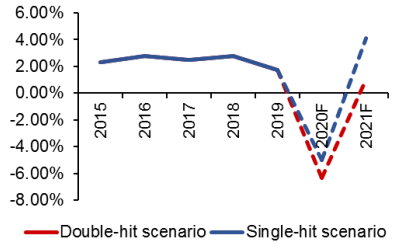
A detailed assessment list of the different commodities follows:

Figure 19 - Euro Area GDP Growth



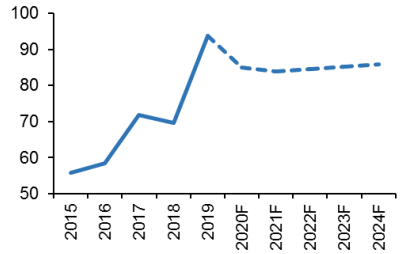
Source: OECD

Figure 20 - Australia GDP Growth



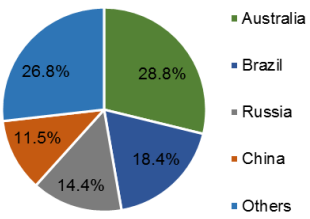
Source: OECD

Figure 21 - Iron Prices ($/dmt)



Source: World Bank

Figure 22 - Worldwide Iron Ore Reserves in 2018



Source: Statista

Iron Ore

Iron is the most used metal worldwide, mostly as a major component of steel. More than 95% of all iron ore is used to produce steel, which then is used by the construction (50%), transportation (16%), machinery (14%) and metal products (14%) and other sectors. Although iron ore is one of the most common elements worldwide, to be economically viable it must be in a high concentration (48.2% to 72.4%). Product differentiation only occurs via the iron grade. A higher concentration means a more efficient steel production and therefore a better price for the iron ore.

Australia and Brazil together hold 47.2% of the world reserves. Consequently, the major producers are from these countries. Four major companies, also called “the big four” dominate the iron ore production: BHP Billiton (BHP), Fortescue Metals (FSUMF), Rio Tinto (RIO), all Australian or Anglo-Australian and Vale (VALE) from Brazil. Together they are responsible for more than 70% of the export market, furthermore there are regional players which operate at higher costs but are often protected by tariff and non-tariff barriers.

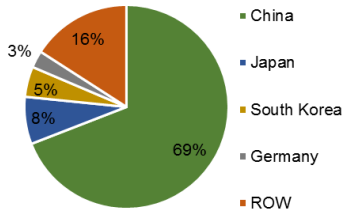
On the demand side, China as the world´s largest steel producer is mainly responsible for the global demand of iron ore with roughly 69% of global total imports in 2019. There has been a lot of criticism from other countries about subsidies and dumbing margins from state-owned or state-influenced companies. For this reason and environmental concerns, the government has shut down the most inefficient producers taking out 50mt production capacity in 2017. Nonetheless, steel production has increased rapidly since then, and the country has constantly increased its share in the worldwide steel production reaching 53.3% in 2019. While the output increased, profits in the industry declined heavily. Baoshan Iron & Steel, China´s leading steel producer, profits plummeted by 32% in 2019. To combat the oversupply the government seems to be eager to close more unprofitable factories and to consolidate the industry.

China is with (68.8mt) also the biggest exporter of steel worldwide (2 rank: Japan with 35.8mt) but this makes with 6,9% only a small fraction of its output. The lion´s share is used domestically across various sectors. As the manufacturing sector is decreasing as part of overall GDP, growth in domestic demand is expected to diminish. A substitute for primary steel is scrap steel, which use is growing enormously with a CAGR of 26.9% in China during the period of 2015-19 reaching 215.9mt in 2019 and increasing the ratio of steel scrap to crude steel in percentage from 10.4% in 2015 to 21.7% in 2019. The use of recycled steel is projected to become even more important in the future and therefore depressing the demand for iron ore even further.

From 2010 to 2018 iron ore demand grew by 2.4% CAGR, see figure 20. The global iron ore market is expected to grow only by 0.2% annually according to Fitch. In this environment the big four are focused on driving down costs:

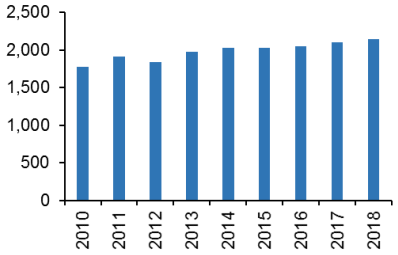
- Rio Tinto used to be the most efficient producer with 19.5 US$/wmt in 2014 but only managed to drive cash costs down by 4.95% CAGR during the last 5 years, far less than the competition, see table 9. The guidance is between 14-15 US$/wmt until the new Koodaideri mine (43mts annually) is operating expected at the end of 2021. The company is industry leading in EBITDA margin.
- BHP, the world’s largest mining company by market capitalization, has brought down cash costs by 10.18% CAGR during the same time and is investing $3bn in the new state-of-the-art mine South Flank, which is expected to replace the mine Yandi, which soon will be depleted, with an output of 80mts per year in 2021.
- Fortescue was founded in 2003 and only started mining in 2008 but since then managed to develop itself into the fourth-largest iron ore

Figure 23 - Iron ore imports by country in 2019



Source: Statista

Figure 24 - Apparent Iron Ore Consumption in million mt



Source: Statista

Table 9 - Comparison of cash costs

	cash costs (US$/wmt) in 2014	cash costs (US$/wmt) in 2019	CAGR
BHP	26.96	14.16	-10.18%
Fortescue	34.00	12.36	-15.52%
Rio Tinto	19.50	14.40	-4.93%
Vale	na	15.30	na

Source: Company data, the author

Table 10 - Comparison of company data

	Production volume (in m wmt) in 2019	EBITDA margin in 2018	EBITDA margin in 2019
BHP	238.0	62%	61%
Fortescue	206.7	20%	39%
Rio Tinto	281.2	68%	72%
Vale	302.0	45%	57%

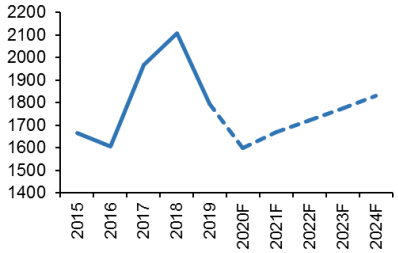
Source: Company data

miner with industry leading cash costs at 12.36 US$/wmt. Currently, the company has two iron ore projects, the $1.3bn Eliwana mine (30mt annually expected by the end of 2020) and the 2.6US$/bn Iron Bridge project (22mt annually expected by mid-2022). The enterprise is not diversified at all, solely relying on iron ore mining in Australia and roughly 92% of its sales are going to China but Fortescue is looking towards diversifying into other mineral mining, also in South America with more diversified sales by geography.

- Vale, the largest iron ore producer by output, has invested a total of $14.3bn to bring its S11D mine online in 2016. The mine produced more than 73mt in 2019 and is expected to generate 90mt in 2020. The company is currently investing another 770US$m to increase output to 100mt annually by 2022. This is one of its largest investments not only to increase output but also to reduce costs by using new technological innovations.

Prices hit with 168US$/mt a record high in 2011 but have decreased since then. In 2019 the average price was 85.9US$/mt and in the following years a stabilization around the 85US$/mt line is expected. Prices drivers are global GDP growth, Chinese GDP growth, the Chinese construction sector, industrialization and urbanization of emerging economies, availability of recycled steel and production costs.

Figure 25 - Aluminum ($/mt)



Source: World Bank

Aluminum

Aluminum is the most common metallic element in earth's crust but exists in nature almost exclusively in combination with other materials. Bauxit is the most important aluminum ore, which is widely found around the globe, especially in tropical and sub-tropical areas. It is created by weathering aluminum rich rocks. Therefore, major reserves are generally close to surface and mostly mined in open pits. To be defined as an orebody it should have a minimum content of aluminum hydroxides of 30% (Al2O3). Guinea, Australia, Vietnam, Brazil, and Jamaica have over 70% of worldwide known reserves. Bauxite is used 95% of times in refineries to produce aluminum. Between two and three tons are necessary to produce one ton of alumina (aluminum oxide), principally by the Bayer process. The alumina is then smelted to extract the pure aluminum from its oxide, principally by the Hall-Héroult process.

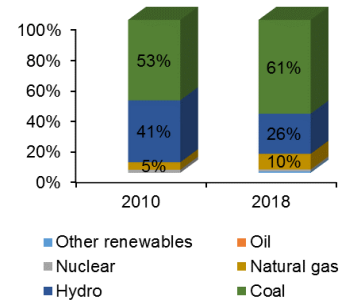
Table 11 - Aluminum Cost Breakdown

Aluminum Cost Breakdown	
Alumina	38%
Energy	38%
Raw Material	11%
Labor	5%
Other	8%

Source: Wood Mackenzie

The smelting process is highly energy intensive. Therefore, energy costs make up around 38% of total aluminum production costs, see table 11. Around 60% of energy consumed by the industry is self-generated. Although this varies heavily by region. So has Asia the highest share of self-generation (China 75%, rest of Asia 10%), a moderate share in the Americas with roughly 50% and the lowest in Africa, Europa, and Oceania, where most of the energy is purchased from the grid. Also, sources and prices of energy vary heavily by region. There is a trend to shift production from high-energy cost regions (Australia, Europe) to low-energy cost regions (Gulf region, India). Rio Tinto´s smelters in Canada obtain their electricity from 100% hydro energy (7 hydropower plants) and are in the first decile of the industry cost curve.

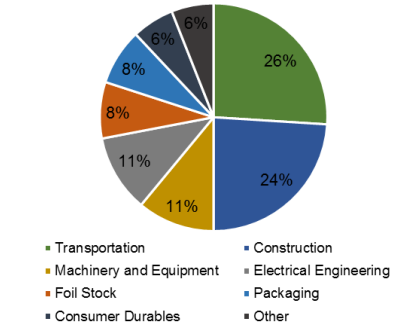
Figure 26 - Global aluminum industry power mix



Source: International Energy Agency

China is with a market share of estimated 56% in 2019 the largest manufacturer and at the same time biggest consumer of aluminum (responsible 67.4% of demand in 2018). From 2000 to 2019 the aluminum output of China grew by 14.4% CAGR. The country had the second highest electricity intensity in the industry and has now by far the lowest, see figure 26. China is also responsible for the shift of energy sources to more coal see figure 22. At the same time, western countries have only reluctantly reduced capacity, building up pressure on the aluminum price. Global total aluminum inventories, both reported and unreported, grew to an estimated 13.3mt in 1Q2020. At the same time 60% of smelting production in China run and 20% outside of China run cash negative, see figure 24. Prices are not forecasted

Figure 27 - Aluminum use by sector in 2019



Source: Statista

to recover during the next two years. We can expect a further reduction of capacity, closure of inefficient smelters and a consolidation in the Chinese industry.

Aluminum is mainly used in transportation (26%), construction (24%), machinery & equipment (11%) and others (see figure 23). The largest growth of demand is expected to be in the transportation sector with a CAGR of 3-4% from 2018 to 2028. In this industry aluminum has a big advantage over steel, it has around a third of the weight of steel with almost the same strength, enabling it to carry more weight and save fuel. Modern air travel would be unimaginable without aluminum. The airframe of a modern commercial airplane is around 80% aluminum in weight. Aluminum helps countries meet their carbon dioxide (CO2) emission reduction targets. Passenger cars are responsible for about of total EU emissions of 12% of CO2. EU legislation has set targets for car fleets: reduction of 15% until 2025 and 37.5% until 2030 from the 2021 level. Ducker Worldwide estimates that the total aluminum content per car will grow by 1.9% (low scenario) and 3.0% (high scenario) until 2025. Overall, the demand for aluminum across industries is expected to grow by 1% CAGR.

The aluminum industry struggles with low profitability. According to CSIMarket the Industry EBITDA margin was 5.1% in 2019. Rio Tinto states in its 2019 annual report that it has an industry leading EBITDA margin of 26% from integrated operations in the aluminum business. It should be noted though, that the margin varies heavily along the production process, see table 13. In 2019, 72.6% of total bauxite shipments were third-party shipments. Many other aluminum producers have bauxite production only or mostly to secure their supply. Alcoa, the largest aluminum producer of the USA, had 13% third-party bauxite shipments that year. The higher EBITDA margin does not necessarily reflect a better performance in the aluminum smelting business but a difference in the value chain structure. The aluminum smelters had an EBITDA margin of 10.3% but due to the regional differences in electricity prices the division Primary Metal, which includes the Canadian smelters, had a margin of 15.3% and, on the other side the division Pacific Aluminium which includes the smelters in Australia and New Zealand with a negative EBITDA.

In the past, Rio Tinto has already mandated investment banks to find buyers for Pacific Aluminium and even had entertained the idea of an IPO but was not satisfied with the offers. Rio Tinto announced the closure of the NZ smelter in August 2021 and the review of the Icelandic operation. The company´s strategy of divesting of non-performing assets will make the future for the Australian smelter also questionable. Pacific Aluminium has the lowest EBITDA margin of the whole Rio Tinto group.

The aluminum prices have been very volatile during the last 15 years, with the highest price of 2,639.86$mt in 2007 and the lowest of 1,604.18$mt in 2016. Prices are projected to contract by around 11.8% in 2020F and recover slightly by 2.2% in 2021F. Price drivers are energy prices, automotive industry demand, global GDP growth and the US dollar.

Table 12 - Largest aluminum producers by output in 2019

Producer	Output (mt)
Chalco	6.1
Hongqiao	5.7
Rusal	3.8
Xinfa	3.5
Rio Tinto	3.2

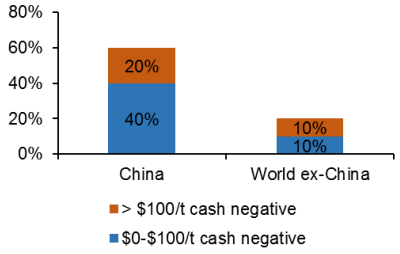
Source: Statista

Table 13 - Aluminum business EBITDA margins across value chain

Division	EBITDA margin
Bauxite	39.41%
Alumina	23.64%
Primary Metal	15.28%
Pacific Aluminium	-1.00%
Aluminum (combined)	10.26%
Integrated Operations	**25.67%**

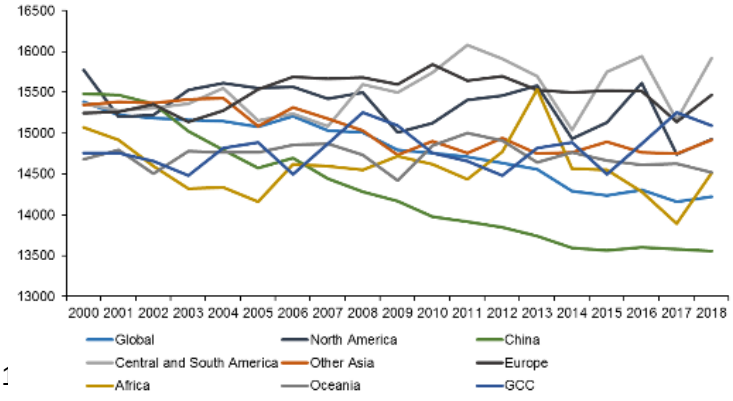
Source: Company data, the author

Figure 28 - Smelting production cash negative 2020Q1 ($/t)



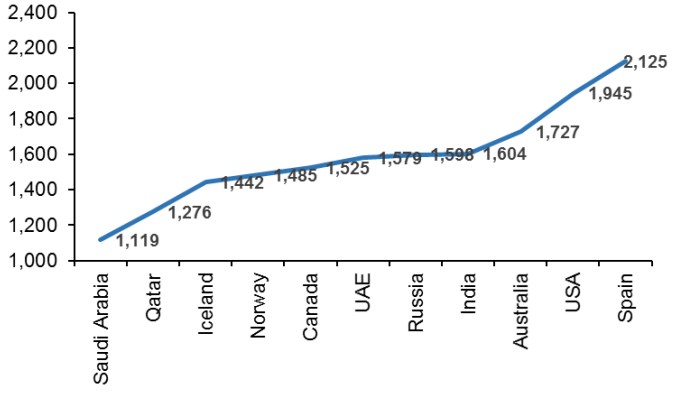
Source: Alcoa

Figure 30 - Electricity intensity of primary aluminum smelting by region from 2000 to 2018 in kWh/t



Source: International Energy Agency

Figure 29 - Primary aluminum cash costs by country except China March 2019 ($/t)



Source: HARBOR Aluminum

Copper & Diamonds

Copper, due to its excellent electrical and heat conductivity and malleability, is used in a very wide range of purposes across different industries: Construction (30%), consumer goods & other applications (28%), Electricity supply (19%), transportation (12%) and industrial machines & plants (11%). Due to its broad applications it is regarded as a signpost for the world economy. On the other side lower global GDP projections as with the corona crises affect the copper price heavily.

The South American countries Chile (28%) and Peru (12%) were responsible for roughly 40% of global copper production in 2019. Environmental, political and labor issues, like natural disaster, nationalization of mines or miner strikes in producer countries can cause supply disruptions.

From 2008 to 2018 global primary copper supply grew by 2.7% CAGR slower than global demand with 3.2% CAGR. Copper can be substituted by different materials like aluminum, glass fiber and plastic for specific products. Recycled copper consumption was about 9% of total copper consumption in the USA in 2019. Half of the US demand for copper comes from the home building industry.

Rio Tinto was with 3% of total global production the 8th biggest producer of Copper in 2019. The company has three different operations. Rio Tinto has a 30% share of the biggest copper mine worldwide, Escondida in Chile, in a joint venture with BHP Billiton (57.5%) and other partners, which is managed by BHP.

Copper prices have fluctuated widely since 2006. The maximum was hit in 2011 with an avg price of 8,823 US$mt and the low in 2016 with an avg price of 4,868 US$mt. 2019 saw an avg price of 6,010 US$mt and prices are expected to decline by -16% in 2020F and further -3% in 2021F. Main price drivers are global GDP growth, GDP growth in emerging markets, the fragile copper supply chain and the US housing market.

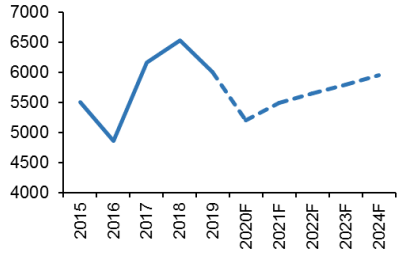
Diamonds are the hardest material on Earth and are used as jewelry as well as industrial tools to cut, grind, drill or polish other materials due to their hardness. Approximately half of all mined diamonds do not satisfy gemstone quality and are used for industrial applications. Synthetic diamonds, also called lab-grown diamonds, are a recent substitution for mined diamonds, which already fulfill substantial industrial demand and are more and more used as jewelry for ethical and cost reasons although their market share is still dwindling. From a chemical perspective these are the same.

Former monopolist De Beers has entered the synthetic diamond market with its Lightbox Collection in Sept 2018, the only natural diamond producer to do so up to now, but with a different pricing with 1-carat at 800US$ and marketing it as an entirely different product. It remains to be seen in the future how consumers will perceive natural diamonds vs. lab-grown ones.

Diamond prices are determined by the so-called four “Cs”: cut, clarity, color and carat. The value of a diamond increases exponentially when it advances through processing. Because diamonds do not possess fungibility it is difficult to gather market price data. Rough diamonds are usually sold by auction, tender or long-term contracts. Rio Tinto is the third biggest producer of diamonds worldwide. The top 5 producers dominate the supply with over 70%, see figure 30.

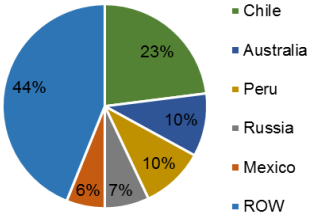
Rio Tinto has plans to shut down its Argyle mine which has started its operations in 1983 in 4Q2020, due to lower profitability, this would cut global diamond production by roughly 10% and likely increase diamond prices. Several other mines from other market players are expected to curtail production or to close due to depletion by 2022.

Figure 31 - Copper ($/mt)



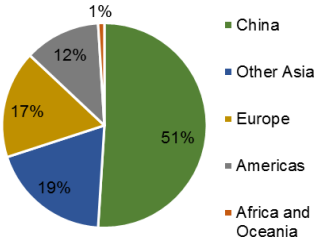
Source: World Bank

Figure 32 - Copper reserves by country in 2019



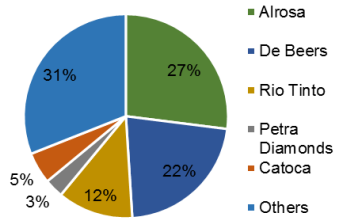
Source: Statista

Figure 33 - Global copper demand by region in 2019



Source: Statista

Figure 34 - Share of largest diamond producers in 2019



Source: Statista

Prices reached an all-time high in 2011 caused by new Chinese demand, which led to more mining and pressure on prices. After a strong 1H2018 the industry has struggles. Prices drivers are the global GDP growth, consumer spending preferences, marriage rates, the Chinese and Indian middleclass.

Energy & Minerals

Borates are crystallized salts that contain boron. It is used for glass (51%), fertilizers (13%), ceramics (12%), detergents (3%) and other purposes (21%). Rio Tinto owns a mine in California which delivers about 25% of worldwide refined borates demand (2mtons), together with the company ETi MADEN of Turkey they account for around 80% of global market share. Demand comes mainly from Asia (56%), the Americas (25%) and Europe (18%). Key demand drivers are urbanization, global population, food supply and energy production. Demand is expected to grow by 3% CAGR until 2023.

Salt is used industrially to make soda ash, chlorine and caustic soda which then is used for PVC, glass, detergents & soaps, textiles, industrial chemicals and road de-icing. Dampier Salt Limited, in which Rio has a 68% stake, is the largest exporter of seaborne salt. The company has the capacity to produce about 10.3m tons per year. The global salt market size was 13,607m tons in 2017 and is expected to grow 4.9% CAGR until 2023.

Titanium is a metal which has several advantageous properties which makes it suitable for a variety of purposes. Biggest customer market is the aerospace sector (about 70%) where it is used due to its extreme temperature resistance. It´s non-toxicity makes it perfectly suited for implants in the healthcare sector, while its corrosion resistance is demanded in the chemical industry. Lower emission goals in many countries have caused an increased demand from the transportation industry due to its high strength-to-weight ratio. Titanium dioxide is used to whiten products like toothpaste. Rio Tinto has stakes in Richards Bay Minerals (74%) which is the biggest mineral sand producer in South Africa and QIT Madagascar Minerals (80%) and owns a mine and a metallurgic complex in Quebec, Canada.

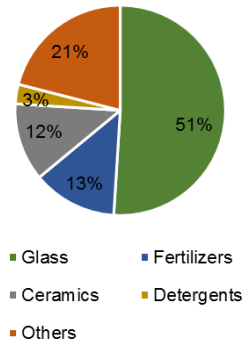
Uranium is a naturally occurring element found in low concentrations in rocks, rivers, soil, and oceans and is almost exclusively used for electricity production. Although there are concerns about the use of nuclear power it is a reliable energy source and provides about 10% of world´s electricity. Demand in electricity will boosted by further population growth, the global population is expected to reach 9.7bn in 2050, as well as economic growth. Rio sold its 68.8% stake of Rössing Uranium Limited on 16 July 2019. Rio Tinto holds a 68.4% stake in Energy Resources of Australia Ltd. In 2012 ended the open pit mining. Since then it is stockpile mining. At the end of 2020, a 5-year rehabilitation is planned for the mine. Rio Tinto has a uranium project in Canada.

Porter's Five Forces Analysis

Industry rivalry (High): There is some cooperation with certain mines between companies, but the industry is dominated by a fight over lowest cash costs per ton. At the same time some of the "big four" work on projects to expand output in a market in which demand is not expected to grow significantly.

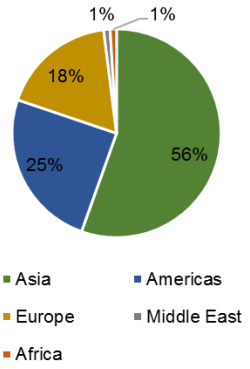
Threats of new entrants (Low): The example of the entrance of Fortescue into the iron ore market in 2008 shows that until recently it was possible to successfully engage as a new player. But that was during the time of the commodity super cycle. Since then prices have contracted and profit is made by aggressively lowering production costs. Initial high Capex and know-how are needed to set up shop, so hurdles are high.

Figure 35 - Borates demand by sector



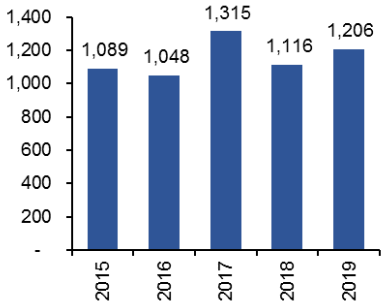
Source: Orocobre Limited

Figure 36 - Borates demand by region



Source: Orocobre Limited

Figure 37 - Titanium slag production in thousand tons (Rio Tinto share)



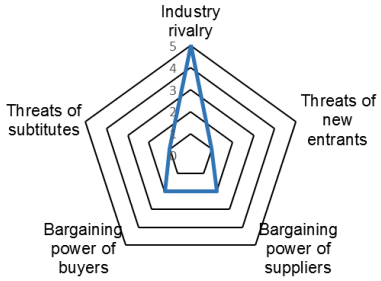
Source: Company data

Bargaining power of suppliers (Medium Low): Energy prices play a role especially coal which made up 32.2% of energy sources used in 2019. Another area are freight costs, where shipping supply is inelastic in the short-term.

Bargaining power of buyers (Medium Low): There are few companies from which iron ore can be bought. If there would be a consolidation of the Chinese steel industry in the future and at the same time more supply of iron ore this could change.

Threats of substitutes (Low): Substitutes for primary metals are recycled metals, new materials and depending on the purpose sometimes plastic. We expect the share of scrap metals to increase overall, especially in the long run, when developed countries move towards a circular economy. This effect will be offset by an increasing demand from emerging and developing countries.

Figure 38 - Porter´s five forces



Source: The author

Table 14 - SWOT analysis

Strength	Weaknesses
• Highest EBITDA margin in iron ore	• Loss of leading cash costs per ton in iron ore
• Strong balance sheet	• Reputation
• Technological expertise	• Iron ore dominates sales and profits
• Market position	
• Experience	
Opportunities	**Threats**
• Koodairderi Mine and Koodairderi Phase 2	• Loss of market share
• Further cost reductions	• Lower margins
• Furter expansion in areas with high margins like bauxite	• Protectionism and trade barriers

Source: The author

5. Investment Summary

The final recommendation for Rio Tinto Ltd stands for reduce. This recommendation derives from our price target of $62.23/sh for 2021YE with a high-risk assessment and an upside potential of 3.0% as of September 30th, 2020. While we see short- and mid-term potential in the company´s performance, we have a dim outlook for the mining industry in the long-run.

Rio Tinto has with 72% the highest EBITDA margin of the “big four” in the iron ore mining business. We think that with the opening of the new Koodaideri mine at the end of 2021F and further efficiency improvements at the other mines the company will manage to increase its EBITDA margin even further and lower cash costs for one ton of iron ore beneath 14$/wmt. The aluminum product group will benefit from the 2m tons additional output of Bauxite by the Sangaredi mine in Guinea and the closure of the Tiwai Point smelter in New Zealand. The copper, mined and refined, is expected to have dramatic contraction of revenue by 32% in 2020F but is projected to recover by higher outputs as well as recovering copper prices over the following years.

While a contraction of sales revenue by 7% is expected for 2020F, we expect revenue to grow by 2.4% CAGR for the forecasting period, while we expect EBITDA to increase by 3.3% CAGR and the EBITDA margin to increase from 43.45% in 2020F by 159 basis points to 45.05% in 2024F. In the long run prospects for the mining industry, with the depletion of ore reserves, are modest. We considered this with a terminal growth rate of 0% in the DCF model which has a big impact on the valuation.

Valuation Methods

The final price target of $62.23/sh was reached by the Discounted Cash-Flow (DCF) through Free Cash Flow to the Firm (FCFF) method. Furthermore, the Gordon Growth Model (GGM) was used for the Dividend Discount Method (DDM) and with Market Multiples also a relative valuation was conducted.

The Multiples target price of $67.34 is the average of EV/Sales, EV/EBITDA and EV/CFO. The EV/EBITDA target price of $86.74 is the highest of all target prices reached by the different methods while the EV/Sales is the lowest, highlighting the higher profitability of Rio Tinto over its peer group.

The DDM model obtains the lowest target price. We attribute this to the partial perspective of the DDM model by just focusing on the dividend payments, the growth of dividend payments and cost of equity instead of looking at the whole company but the high diverging values conform the high-risk assessment associated with the target price of the main valuation method.

Investment Risks

Rio Tinto is subject to a variety of economic, market and operational risks that often cannot be mitigated and can have a significant impact on the price target. The different risks, their nature and their expected impact are explained in the chapter Investment Risks. Also, several sensitivity analyses were performed to quantify the impact changes of different variables of the DCF valuation can have on the price target.

Table 15 - Valuation Methods

Valuation Method	2021YE Target Price
DCF	$62.23
DDM	$43.65
Multiples	$67.34
EV/Sales	$51.41
EV/EBITDA	$86.74
EV/CFO	$63.86

Source: The author

Table 16 - DCF valuation enterprise value

Enterprise Value	
Terminal Growth Rate	0.00%
Perpetuity WACC	6.98%
Terminal Value ($m)	114,346
PV of Terminal Value ($m)	87,314
NPV of FCFF ($m)	19,395
Enterprise Value ($m)	**106,709**

Source: The author

Table 17 - DCF valuation price target

Price Target	
Net Debt ($m)	6,031
Value of Equity ($m)	100,678
Shares Outstanding (m)	1,618
Price per Share ($)	**62.23**
Upside Potential	3.04%

Source: The author

6. Valuation

To obtain the fair value for the Rio Tinto Group we used as the main valuation method the Discounted Cash-Flow Analysis (FFCF). This method was chosen because it gives in the author´s view the best estimation of the intrinsic value of the company considering the fundamental factors, like the business model, industry analysis and positioning of the company in the market as discussed in the previous chapters. Additionally, the Dividend Discount Model (DDM) and the Market Multiples approach was used to compare the results of the different methodologies.

Revenues

The revenues for the Rio Tinto Group are forecasted by estimating the revenues for each product group first and adding those together. All price forecasts for the commodities are from the World Bank database except for Uranium, where the price forecast comes from the IMF database and diamonds, where we estimate price changes. The growth rates for each market from the chapter industry analysis are considered in the forecasts:

Iron Ore

Rio Tinto is a major player in the global iron ore market accounting for roughly 11.3% of global output in 2019. Therefore, we used the top-down approach to estimate production. The market is projected to be stagnant with an almost non-existent growth of 0.2% CAGR. In this environment major players like Vale have expansion projects. We think that Rio Tinto can maintain its market share and the increased output by the “big four” will be to the disadvantage to regional higher cost producers who will lose market share. Should this not be the case i.e. due to national protectionism, we expect Rio Tinto to fight for its share also in a price war. As Rio Tinto is the market leader in EBITDA margin, we think that the company is in the right position to defend its market share, but the scenario of a price war seems unlikely.

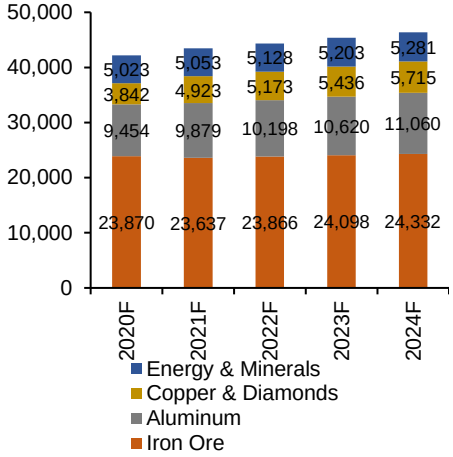
Aluminum

For the aluminum product group, we used principally the top-down approach as Rio Tinto was the 5th largest producer worldwide in 2019 but adjusted for company specific events. Due to the current oversupply of aluminum, the overall global market is expected to grow by 1.0% CAGR for the forecasting period. We also expect the Alumina and Bauxite market to grow accordingly alongside this figure. Rio Tinto has announced that the company will close the Tiwai Point Smelter in New Zealand, taking out 279k tons of production. Afterwards we assume that through gains in productivity production will increase in accordance with the market growth. This is also assumed for Alumina and Bauxite, although for Bauxite the 2.025m tons increase due to the expansion of the Sangaredi mine in Guinea is considered in 2020F. Together with the expected closure of Bauxite mines in China by the government due to stiffer environmental regulation and crack-down on the black market we think that Rio Tinto can increase its global bauxite market share by 36bps. Prices for Bauxite and Alumina are projected to follow along with price changes for aluminum.

Copper & Diamonds

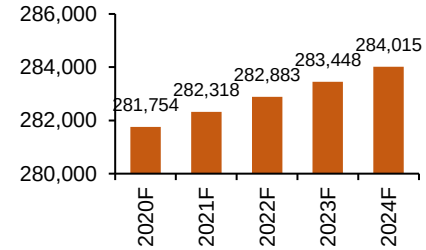
To analyze the copper segment the top-down approach was used adjusting for company related events. The guidance was lowered due to different reasons for the mines. Therefore, we expect an output 500k mts of mined copper for 2020F, lowering its worldwide market share by 31bps but think that the company will achieve its previous markets share of 2.89% in the following year. Mainly due to the increase of the copper grade of the Kennecott mine in H1 2021F by transitioning mining from the east wall to the south wall and a further development of the Oyu Tolgoi mine in Mongolia. There is a high correlation between copper demand and world GDP. Therefore, the copper

Figure 39 - Projected revenues by product group (in $m)



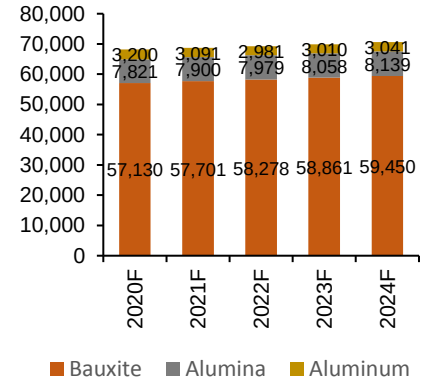
Source: The author

Figure 40 - Projected Iron ore production in mt (Rio Tinto share)



Source: The author

Figure 41 - Aluminum product group projected production in k tons



Source: The author

Figure 42 - Projected copper production in k tons

Source: The author

market is expected to grow with the projected global GDP growth. Due to Rio Tinto copper growth projects we think that the company will be able to maintain its market share for the rest of the forecasting period.

Although Rio Tinto is the third largest diamond producer worldwide the bottom up approach was used to analyze the diamond segment. This is mainly due to the lower grades at both mines of the company and the closure plans. The Argyle mine in Western Australia is scheduled to close by the end of 2020F. For that year we took the probable reserve of recoverable diamonds of 9.5m carats provided by the company as output (-27% less than in FY2019). For the Diavik mine in Canada we assume a decline of 10% per year of output as the ore grade lowers. The total output for the forecasting period reaches the probable reserve of recoverable diamonds of 14.9m carats. The mine is scheduled to close in 2025F. Due to the Corona pandemic and lockdowns in some areas we expect the consumer demand for luxury goods like diamonds to drop drastically and therefore prices to contract by 30% in 2020F. For the rest of the forecasting period we expect prices to rise by 10% annually, also due to the supply cut of 10% of global production by the closure of the Argyle mine.

Energy & Minerals

The demand for **Boron** is projected to grow by 3.0% CAGR until 2023F according to Orocobre. We assume that in 2024F the same growth will occur and Rio Tinto as a major global supplier for Boron will increase supply accordingly. We expect prices to maintain their level. For **iron ore concentrate & pellets** we assume the same sales and prices as in the iron ore section before. For **titanium dioxide** we expect a growth rate of 1% per year due to operational improvements and prices at the constant level during the forecasting period. The last **uranium** mine of Rio Tinto is expected to close at the end of 2020F. Currently, there is still stockpile mining going on. For **salt** we assume a business growth of 4.9% CAGR for the forecasting period as this is the projected market growth.

Main Costs

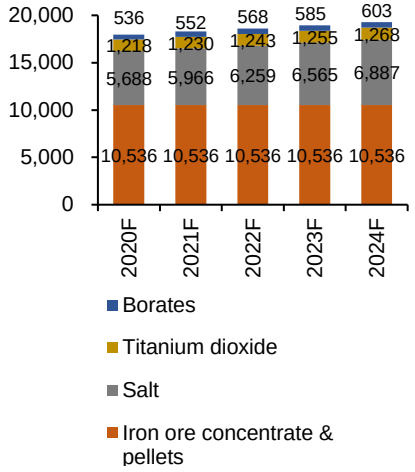
Because the company does not report costs by product group, the estimation of the costs was done for the Rio Tinto Group. Due to the high investments of the company into productivity improvements especially through technological advances we expect Cost of Goods Sold (COGS) to contract by 25bps CAGR in relation to Consolidated Revenue. Employment Costs are projected to rise with global inflation rate adjusted for the closure Tiwai smelter in Aug 2021F with a CAGR of 1.9% for the forecasting period. Shipping and Other Freight Costs are expected to increase by 0.2% CAGR mainly due to shipment of higher quantities. Other External Costs are expected to grow with the global inflation rate from $3,627m in FY2019 to $4,056m to 2024F.

Capex, D&A and Impairment

Rio Tinto has changed its capital expenditure plan to be $6bn (before: $7bn) in 2020F and $7bn (before $6.5bn) in 2021F-22F due to the COVID-19 pandemic and therefore a reduction of spending in 2020. We assume a continuation of the previous planned level of $6.5bn for the rest of the forecasted period.

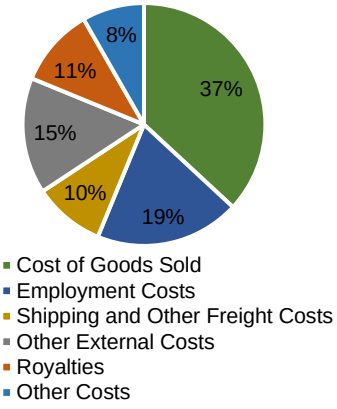
Amortization is expected to be $133m p.a. as it was the last two years reducing intangibles. For depreciation we used the percentage of D&A of FY2019 minus the abovementioned amount for amortization for PP&E end of FY2018. Considering projected Capex and Depreciation the net value of PP&E increases over time to $67,173m in 2024F. We do not expect any impairments to occur during the forecasting period.

Figure 43 - Projected production product group Energy & Minerals except uranium in k tons



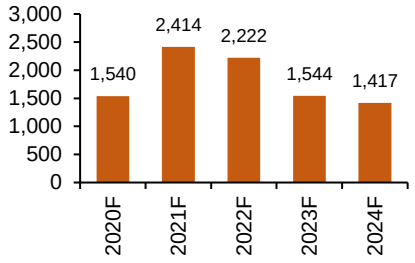
Source: The author

Figure 44 - Cost distribution Rio Tinto



Source: Company data, the author

Figure 45 - Net Capex projection



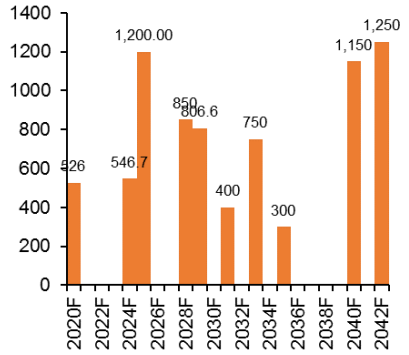
Source: The author

Debt Strategy

Rio Tinto has in 2020F $7.2bn outstanding bonds in long-term financing on the corporate level and other debt of $6.2bn at business unit or asset level, mainly due to the Oyu Tolgoi mine project financing of $4.2bn, further $1.2bn lease liabilities and another $0.8bn of secured and unsecured debt.

Rio Tinto has managed to reduce its net debt significantly over the last years. So is its net debt level in FY2019 with $6,686m almost half of what the company had in FY2013 with $13,335m. We think that reducing the net debt level will not be the focus in the future but having a high reserve of cash and cash equivalents due to the economic uncertainties which indirectly can reduce the net debt level even a bit further. Due to Rio Tinto´s long-term borrowings only two bonds are due during the forecasting period (2020F: $526m, 2024F: $546m) and one bond with a principal of $1,200m in 2025F. We assume that to guarantee high cash reserves the two bonds due during the forecasting period will be refinanced by new issues with the same principals.

Figure 46 - Rio Tinto bond maturity profile in $m



Source: Company data

WACC Assumptions

The WACC rate increases from 6.6% in 2021F to 7.0% in 2024F due to changes in the weight of equity from 77.1% in 2020F to 84% in 2021F. For the risk-free rate we used the 10-yr US Treasury Bond rate since Rio Tinto´s debt is predominantly in issued US Dollars and when a bond is issued in a different currency the company´s policy is to enter into a currency interest swaps to convert non-US dollar borrowings to US-Dollar ones. After taking these swaps into consideration 95.5% of all borrowings are denominated in US-Dollars. The market risk premium (MRP) is the estimation of the MRP for the United Kingdom by NYU Stern as the company is headquartered in the UK and the beta is calculated by doing a regression with 60 observations for the last 5 years with the FTSE 100 index adjusted by the blume method. Due to the business cycle of the mining industry we added an industry risk premium (IRP).

To estimate the Cost of Debt (Kd) we used the yield to maturity (YTM) of the Rio Tinto bond US013716AQ81 since its time to maturity is roughly 10 years and it is issued in US Dollars. We think that using the YTM is the most adequate method because Rio Tinto has a policy of seeking floating interest rates for the management of its interest rate risk exposure and uses interest swaps to convert its payments of fixed interest bonds into floating ones. After taking into consideration interest rate swaps 76% of debt has floating interest rates and 24% fixed.

Table 18 - WACC assumptions

DCF Analysis	2021F
Cost of Equity	
Risk-Free Rate (Rf)	0.68%
Industry Risk Premium (IRP)	0.98%
Market Risk Premium (MRP)	5.96%
Beta (ß)	1.07
Cost of Equity (Ke)	8.04%
Cost of Debt	
Cost of Debt	2.248%
Effective Tax Rate	36.35%
After-Tax Cost of Debt	1.43%
WACC	
Weight of Equity	78.60%
Weight of Debt	21.40%
WACC	6.62%

Source: The author

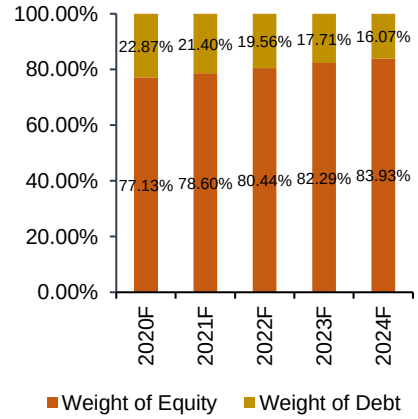
Terminal Value Assumptions

For the terminal growth rate, we assume that the mining industry, due to the depletion of ore reserves in the long run, will have 0% growth. The present value of terminal value makes with $87,314m roughly 81.8% of the enterprise value for the DCF calculation up.

Dividend Discount Model

We decided to use the Gordon´s Growth Model (GGM) since Rio Tinto is a large, stable company in market that is already mature and has a predictable rate of dividend growth. The company aims for a payout ratio between 40-60% of underlying earnings. We assume that the company will spend around 50% of earnings in the following years due to the fact that investors are accustomed to high dividends as the company has paid a higher payout ratio (currently: 76.35%) since it distributed the extra cash generated by the sales of parts of the business but on the other hand it should consider to have a high reserve of cash and cash equivalents due to the uncertainty of the global economy. This figure seems therefore to be a balanced stance. With this model we obtained a target price of $43.65 and an upside potential of -27.7%.

Figure 47 - Projected capital structure development



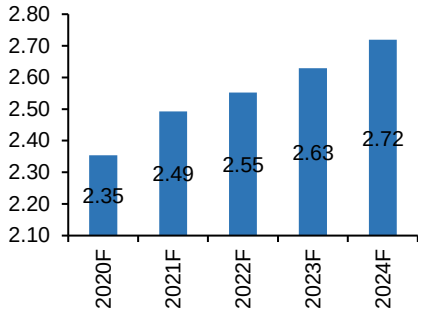
Source: The author

Market Multiples

Besides the two previous absolute valuations also a relative valuation in form of Market Multiples was conducted. By this method, a target price of $67.34 and an upside potential of 11.5% was reached. The ratios **EV/Sales**, **EV/EBITDA** and **EV/CFO** were selected to focus on the performance of the enterprise in comparison to its peer group and disregard different capital structures.

Since Rio Tinto has the second highest market capitalization in the mining industry, we listed the five largest companies by market cap in the mining sector and the five largest in the iron ore sector (including Rio Tinto) to find its peer group. When an iron ore mining company was already listed in the first list, we skipped that one to the next company. Further criteria were a majority of share in free float, mainly private investors, a diversified mining portfolio with preference to similar commodities as Rio Tinto has an international diversification. At the end three enterprises were the most adequate to include into the peer group. BHP Billiton, Vale and Anglo American.

Figure 48 - Projected dividends per share in $ (DPS)



Source: The author

Table 19 - Analysis Rio Tinto peer group

Enterprise	Market Cap	Free Float	Investors	Diversified Portfolio					International Diversification				Peer
				Iron Ore	Aluminum	Copper & Diamonds	Energy & Minerals	Others	Asia-Pacific	Americas	Europe	Others	
BHP	136.42	99.20	Private	38.96	0	24.47	0	36.57	88.06	7.01	4.23	0.7	Yes
Rio Tinto	**101.40**	**99.00**	**Private**	**53.07**	**22.79**	**12.82**	**11.32**	**0**	**72.5**	**17.5**	**6.6**	**3.4**	
China Shenhua Energy	63.55	26.96	State	0	0	0	0	100	98.8	0	0	1.2	No
Vale	59.71	70.76	State/ Private	62.13	0	5.28	0	32.59	64.3	16.1	13.8	5.8	Yes
Newmont Corporation	55.53	99.7	Private	0	0	4.75	0	95.25	10.3	2.75	85.25	1.7	No
Barrick Gold	51.87	97.75	Private	0	0	4.54	0	95.46	na	na	na	na	No
Fortescue Metals Group Ltd	38.75	49.68	Private	99.98	0	0	0	0.02	92.93	0	0	7.07	No
Anglo American	33.62	80.22	Private	22.62	0	34.97	0	42.41	68.39	5.87	19.37	6.37	Yes
Franco-Nevada	30.62	99.32	Private	0	0	0	0	100	0	84.93	0	15.07	No
Glencore	30.29	74.17	Private	0	0	36.68	0	63.32	43.25	17.72	35.21	3.82	No

Source: Yahoo finance, company data, the author

7. Financial Analysis

Profits

Although revenue is expected to decrease by 7.0% from FY2019 to 2020F, mainly due diminishing commodity prices but also dramatically less output in the copper segment, net income is projected to increase by 11.6%. This is mainly due to extraordinary high impairments of $3.5bn in FY2019. We do not expect any further impairments during the forecasted period. Afterwards, net income is projected to increase by 2.9% CAGR during the period 2020F-24F, mainly due to recovering prices and to a lesser extent slightly higher output.

COGS are expected to decrease by 25bps CAGR over the forecasted period in relation to revenue from 21.86% of revenue in 2020F to 21.64% of revenue in 2024F as the company has invested high amounts in higher productivity over the last years.

Profitability Ratios

Margins are expected to increase slightly over the forecasted period as well as Return on Assets (ROA). Return on Equity (ROE) is expected to decrease from 16.9% in 2020F to 16.1% in 2024F. We attribute this trend to the high investments into PP&E financed by retained earnings which will increase earnings only later. The Return on Capital Employed (ROCE) is projected to increase from 16.7% to 17.4%.

Liquidity Ratios and Leverage

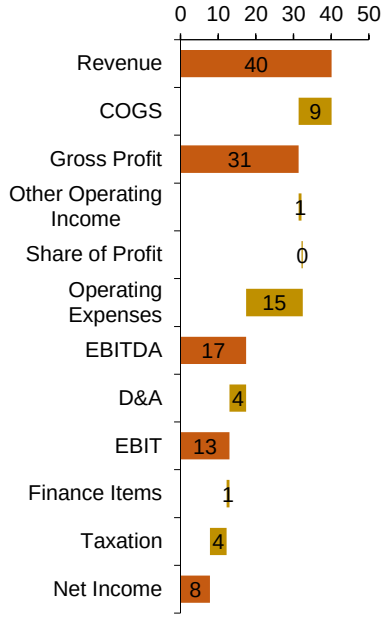
Rio Tinto´s liquidity ratios are projected to increase from FY2019 to 2020F but then contract over the next years and only to recover slightly in 2024F without reaching the 2020F level. For example, the quick ratio is expected to contract from 1.31 in 2020F to 1.18 in 2023F and to increase to 1.25 in 2024F. The reason is mainly the timing of Capex spending. Due to the COVID-19 pandemic instead of the initial planned $7bn for 2020F only $6bn are planned to be spent this year. The difference is intended to be spent in 2021F-22F on top of the initial planned $6.5bn for each year. We assume a continuation of the initial planned spending for Capex for the period 2023F-24F. The decrease in the liquidity ratios during the period 2021F-23F will not be an issue for the company as it will be still in a comfortable position to pay all its obligations.

We expect that Rio Tinto will retain 50% of net income during the forecasted period and will only refinance its two bonds due during the same period. Therefore, the leverage of the company decreases. Total Debt to Total Equity is projected to contract from 0.90 in 2020F to 0.70 in 2024F.

Dividend Payments

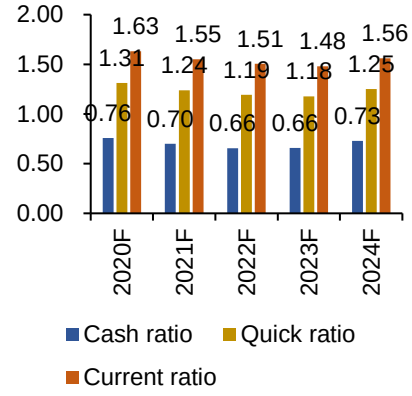
With growing net income and a stable payout ratio at 50%, we expect Dividends per Share (DPS) to increase over the forecasted period, from $2.35 in 2020F to $2.72 in 2024F. Total Dividends paid by the company are projected to increase from $3,808m in 2020F to $4,400m in 2024F.

Figure 49 - Net income breakdown 2020F (in $bn)



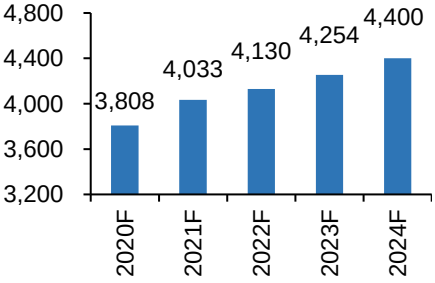
Source: The author

Figure 50 - Projected liquidity ratios



Source: The author

Figure 51 - Projected dividend payments (in $m)



Source: The author

8. Investment Risks

Economic and Market Risks

- ➔ **Economic Growth (EM1; medium-high):** The mining industry is generally linked to the well-being and growth of the global economy; a downturn would have a significant impact on the company.
- ➔ **Input Prices (EM2; medium):** As a high energy-intensity industry especially electricity prices play an important role.
- ➔ **Exchange Rate (EM3; medium):** The highest share of revenues is denominated in US dollar while the costs are mainly determined in the currencies of the countries in which the Group operates and in the currencies from which it imports goods and services. A rise in the US dollar against these currencies therefore has a positive effect on the underlying earnings while conversely a drop has a negative effect.
- ➔ **Interest Rates (EM4; medium-low):** Most of the borrowing is done with floating interest rates. Historically, there is a high correlation between high interest rates and high commodity prices, which offsets the effects of higher borrowing costs.
- ➔ **Substitution (EM5; low-high):** Aluminum margins are not as high as iron ore margins. When steel becomes substituted by aluminum profitability goes down. A general higher price level for aluminum than steel prevents a large-scale substitution.
- ➔ **Liquidity (EM6; high-low):** If there would be an external shock which leads banks to stop funding and cancelling credit lines, Rio Tinto could face liquidity issues. A high position in cash and cash equivalents makes this scenario unlikely.

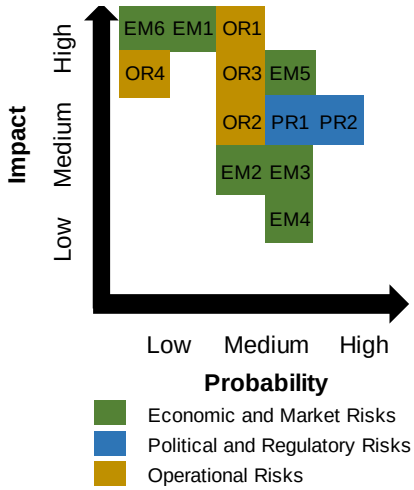
Political and Regulatory Risks

- ➔ **Nationalism (PR1; medium)**: Trade barriers monetary as well as non-monetary threaten global operating companies. Countries could implement measures like higher tariffs, subsidies or governmental preference for local producers to support their national industry.
- ➔ **Environmental Regulation (PR2; medium-high):** The public across the globe becomes more sensitive to environmental issues. It can be expected that the mining industry which has a big impact on the environment due to its operations will be subject to stricter laws, for which the compliance leads to higher costs.

Operational Risks

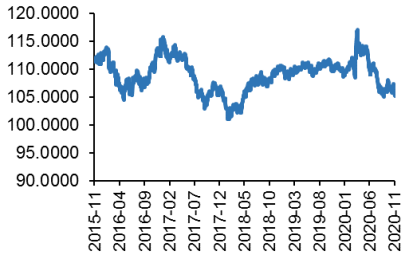
- ➔ **Cyber Attacks (OR1, medium-high)**: With more and more operations conducted via automatization and remote control the company will have a higher exposure to attacks or computer viruses which could have significant effects on the results.
- ➔ **Natural Disaster (OR2; medium)**: Rio Tinto operates in a wide range of geographic locations. These are prone to earthquakes, fire, hurricanes etc. Due to the scale of operations there is a limited possibility to obtain insurance for these events. Western Australia is regularly affected by cyclones which can halt production and port operations. Due to climate change, a higher occurrence and intensity of tropical storms can be expected.
- ➔ **Operational Difficulties and Failures (OR3; medium-high)**
  Operations can be interrupted from an infrastructure breakdown for power, water or transportation, labor strikes and disputes, delayed developments for new projects to major, safety incidents or a COVID-19 outbreak in operations. In 2018 operations at a Canadian facility were halted for 10 days after a fatality occurred.
- ➔ **Exploration and Reserves (OR4; low-high)**
  The company´s long-term success depends on exploring new sites and making accurate reserve estimates.

Figure 52 - Risk Matrix



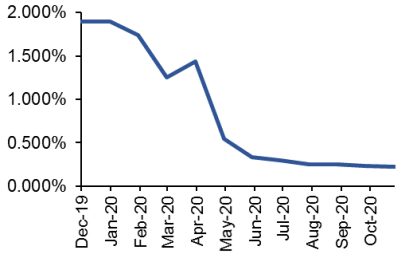
Source: The author

Figure 53 - Trade weighted U.S. Dollar Index: advanced foreign economies



Source: Federal Reserve Bank St. Louis

Figure 54 - USD Libor interest rates 3m (first rate of the month)



Source: Global-rates.com

Risks to Price Target

To measure the impact of change to various key components of the DCF valuation we have performed several sensitivity analyses.

The first analysis shows the impact of changes in the terminal growth rate as well as changes in perpetuity WACC. In the worst-case scenario with a 7.7% perpetuity WACC the new target price would be $55.65. A deviation of -10.6% to the target price of the DCF valuation, while in the best-case scenario a rise of 46.9% would occur.

Table 20 - Change in Perpetuity WACC & Change in Terminal Growth Rate

Change in Perpetuity WACC	Change in Terminal Growth Rate						
	0.00%	0.25%	0.50%	0.75%	1.00%	1.25%	1.50%
6.23%	**70.46**	**73.22**	**76.23**	**79.51**	**83.10**	**87.05**	**91.43**
	13.22%	17.66%	22.49%	27.76%	33.54%	39.90%	46.92%
6.48%	**67.49**	**70.03**	**72.77**	**75.76**	**79.01**	**82.58**	**86.51**
	8.46%	12.53%	16.94%	21.74%	26.97%	32.71%	39.02%
6.73%	**64.76**	**67.09**	**69.60**	**72.33**	**75.29**	**78.53**	**82.07**
	4.07%	7.81%	11.85%	16.23%	20.99%	26.19%	31.89%
6.98%	**62.23**	**64.37**	**66.69**	**69.18**	**71.89**	**74.83**	**78.04**
	0.00%	3.45%	7.16%	11.18%	15.53%	20.26%	25.42%
7.23%	**59.88**	**61.86**	**63.99**	**66.29**	**68.77**	**71.45**	**74.38**
	-3.78%	-0.59%	2.83%	6.52%	10.51%	14.83%	19.52%
7.48%	**57.69**	**59.53**	**61.50**	**63.61**	**65.89**	**68.35**	**71.02**
	-7.30%	-4.34%	-1.18%	2.22%	5.89%	9.84%	14.13%
7.73%	**55.65**	**57.35**	**59.18**	**61.13**	**63.24**	**65.50**	**67.95**
	-10.58%	-7.83%	-4.90%	-1.76%	1.62%	5.26%	9.19%

Source: The author

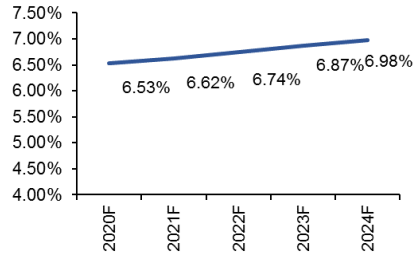
In the next analysis the impact of changes in the iron ore expected production growth and COGS as a percentage of revenue were examined. In the worst-case scenario a contraction of 18.9% ($50.45) would occur and in the best-case scenario a rise of 20.48% of the target price.

Table 21 - Change COGS as Percentage of Revenue & Change in Iron Ore Expected Production Growth

COGS as Percentage of Revenue	Iron Ore Expected Production Growth						
	-2.20%	-1.40%	-0.60%	0.20%	1.00%	1.80%	2.60%
21.56%	**51.80**	**55.42**	**59.13**	**62.94**	**66.85**	**70.86**	**74.97**
	-16.75%	-10.94%	-4.98%	1.14%	7.42%	13.87%	20.48%
21.66%	**51.58**	**55.19**	**58.90**	**62.70**	**66.61**	**70.61**	**74.72**
	-17.11%	-11.31%	-5.35%	0.76%	7.04%	13.47%	20.07%
21.76%	**51.35**	**54.96**	**58.67**	**62.47**	**66.36**	**70.36**	**74.47**
	-17.47%	-11.68%	-5.72%	0.38%	6.65%	13.07%	19.67%
21.86%	**51.13**	**54.73**	**58.43**	**62.23**	**66.12**	**70.12**	**74.22**
	-17.84%	-12.04%	-6.10%	0.00%	6.26%	12.68%	19.26%
21.96%	**50.90**	**54.50**	**58.20**	**61.99**	**65.88**	**69.87**	**73.96**
	-18.20%	-12.41%	-6.47%	-0.38%	5.87%	12.28%	18.86%
22.06%	**50.68**	**54.28**	**57.97**	**61.75**	**65.64**	**69.62**	**73.71**
	-18.56%	-12.78%	-6.85%	-0.76%	5.48%	11.88%	18.45%
22.16%	**50.45**	**54.05**	**57.73**	**61.51**	**65.40**	**69.38**	**73.46**
	-18.92%	-13.15%	-7.22%	-1.15%	5.09%	11.49%	18.05%

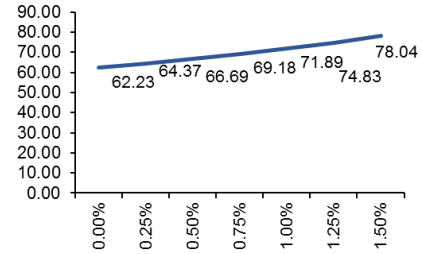
Source: The author

Figure 55 - WACC evolution



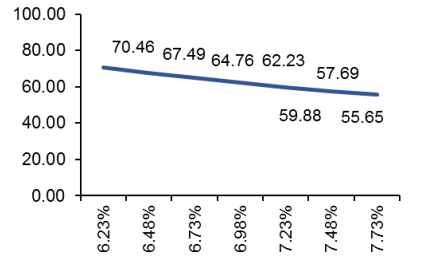
Source: The author

Figure 56 – Impact of change in terminal growth rate on target price



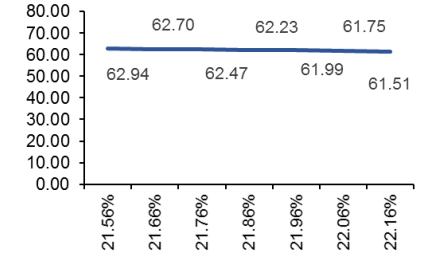
Source: The author

Figure 57 - Impact of change in perpetuity WACC on target price



Source: The author

Figure 58 - Impact of change in COGS as percentage of revenue on target price



Source: The author

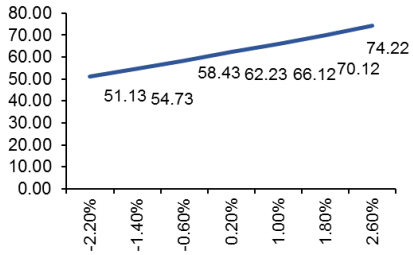
Iron ore is Rio Tinto´s most important product. Therefore, a sensitivity analysis for iron prices was performed. A change of ±15% in iron ore prices causes a change of about ±26% on the target price, highlighting the importance of the commodity for the company and especially what impact fluctuations of the iron ore price can have on the company performance.

Table 22 - Impact of different iron prices on the target price in $

Iron Ore Prices	72.25	76.50	80.75	85.00	89.25	93.50	97.75
New Target Price	**45.80**	**51.31**	**56.78**	**62.23**	**67.65**	**73.04**	**78.41**
Change of Target Price	-26.41%	-17.55%	-8.75%	0.00%	8.71%	17.38%	26.01%

Source: The author

Figure 59 - Impact of change in iron ore expected production growth on target price



Source: The author

Monte Carlo Simulation

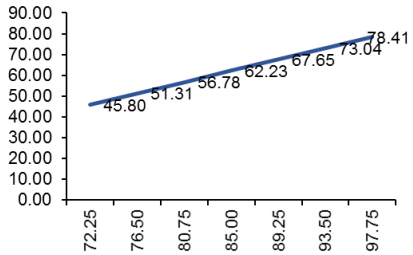
We also conducted a Monte Carlo Simulation with 100,000 trials to measure the impact of variables, which in our opinion could have the most influence on the target price. The terminal growth rate, the market risk premium and beta were selected. We assumed a normal distribution for all variables and the following standard deviations:

Table 23 - Monte Carlo Simulation variables

Variable	Mean	Std. Dev	Distribution	Explanation
Industry Risk Premium	0.98%	0.10%	Normal	Checks the sensitivity to changes of the industry risk premium on the target price
Market Risk Premium	5.96%	0.42%	Normal	Checks the sensitivity to changes of the market risk premium on the target price
Beta	1.07	0.11	Normal	Checks the sensitivity to changes of the beta on the target price

Source: The author

Figure 60 – Impact of change in iron ore price on target price



Source: The author

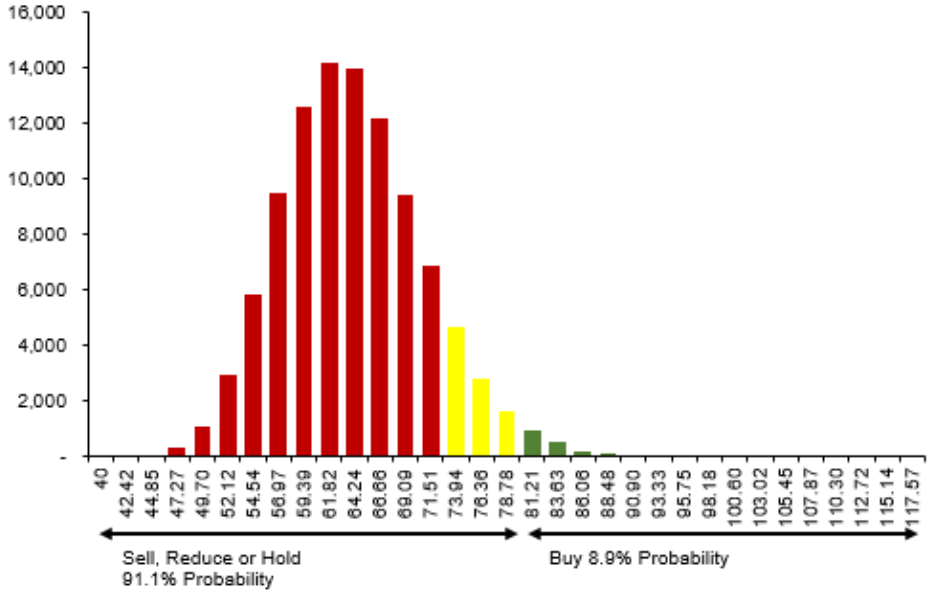
The target price of the Monte Carlo Simulation is $62.89 in comparison the $62.23 of the DCF valuation method and a standard deviation of $6.88. With the high-risk assessment for the stock, there is an 8.9% buy probability and a remaining 91.1% sell, reduce or hold probability in comparison with the closing price of $60.39 on September 30th, 2020.

Table 24 - Monte Carlo statistics

Monte Carlo statistics	
No. of trials	100,000
Mean	62.89
Standard deviation	6.88
Minimum	41.10
Maximum	119.20
10th percentile	54.47
90th percentile	71.96

Source: The author

Figure 61 - Monte Carlo Simulation Frequency Histogram



Source: The author

Appendices

Appendix 1: Statement of Financial Position

In Millions of USD	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F
Cash and cash equivalents	10,550	10,773	8,027	7,633	7,401	7,032	7,414	8,194
Accounts receivable	3,443	3,179	3,027	2,815	2,902	2,960	3,027	3,095
Inventories	3,472	3,447	3,463	3,204	3,295	3,352	3,419	3,488
Other current assets	1,213	2,769	2,786	2,786	2,786	2,786	2,786	2,786
Held for sale assets	494	734	0	0	0	0	0	0
Current Assets	**19,172**	**20,902**	**17,303**	**16,438**	**16,384**	**16,131**	**16,646**	**17,563**
Goodwill	1,037	912	922	922	922	922	922	922
Accounts receivable	1,724	1,585	1,716	1,596	1,645	1,678	1,716	1,755
Inventories	160	152	139	588	606	619	632	647
Long-term financial assets	4,486	4,299	3,971	3,971	3,971	3,971	3,971	3,971
Property, plant & equipment	62,093	56,361	57,372	59,045	61,591	63,946	65,623	67,173
Intangibles	3,119	2,779	2,637	2,504	2,371	2,238	2,105	1,972
Other long-term assets	3,935	3,959	3,742	3,742	3,742	3,742	3,742	3,742
Non-Current Assets	**76,554**	**70,047**	**70,499**	**72,368**	**74,849**	**77,116**	**78,711**	**80,182**
Total Assets	**95,726**	**90,949**	**87,802**	**88,806**	**91,233**	**93,246**	**95,357**	**97,745**
Current borrowings and other financial liabilities	904	1,073	1,372	435	822	874	1,302	1,200
Current trade and other payables	7,061	6,600	6,480	6,346	6,451	6,539	6,648	6,761
Current tax payable	1,985	1,842	1,874	1,900	1,900	1,900	1,900	1,900
Current provisions including post-retirement benefits	1,275	1,056	1,399	1,399	1,399	1,399	1,399	1,399
Liabilities of disposal groups held for sale	124	294	0	0	0	0	0	0
Current Liabilities	**11,349**	**10,865**	**11,125**	**10,080**	**10,572**	**10,712**	**11,250**	**11,260**
Non-current borrowings and other financial liabilities	15,148	12,847	13,341	13,432	12,610	11,736	10,434	9,780
Non-current trade and other payables	856	841	794	778	790	801	815	828
Non-current Tax payable	263	348	376	329	329	329	329	329
Deferred tax liabilities	3,628	3,673	3,220	3,507	3,507	3,507	3,507	3,507
Non-current provisions including post-retirement benefits	13,367	12,552	13,704	13,904	14,104	14,304	14,504	14,704
Non-current Liabilities	**33,262**	**30,261**	**31,435**	**31,950**	**31,340**	**30,677**	**29,589**	**29,148**
Total Liabilities	**44,611**	**41,126**	**42,560**	**42,030**	**41,912**	**41,390**	**40,838**	**40,409**
Share capital Rio Tinto plc	220	211	207	207	207	207	207	207
Share capital Rio Tinto Limited	4,140	3,477	3,448	3,373	3,373	3,373	3,373	3,373
Share premium account	4,306	4,312	4,313	4,313	4,313	4,313	4,313	4,313
Other reserves	12,284	8,661	9,177	7,176	5,601	3,920	2,238	563
Retained earnings	23,761	27,025	23,387	27,276	31,394	35,612	39,956	44,448
Equity attributable to owners of Rio Tinto	**44,711**	**43,686**	**40,532**	**42,344**	**44,888**	**47,425**	**50,086**	**52,904**
Attributable to non-controlling interests	6,404	6,137	4,710	4,432	4,432	4,432	4,432	4,432
Total Equity	**51,115**	**49,823**	**45,242**	**46,776**	**49,320**	**51,857**	**54,518**	**57,336**
Total Liabilities and Equity	**95,726**	**90,949**	**87,802**	**88,806**	**91,233**	**93,246**	**95,357**	**97,745**

Appendix 2: Income Statement

In Millions of USD	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F
Consolidated Revenue	40,030	40,522	43,165	40,143	41,383	42,213	43,158	44,138
Production Cost of Goods Sold	9,286	10,613	9,485	8,775	9,024	9,182	9,364	9,552
Gross Profit	**30,744**	**29,909**	**33,680**	**31,368**	**32,359**	**33,031**	**33,794**	**34,586**
Other Operating Income	1,002	1,041	773	773	773	773	773	773
Share of profit after tax of equity accounted units	339	513	301	301	301	301	301	301
Operating Expenses	14,816	14,304	14,794	15,001	15,146	15,319	15,546	15,780
EBITDA	**17,269**	**17,159**	**19,960**	**17,441**	**18,288**	**18,786**	**19,322**	**19,880**
Gain on Sale PP&E	32	506	(31)	0	0	0	0	0
Depreciation & Amortization	4,375	4,015	4,384	4,460	4,586	4,778	4,956	5,083
Impairment	796	132	3,487	0	0	0	0	0
EBIT	**12,130**	**13,518**	**12,058**	**12,980**	**13,701**	**14,008**	**14,366**	**14,797**
Finance Items	**(1,658)**	**(33)**	**(648)**	**(761)**	**(760)**	**(756)**	**(717)**	**(680)**
Net Exchange Gains/(Losses) on net external and intragroup debt balances	(601)	704	58	0	0	0	0	0
Net (Losses)/Gains on Derivatives not qualifying for hedge accounting	33	(57)	(68)	0	0	0	0	0
Finance Income	141	249	300	230	230	230	230	230
Finance Costs	(848)	(552)	(554)	(607)	(606)	(602)	(563)	(526)
Amortisation of Discount	(383)	(377)	(384)	(384)	(384)	(384)	(384)	(384)
Net Income Before Taxation	**10,472**	**13,485**	**11,410**	**12,219**	**12,941**	**13,252**	**13,649**	**14,118**
Taxation	3,965	4,242	4,147	4,442	4,704	4,817	4,961	5,132
Net Income After Taxation	**6,507**	**9,243**	**7,263**	**7,778**	**8,237**	**8,435**	**8,688**	**8,986**
Net Income from Discontinued Operations	2,344	4,622	(291)	0	0	0	0	0
Net Income	**8,851**	**13,865**	**6,972**	**7,778**	**8,237**	**8,435**	**8,688**	**8,986**
-attributable to owners of Rio Tinto (net earnings)	8,762	13,638	8,010	7,617	8,067	8,260	8,508	8,800
-attributable to non-controlling interests	89	287	(1,038)	161	171	175	180	186

Appendix 3: Cash Flow Statement

In Millions of USD	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F
Cash Flow from Operations								
EBIT	12,130	13,518	12,058	12,980	13,701	14,008	14,366	14,797
D&A	4,375	4,015	4,384	4,460	4,586	4,778	4,956	5,083
Impairments	796	132	3,487	0	0	0	0	0
Dividends from equity accounted units	817	800	669	762	762	762	762	762
Changes in NWC	(199)	(532)	0	(363)	73	27	23	25
Other operating cash flow	(1,728)	(2,570)	(1,137)	(1,812)	(1,812)	(1,812)	(1,812)	(1,812)
Tax paid	(2,307)	(3,602)	(4,549)	(4,442)	(4,704)	(4,817)	(4,961)	(5,132)
Cash Flow from Operations	**13,884**	**11,761**	**14,912**	**11,586**	**12,607**	**12,947**	**13,334**	**13,723**
Cash Flow from Investing								
Capex, PP&E and intangibles	(4,482)	(5,430)	(5,488)	(6,000)	(7,000)	(7,000)	(6,500)	(6,500)
Other Investments	(744)	(1,587)	(65)	(799)	(799)	(799)	(799)	(799)
Divestments	2,853	8,338	52	0	0	0	0	0
Cash Flow from Investing	**(2,373)**	**1,321**	**(5,501)**	**(6,799)**	**(7,799)**	**(7,799)**	**(7,299)**	**(7,299)**
Cash Flow from Financing								
Proceeds/(Repayment) of interest-bearing liabilities	(2,777)	(2,246)	(123)	(804)	(777)	(1,267)	(1,304)	(1,189)
Lease principal payments	0	0	(315)	(349)	(267)	(157)	(133)	(93)
Dividend payments	(4,250)	(5,356)	(10,334)	(3,808)	(4,033)	(4,130)	(4,254)	(4,400)
Share buy-back	(2,083)	(5,386)	(1,552)	(197)	0	0	0	0
Other financing cash flows	(31)	37	105	37	37	37	37	37
Cash Flow from Financing	**(9,141)**	**(12,951)**	**(12,219)**	**(5,121)**	**(5,040)**	**(5,517)**	**(5,654)**	**(5,645)**
Effects of exchange rates on cash and cash equivalents	(12)	151	(54)	0	0	0	0	0
Net change of cash	**2,358**	**282**	**(2,862)**	**(334)**	**(232)**	**(369)**	**382**	**780**
Opening Balance	8,189	10,547	10,829	7,967	7,633	7,401	7,032	7,414
Closing Balance	10,547	10,829	7,967	7,633	7,401	7,032	7,414	8,194

Appendix 4: Key Financial Ratios

Ratios	Unit	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F
Profitability Ratios									
Gross profit margin	%	76.80%	73.81%	78.03%	78.14%	78.19%	78.25%	78.30%	78.36%
EBITDA margin	%	43.14%	42.34%	46.24%	43.45%	44.19%	44.50%	44.77%	45.04%
EBIT margin	%	30.30%	33.36%	27.93%	32.34%	33.11%	33.18%	33.29%	33.53%
Net profit margin	%	22.11%	34.22%	16.15%	19.37%	19.90%	19.98%	20.13%	20.36%
ROA	%		14.85%	7.80%	8.81%	9.15%	9.14%	9.21%	9.31%
ROE	%		27.47%	14.67%	16.90%	17.14%	16.67%	16.33%	16.07%
ROCE	%		16.44%	15.38%	16.71%	17.19%	17.17%	17.24%	17.35%
Efficiency Ratios									
Receivable turnover	times		8.16	9.08	8.77	9.24	9.19	9.20	9.20
Days sales outstanding (DSO)	days	47.11	42.91	40.11	40.11	40.11	40.11	40.11	40.11
Inventory turnover	times		0.88	0.84	0.76	0.75	0.75	0.75	0.76
Days inventory outstanding (DIO)	days	365.39	365.34	365.38	365.43	365.43	365.43	365.43	365.43
Payables turnover	times		1.38	1.29	1.22	1.26	1.26	1.27	1.27
Days payable outstanding (DPO)	days	311.19	255.91	279.92	296.29	292.90	291.80	290.91	290.00
Operating cycle	days	412.50	408.25	405.49	405.54	405.54	405.54	405.54	405.54
Cash conversion cycle	days	101.32	152.34	125.57	109.25	112.64	113.74	114.63	115.54
Fixed asset turnover	times		0.68	0.76	0.69	0.69	0.67	0.67	0.66
Total asset turnover	times		0.43	0.48	0.45	0.46	0.46	0.46	0.46
Liquidity Ratios									
Current ratio	times	1.69	1.92	1.56	1.63	1.55	1.51	1.48	1.56
Quick ratio	times	1.38	1.61	1.24	1.31	1.24	1.19	1.18	1.25
Cash ratio	times	0.93	0.99	0.72	0.76	0.70	0.66	0.66	0.73
Capital Structure									
Total debt to total equity	times	0.87	0.83	0.94	0.90	0.85	0.80	0.75	0.70
Total debt to total capital	times	0.17	0.15	0.17	0.16	0.15	0.14	0.12	0.11
Total Debt to total assets	times	0.47	0.45	0.48	0.47	0.46	0.44	0.43	0.41
EBITDA interest coverage ratio	times	20.36	31.09	36.03	28.73	30.19	31.22	34.33	37.81
EBIT interest coverage ratio	times	14.30	24.49	21.77	21.38	22.62	23.28	25.52	28.14
Long-term debt to equity	times	0.65	0.61	0.69	0.68	0.64	0.59	0.54	0.51
Long-term debt to total capital	times	0.16	0.14	0.15	0.15	0.14	0.13	0.11	0.10
Long-term debt to assets	times	0.35	0.33	0.36	0.36	0.34	0.33	0.31	0.30

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Appendix 5: Common-Size Statement of Financial Position

In Millions of USD	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F
Cash and cash equivalents	11.0%	11.8%	9.1%	8.6%	8.1%	7.5%	7.8%	8.4%
Accounts receivable	3.6%	3.5%	3.4%	3.2%	3.2%	3.2%	3.2%	3.2%
Inventories	3.6%	3.8%	3.9%	3.6%	3.6%	3.6%	3.6%	3.6%
Other current assets	1.3%	3.0%	3.2%	3.1%	3.1%	3.0%	2.9%	2.9%
Held for sale assets	0.5%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Current Assets	**20.0%**	**23.0%**	**19.7%**	**18.5%**	**18.0%**	**17.3%**	**17.5%**	**18.0%**
Goodwill	1.1%	1.0%	1.1%	1.0%	1.0%	1.0%	1.0%	0.9%
Accounts receivable	1.8%	1.7%	2.0%	1.8%	1.8%	1.8%	1.8%	1.8%
Inventories	0.2%	0.2%	0.2%	0.7%	0.7%	0.7%	0.7%	0.7%
Long-term financial assets	4.7%	4.7%	4.5%	4.5%	4.4%	4.3%	4.2%	4.1%
Property, plant & equipment	64.9%	62.0%	65.3%	66.5%	67.5%	68.6%	68.8%	68.7%
Intangibles	3.3%	3.1%	3.0%	2.8%	2.6%	2.4%	2.2%	2.0%
Other long-term assets	4.1%	4.4%	4.3%	4.2%	4.1%	4.0%	3.9%	3.8%
Non-Current Assets	**80.0%**	**77.0%**	**80.3%**	**81.5%**	**82.0%**	**82.7%**	**82.5%**	**82.0%**
Total Assets	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Current borrowings and other financial liabilities	0.9%	1.2%	1.6%	0.5%	0.9%	0.9%	1.4%	1.2%
Current trade and other payables	7.4%	7.3%	7.4%	7.1%	7.1%	7.0%	7.0%	6.9%
Current tax payable	2.1%	2.0%	2.1%	2.1%	2.1%	2.0%	2.0%	1.9%
Current provisions including post-retirement benefits	1.3%	1.2%	1.6%	1.6%	1.5%	1.5%	1.5%	1.4%
Liabilities of disposal groups held for sale	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Current Liabilities	**11.9%**	**11.9%**	**12.7%**	**11.4%**	**11.6%**	**11.5%**	**11.8%**	**11.5%**
Non-current borrowings and other financial liabilities	15.8%	14.1%	15.2%	15.1%	13.8%	12.6%	10.9%	10.0%
Non-current trade and other payables	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%
Non-current Tax payable	0.3%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%
Deferred tax liabilities	3.8%	4.0%	3.7%	3.9%	3.8%	3.8%	3.7%	3.6%
Non-current provisions including post-retirement benefits	14.0%	13.8%	15.6%	15.7%	15.5%	15.3%	15.2%	15.0%
Non-current Liabilities	**34.7%**	**33.3%**	**35.8%**	**36.0%**	**34.4%**	**32.9%**	**31.0%**	**29.8%**
Total Liabilities	**46.6%**	**45.2%**	**48.5%**	**47.3%**	**45.9%**	**44.4%**	**42.8%**	**41.3%**
Share capital Rio Tinto plc	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Share capital Rio Tinto Limited	4.3%	3.8%	3.9%	3.8%	3.7%	3.6%	3.5%	3.5%
Share premium account	4.5%	4.7%	4.9%	4.9%	4.7%	4.6%	4.5%	4.4%
Other reserves	12.8%	9.5%	10.5%	8.1%	6.1%	4.2%	2.3%	0.6%
Retained earnings	24.8%	29.7%	26.6%	30.7%	34.4%	38.2%	41.9%	45.5%
Equity attributable to owners of Rio Tinto	**46.7%**	**48.0%**	**46.2%**	**47.7%**	**49.2%**	**50.9%**	**52.5%**	**54.1%**
Attributable to non-controlling interests	6.7%	6.7%	5.4%	5.0%	4.9%	4.8%	4.6%	4.5%
Total Equity	**53.4%**	**54.8%**	**51.5%**	**52.7%**	**54.1%**	**55.6%**	**57.2%**	**58.7%**
Total Liabilities and Equity	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

In Millions of USD	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F
Consolidated Revenue	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Production Cost of Goods Sold	23.2%	26.2%	22.0%	21.9%	21.8%	21.8%	21.7%	21.6%
Gross Profit	**76.8%**	**73.8%**	**78.0%**	**78.1%**	**78.2%**	**78.2%**	**78.3%**	**78.4%**
Other Operating Income	2.5%	2.6%	1.8%	1.9%	1.9%	1.8%	1.8%	1.8%
Share of profit after tax of equity accounted units	0.8%	1.3%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Operating Expenses	37.0%	35.3%	34.3%	37.4%	36.6%	36.3%	36.0%	35.8%
EBITDA	**43.1%**	**42.3%**	**46.2%**	**43.4%**	**44.2%**	**44.5%**	**44.8%**	**45.0%**
Gain on Sale PP&E	0.1%	1.2%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Depreciation & Amortization	10.9%	9.9%	10.2%	11.1%	11.1%	11.3%	11.5%	11.5%
Impairment	2.0%	0.3%	8.1%	0.0%	0.0%	0.0%	0.0%	0.0%
EBIT	**30.3%**	**33.4%**	**27.9%**	**32.3%**	**33.1%**	**33.2%**	**33.3%**	**33.5%**
Finance Items	**-4.1%**	**-0.1%**	**-1.5%**	**-1.9%**	**-1.8%**	**-1.8%**	**-1.7%**	**-1.5%**
Net Exchange Gains/(Losses) on net external and intragroup debt balances	-1.5%	1.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Net (Losses)/Gains on Derivatives not qualifying for hedge accounting	0.1%	-0.1%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Finance Income	0.4%	0.6%	0.7%	0.6%	0.6%	0.5%	0.5%	0.5%
Finance Costs	-2.1%	-1.4%	-1.3%	-1.5%	-1.5%	-1.4%	-1.3%	-1.2%
Amortisation of Discount	-1.0%	-0.9%	-0.9%	-1.0%	-0.9%	-0.9%	-0.9%	-0.9%
Net Income Before Taxation	**26.2%**	**33.3%**	**26.4%**	**30.4%**	**31.3%**	**31.4%**	**31.6%**	**32.0%**
Taxation	9.9%	10.5%	9.6%	11.1%	11.4%	11.4%	11.5%	11.6%
Net Income After Taxation	**16.3%**	**22.8%**	**16.8%**	**19.4%**	**19.9%**	**20.0%**	**20.1%**	**20.4%**
Net Income from Discontinued Operations	5.9%	11.4%	-0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Net Income	**22.1%**	**34.2%**	**16.2%**	**19.4%**	**19.9%**	**20.0%**	**20.1%**	**20.4%**
-attributable to owners of Rio Tinto (net earnings)	21.9%	33.7%	18.6%	19.0%	19.5%	19.6%	19.7%	19.9%
-attributable to non-controlling interests	0.2%	0.7%	-2.4%	0.4%	0.4%	0.4%	0.4%	0.4%

Appendix 6: Forecasting Assumptions

General Assumptions	Unit	2019	2020F	2021F	2022F	2023F	2024F	Assumption
Global Inflation Rate			1.50	2.00	2.60	2.60	2.60	based on PwC Projections
Global GDP Growth	%	2.90	-3.03	5.80	3.45	3.45	3.45	IMF World Economic Outlook (April, 2020) for 2020F-21F; For 2022F-24F 5-year average 2015-19
Weighted average number of shares	m	1630.10	1617.90	1617.90	1617.90	1617.90	1617.90	Rio Tinto plc: 1,259.4m; Rio Tinto Limited: 370.7 m at the end of 2019; Share buyback program ended early 2020; No announcement for any change in number of shares

Iron Ore	Unit	2019	2020F	2021F	2022F	2023F	2024F	Assumption
Global Production Growth	%	-	0.20	0.20	0.20	0.20	0.20	Expected global growth according to Fitch forecast
Global Production	k tons	2,500,000	2,505,000	2,510,010	2,515,030	2,520,060	2,525,100	
Company Share	%	11.25	11.25	11.25	11.25	11.25	11.25	
Company Production	k tons	281,192	281,754	282,318	282,883	283,448	284,015	Koodaideri mine start end of 2021 to replace other depleted mines in Western Australia (expected capacity 43m tons a year but could be expanded to 70m tons)
Iron Ore Price	$/dmt	85.90	85.00	84.00	84.65	85.30	85.95	World Bank Commodities Price Forecasts (April, 2020)
Iron Ore Price Change	%		-1.05	-1.18	0.77	0.77	0.77	
Total Revenue	**US$m**	**24,075**	**23,870**	**23,637**	**23,866**	**24,098**	**24,332**	

Aluminum	Unit	2019	2020F	2021F	2022F	2023F	2024F	Assumption
Aluminium								
Global Production Growth	%	-	1.00	1.00	1.00	1.00	1.00	Expected global growth
Global Production	k tons	63,690	64,327	64,970	65,620	66,276	66,939	
Company Share	%	4.98	4.97	4.76	4.54	4.54	4.54	
Company Production Aluminum	k tons	3,171	3,200	3,091	2,981	3,010	3,041	For 2020F production guideline by the company; Tiwai Point Smelter (NZ) will close Aug 2021F(FY2019: 279k tons output Rio Tinto share); We assume half of the ouputof FY2019 in 2021F (140k tons) and nothing for 2022F-24F; For the rest of production we expect 1% higher production p.a. due to increased productivity and that Rio Tinto will be able to maintain its market share excluding Tiwai
Company Production Aluminum Change	%		0.91	-3.40	-3.57	1.00	1.00	
Aluminum Price	$/t	1,794.49	1,600.00	1,670.00	1,721.94	1,775.49	1,830.71	World Bank Commodities Price Forecasts (April, 2020)
Aluminum Price Change	%		-10.84	4.38	3.11	3.11	3.11	
Alumina								
Global Production Growth	%	-	1.00	1.00	1.00	1.00	1.00	Same growth as Aluminium market
Global Production	k tons	129,431	130,725	132,033	133,353	134,687	136,033	
Company Share	%	5.98	5.98	5.98	5.98	5.98	5.98	Maintaining ist market share
Company Production Alumina	k tons	7,744	7,821	7,900	7,979	8,058	8,139	Higher production due to increased productivity
Bauxite								
Global Production Growth	%	-	1.00	1.00	1.00	1.00	1.00	Same growth as Aluminium market
Global Production	m tons	400	404	408	412	416	420	
Company Share	%	13.78	14.14	14.14	14.14	14.14	14.14	Company share increasing; Closure of Chinese mines due to stiffer environmental regulation and crack-down on black market
Company Production Bauxite	m tons	55.11	57.13	57.70	58.28	58.86	59.45	non-managed Sangaredi mine (Guinea) Production ramp-up from 14 to 18.5m tons a year; Rio Tinto has the right to 45% of production (2.025m tons increase)
Company Production Bauxite	k tons	55,105	57,130	57,701	58,278	58,861	59,450	
Company Production Bauxite Change	%		3.67	1.00	1.00	1.00	1.00	Higher production due to increased productivity
Aluminum Part of Total Revenue	%	20.06	20.04	19.34	18.63	18.63	18.63	
Alumina Part of Total Revenue	%	21.67	21.68	21.87	22.06	22.06	22.06	
Bauxite Part of Total Revenue	%	58.27	58.28	58.79	59.31	59.31	59.31	
Total Revenue	**US$m**	**10,340**	**9,454**	**9,879**	**10,198**	**10,620**	**11,060**	

Copper	Unit	2019	2020F	2021F	2022F	2023F	2024F	Assumption
Global Production Growth	%	-	-3.03	5.80	3.45	3.45	3.45	Strong correlation between copper demand and world GDP; Wood Mackenzie study shows correlation of 0.99 between 1993-2013 .
Global Production	m tons	20.00	19.39	20.52	21.23	21.96	22.72	
Company Share	%	2.89	2.58	2.89	2.89	2.89	2.89	
Company Production (mined)	k tons	577.4	500	593	613	635	657	Production guidance lowered for 2020F due to different reasons for the mines, Kennecott mine expectation for higher grade mining in H1 2021F and higher output of the Oyu Tolgoi mine due to advanced mine development; Expactation that the company will capture its previously held market share in 2021F and onwards
Company Production (mined) Change	%	-	-13.40	18.60	3.45	3.45	3.45	
Company Production (refined)	k tons	259.6	155	260	260	260	260	Production guidance lowered for 2020F due to an earthquake at the US copper refinery and a consequent furnace rebuild and a planned 45 shutdown May/June for maintance which caused unexpected issues; Recovery to the FY2019 production expected from 2021F on;
Company Production (refined) Change	%	-	-40.29	67.74	0.00	0.00	0.00	
Copper Price	$/mt	6,010.15	5,200.00	5,500.00	5,649.37	5,802.79	5,960.39	World Bank Commodities Price Forecasts (April, 2020)
Copper Price Change	%	-	-13.48	5.77	2.72	2.72	2.72	
Mined Copper as part of Total Copper Output	%	68.98	76.34	69.52	70.23	70.94	71.63	
Refined Copper as part of Total Copper Output	%	31.02	23.66	30.48	29.77	29.06	28.37	The company does not disclose revenue by copper segment but by mine; We use output as an approximation
Total Revenue	**m$**	**5,181**	**3,508**	**4,832**	**5,082**	**5,347**	**5,626**	

Diamonds	Unit	2019	2020F	2021F	2022F	2023F	2024F	Assumption
Argyle	'000 cts	12,999	9,500	0	0	0	0	Lower grades; Expected closure in 4Q2020; Recoverable diamonds probable reserve
Diavik (60%)	'000 cts	4,031	3,628	3,265	2,939	2,645	2,380	Lower grades; Scheduled to close in 2025; 10% lower production annually
Total Production	**'000 cts**	**17,030**	**13,128**	**3,265**	**2,939**	**2,645**	**2,380**	
Price Change	%		-30	10	10	10	10	30% less revenue per Total Production in 2020F in comparison to FY2019 due to Covid-19 and its economic impact; 10% price increase anually afterwards due to recovery of the global economy and the supply cut by the closure of the Argyle mine
Total Revenue	**US$m**	**619**	**334**	**91**	**90**	**90**	**89**	
Total Revenue Copper & Diamonds	**US$m**	**5,800**	**3,842**	**4,923**	**5,173**	**5,436**	**5,715**	

Energy & Minerals	Unit	2019	2020F	2021F	2022F	2023F	2024F	Assumption
Rio Tinto Boron Mine								
Borates B2O3	k tons	520	536	552	568	585	603	3% CAGR market growth expected until end of 2023F and we assume the same growth level for 2020F
Boarates Total Revenue	US$m	593	611	629	648	667	687	Maintaining same price level
Iron Ore Company of Canada								
Iron ore concentrate & pellets	k tons	10,536	10,536	10,536	10,536	10,536	10,536	Expected global growth according to Fitch forecast
Iron ore concentrate & pellets Total Revenue	US$m	2,189	2,170	2,149	2,170	2,191	2,212	Price forecast as in iron ore
Rio Tinto Iron & Titanium								
Titanium dioxide	k tons	1,206	1,218	1,230	1,243	1,255	1,268	In FY2019 Improved Operational performance; Mid-Nov prod at RBM slowed down; Curtailed Beginning of December and restarted end of December; In Madagascar all 9 furnaces were running in 2019 but in SA only 3 out of 4; If the other one is used will depend on future market conditions; 1% Production Increase
Titanium dioxide Total Revenue	US$m	1,938	1,957	1,977	1,997	2,017	2,037	Maintaing same price level
Energy Resources of Australia Ltd. (68.4%)								
Uranium U3O8	k lbs	2,640.00	10.00	-	-	-	-	Rehabilitation of the mine begins end of 2020F; Recoverable Materials according to Annual Report 2019
Uranium U3O8 Production Change	%	-	-99.62	-	-	-	-	
Uranium Price	US$/lbs	25.91	26.12	28.28	-	-	-	IMF World Economic Outlook (April, 2020)
Uranium Price Change	%	-	0.81	8.26	-	-	-	
Uranium Total Revenue	US$m	375	0.26	-	-	-	-	
Dampier Salt								
Salt	k tons	5,422	5,688	5,966	6,259	6,565	6,887	company growth 4.9% CAGR the same as world market
Salt Total Revenue	US$m	271	284	298	313	328	344	Maintaing same price level
Energy & Minerals Total Revenue	**US$m**	**5,366**	**5,023**	**5,053**	**5,128**	**5,203**	**5,281**	
Total Revenue	**US$m**	**45,581**	**42,189**	**43,492**	**44,364**	**45,358**	**46,388**	
Share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales	US$m	-2,202	-2,046	-2,109	-2,152	-2,200	-2,250	
Consolidated Sales	**US$m**	**43,379**	**40,143**	**41,383**	**42,213**	**43,158**	**44,138**	

Balance Sheet	Unit	2020F	2021F	2022F	2023F	2024F	Assumption
Capex	US$m	6,000	7,000	7,000	6,500	6,500	Higher Investments in 2021F-22F company forecast to 2022F. We assume that the company will maintain the previous planned level for the rest of the forecasting period
Accounts receivable	%	7.01	7.01	7.01	7.01	7.01	Same percentage as in FY2019 based on Consolidated Revenue
Inventories	%	36.51	36.51	36.51	36.51	36.51	Same percentage as in FY2019 based on COGS
Other current assets	US$m	2,786	2,786	2,786	2,786	2,786	Same value of other current assets as in FY2019
Held for sale assets	US$m	0	0	0	0	0	No expected assets for sales
Non-Current Assets							
Goodwill	US$m	922	922	922	922	922	Same value of goodwill as in FY2019
Accounts receivable	%	3.98	3.98	3.98	3.98	3.98	Same percentage as in FY2019 in comparison to Consolidated Revenue
Inventories	%	1.47	1.47	1.47	1.47	1.47	Same percentage as in FY2019 in comparison to COGS
Long-term financial assets	US$m	3,971	3,971	3,971	3,971	3,971	Same value as in FY2019
Other long-term assets	US$m	3,742	3,742	3,742	3,742	3,742	Assume same level as in FY2019
Current Liabilities							
Current borrowings and other financial liabilities	US$m	435	822	874	1,302	1,200	Company´s projections from the financial liability analysis;
Current trade and other payables	%	26.69	26.69	26.69	26.69	26.69	Same percentage as in FY2019 based on COGS + Operating Expenses
Current tax payable	US$m	1,900	1,900	1,900	1,900	1,900	Based on 3-yr average
Current provisions including post-retirement benefits	US$m	1,399	1,399	1,399	1,399	1,399	Same value as in FY2019
Liabilities of disposal groups held for sale	US$m	0	0	0	0	0	No liabilities expected
Non-current Liabilities							
Non-current borrowings and other financial liabilities	US$m	13,432	12,610	11,736	10,434	9,780	
Non-current trade and other payables	%	3.27	3.27	3.27	3.27	3.27	Same percentage as in FY2019 based on COGS + Operating Expenses
Non-current Tax payable	US$m	329	329	329	329	329	Based on 3-yr average
Deferred tax liabilities	US$m	3,507	3,507	3,507	3,507	3,507	Based on 3-yr average
Non-current provisions including post-retirement benefits	US$m	13,904	14,104	14,304	14,504	14,704	By far the most part is for mine closure, restoration and environmental clean-up ($10,549M); We expect a net increase of $200m p.a. to account for the increasing costs of such projects in the future
Total Equity							
Share capital Rio Tinto plc	US$m	207	207	207	207	207	Share buy-back program concluded and no further programs expected
Share capital Rio Tinto Limited	US$m	3,373	3,373	3,373	3,373	3,373	Share buy-back program concluded and no further programs expected
Share premium account	US$m	4,313	4,313	4,313	4,313	4,313	No change in premium account expected
Attributable to non-controlling interests	US$m	4,432	4,432	4,432	4,432	4,432	No further changes expected
Retained earnings	%	50	50	50	50	50	

Income Statement	Unit	2020F	2021F	2022F	2023F	2024F	Assumption
Production Cost of Goods Sold Growth	%	21.86	21.81	21.75	21.70	21.64	Based on Total Revenue, same percentage as in FY2019 descreasing by 0.25% anually due to productivity improvements
Other Operating Income	US$m	773	773	773	773	773	Same values as in FY2019
Share of profit after tax of equity accounted units	US$m	301	301	301	301	301	Same values as in FY2019
Gain on Sale PP&E	US$m	0	0	0	0	0	We do not assume any sale of PP&E
Depreciation	%	7.54%	7.54%	7.54%	7.54%	7.54%	Same Percentage on PP&E as in FY2019 (D&A-$133m for Amortization) on PP&E
Amortization	US$m	133	133	133	133	133	Intangibe assets include customer contracts, power supply contracts and water rights (US$m 1,947) which are not subject to amortization but annual impairment tests. We do not assume any impairments in the future but that amortization stays at the same level (US$m 133) as the last 2yrs
Impairment	US$m	0	0	0	0	0	We do not assume any impairments
Net Exchange Gains/(Losses) on net external and intragroup debt balances	US$m	0	0	0	0	0	We do not assume any gains or losses
Net (Losses)/Gains on Derivatives not qualifying for hedge accounting	US$m	0	0	0	0	0	We do not assume any gains or losses
Finance Income	US$m	230	230	230	230	230	Based on 3-yr average
Share of equity accounted unit sales and intra-subsidiary/equity accounted unit sales	%	4.85	4.85	4.85	4.85	4.85	Based on Total Revenue, same percentage as in FY2019
Amortisation of Discount	US$m	384	384	384	384	384	Same values as in FY2019
Effective Tax Rate	%	36.35	36.35	36.35	36.35	36.35	Effective Tax Rate from FY2019
Net Income from Discontinued Operations	US$m	0	0	0	0	0	We do not assume any net income from discontinued operations
Attributable to non-controlling interests	%	2.07	2.07	2.07	2.07	2.07	Same values as in FY2018

Cash Flow Statement	Unit	2020F	2021F	2022F	2023F	2024F	Assumption
Dividends from equity accounted units	US$m	762	762	762	762	762	Based on 3-yr average
Other operating cash flow	US$m	(1,812)	(1,812)	(1,812)	(1,812)	(1,812)	Based on 3-yr average
Other Investments	US$m	(799)	(799)	(799)	(799)	(799)	Based on 3-yr average
Divestments	US$m	0	0	0	0	0	We do not expect any divestments
Dividends	%	50	50	50	50	50	Goal of 40%-60% average payout ratio s throught the the commodity cycle
Interest expenses	US$m	607	606	602	563	526	Company´s Projection + Cost of Debt for new bonds of 2.248%
Proceeds/(Repayment) of interest-bearing liabilities principal	US$m	723	171	665	741	1209	Company´s Projection
Issuance of new bonds	US$m	526	0	0	0	546	Refinancing of bonds due during the forecasting period
Lease principal payments	US$m	-349	-267	-157	-133	-93	Company´s Projection
Share buy-back	US$m	-196.6	0	0	0	0	The FY2019 share buy-back program ended end of Feb 2020F; We do not expect any new buy-back programs
Other financing cash flows	US$m	37	37	37	37	37	Based on 3-yr average
Effects of exchange rates on cash and cash equivalents	US$m	0	0	0	0	0	We do not expect any significant effects of the exchange rates

In Millions of USD	FY2017	FY2018	FY2019	2020F	2021F	2022F	2023F	2024F	Assumption
Operating Expenses	**14,816**	**14,304**	**14,794**	**15,001**	**15,146**	**15,319**	**15,546**	**15,780**	
Employment Costs	4,765	4,728	4,522	4,590	4,656	4,727	4,850	4,976	Increase of Employment Costs by the global inflation rate; Due to closure of Tiwai smelter (NZ) deduction of one third of employee expenses for FY2019 ($74.8m) for 2021F and total reduction for 2022F-24F
Shipping and Other Freight Costs	2,338	2,580	2,257	2,262	2,266	2,271	2,275	2,280	Increase of 0.2% in Iron Ore Shipments
Decrease/(Increase) in finished goods and work in progress	(82)	(186)	42	0	0	0	0	0	We assume that the company plans to sell all of their produce over the forecasting period and that in total decrease and increase will be balanced
Royalties	2,228	2,177	2,501	2,501	2,501	2,501	2,501	2,501	We assume the same level of Royalties as in FY2019
Amounts charged by equity accounted units	980	1,200	1,136	1,105	1,105	1,105	1,105	1,105	We assume a 3-yr average
Net foreign exchange (gain)/losses	61	(56)	(52)	0	0	0	0	0	We do not assume any gains or losses due to foreign exchanges
Other external costs	3,967	3,184	3,627	3,681	3,755	3,853	3,953	4,056	We assume a growth in other external costs by the global inflation rate
Provisions (including exchange differences on provisions)	527	1,011	753	764	764	764	764	764	We assume a 3-yr average
Research & development	58	45	45	49	49	49	49	49	We assume a 3-yr average
Costs included above qualifying for capitalisation	(486)	(589)	(651)	(575)	(575)	(575)	(575)	(575)	We assume a 3-yr average
Exploration and evaluation costs	445	488	624	624	624	624	624	624	We assume the same as in FY2019
(Profit)/loss relating to interests in undeveloped projects	15	(278)	(10)	0	0	0	0	0	We do not assume any profits or losses

Appendix 7: Valuation Method Assumptions

The main valuation method to calculate the target price of Rio Tinto is the Discounted Cash Flow (DCF) model. Besides the DCF model two alternative models were used: The Dividend Discount Model (DDM) and for a relative valuation method the market multiples approach.

DCF: for the DCF model the Free Cash Flow to the Firm (FCFF) approach was chosen in order to focus on the whole company with equity and debt investors instead of only equity holder as it is the case in the Free Cash Flow to Equity (FCFE) approach. There exist several slightly different calculations for the FCFF but we use the most common one:

$$FCFF = EBIT \times (1 - Tax\ Rate) + D\&A + CapEx - \Delta NWC$$

To discount the FCFF the Weighted Average Cost of Capital (WACC) under consideration of taxes was used:

$$WACC = K_e \times \frac{E}{V} + K_d \times \frac{D}{V} \times (1 - Tax\ Rate)$$

Where:

- Cost of Equity: To estimate Ke we used the Capital Asset Pricing Model (CAPM):

$$K_e = R_f + ß \times (R_m - R_f) + IRP$$

- Risk-free Rate: As the US-Dollar is the most important currency for Rio Tinto as almost all of its sales is priced in this currency as well as debt is issued in US-Dollars we used the 10-year US Treasury note.
- Beta: We used a regression for the last 5 years on monthly basis against the FTSE 100 adjusted for the blume method.
- Market Risk Premium: Because the HQ of Rio Tinto Ltd is in London we used the MRP for the UK from NYU Stern.
- Industry Risk Premium: The mining industry is a cyclical business. Therefore, we used an additional IRP to reflect the higher risk.
- Cost of Debt: For the Kd we used the YTM of an outstanding bond with approximately 10-year time to maturity.

DDM: For the Dividend Discount Model we used Gordon Growth Method (GGM) because Rio Tinto is a mature company with a long history of dividend payments and high payment ratios:

$$P = \frac{D}{r - g}$$

Where:

- Dividend (D): We use the dividend payment of 2020F as it is the last value of our forecasted period.
- Rate of Return (r): We use as r the Cost of Equity from the DCF valuation because we think that is the expectation of equity investors.
- Rate of Growth (g): We use the forecasted global GDP growth, as we think it will align with the long-term growth of the company.

Market Multiple: For the Market Multiple we first selected companies similar to Rio Tinto in terms of market capitalization, investor type as well as sales and international diversification to have a peer group and afterwards compared the Enterprise Value to Sales, EBITDA and CFO to calculate a target price.

Appendix 8: Discounted Cash Flow Analysis

DCF Analysis	2020F	2021F	2022F	2023F	2024F	Perpetuity
Cost of Equity						
Risk-Free Rate (Rf)	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%
Industry Risk Premium (IRP)	0.98%	0.98%	0.98%	0.98%	0.98%	0.98%
Market Risk Premium (MRP)	5.96%	5.96%	5.96%	5.96%	5.96%	5.96%
Beta (ß)	0.62	0.62	0.62	0.62	0.62	0.62
Cost of Equity (Ke)	5.36%	5.36%	5.36%	5.36%	5.36%	5.36%
Cost of Debt						
Cost of Debt	2.248%	2.248%	2.248%	2.248%	2.248%	2.248%
Effective Tax Rate	36.35%	36.35%	36.35%	36.35%	36.35%	36.35%
After-Tax Cost of Debt	1.43%	1.43%	1.43%	1.43%	1.43%	1.43%
WACC						
Weight of Equity	77.13%	78.60%	80.44%	82.29%	83.93%	83.93%
Weight of Debt	22.87%	21.40%	19.56%	17.71%	16.07%	16.07%
WACC	4.46%	4.52%	4.59%	4.66%	4.72%	4.72%

In Millions of USD	2020F	2021F	2022F	2023F	2024F	Terminal
EBIT (1-t)	8,262	8,721	8,916	9,144	9,419	9,419
D&A	4,460	4,586	4,778	4,956	5,083	5,083
Net Increase in NWC	(363)	73	27	23	25	25
Capex	6,000	7,000	7,000	6,500	6,500	6,500
FCFF	7,085	6,234	6,667	7,576	7,976	7,976
FCFF, discounted			**6,246**	**6,634**	**6,515**	

Enterprise Value	
Terminal Growth Rate	0.00%
Perpetuity WACC	6.98%
Terminal Value ($m)	114,346
PV of Terminal Value ($m)	87,314
NPV of FCFF ($m)	19,395
Enterprise Value ($m)	**106,709**

Price Target	
Net Debt ($m)	6,031
Value of Equity ($m)	100,678
Shares Outstanding (m)	1,618
Price per Share ($)	**62.23**

Appendix 9: Dividend Discount Model Analysis

Dividend Discount Model Assumptions		
Cost of Equity (Ke)	8.04%	Same as used in the DCF method
Dividend Growth Rate	2.62%	Global GDP growth

In Millions of USD	2020F	2021F	2022F	2023F	2024F
Net Income	7,778	8,237	8,435	8,688	8,986
Dividends	3,808	4,033	4,130	4,254	4,400
Shares Outstanding (m)	1,618	1,618	1,618	1,618	1,618
Earnings per Share (EPS)	4.81	5.09	5.21	5.37	5.55
Dividend per Share (DPS)	2.35	2.49	2.55	2.63	2.72
PV Dividend per Share			2.36	2.25	2.16
Sum PV Dividend per Share					**6.77**
Terminal Price					50.25
PV Terminal					36.88
Target Price					**43.65**

Appendix 10: Market Multiples Analysis

Enterprise	Market Cap	Free Float	Investors	Diversified Portfolio					International Diversification				Peer
				Iron Ore	Aluminum	Copper & Diamonds	Energy & Minerals	Others	Asia-Pacific	Americas	Europe	Others	
BHP	136.42	99.20	Private	38.96	0	24.47	0	36.57	88.06	7.01	4.23	0.7	Yes
Rio Tinto	**101.40**	**99.00**	**Private**	**53.07**	**22.79**	**12.82**	**11.32**	**0**	**72.5**	**17.5**	**6.6**	**3.4**	
China Shenhua Energy	63.55	26.96	State	0	0	0	0	100	98.8	0	0	1.2	No
Vale	59.71	70.76	State/ Private	62.13	0	5.28	0	32.59	64.3	16.1	13.8	5.8	Yes
Newmont Corporation	55.53	99.7	Private	0	0	4.75	0	95.25	10.3	2.75	85.25	1.7	No
Barrick Gold	51.87	97.75	Private	0	0	4.54	0	95.46	na	na	na	na	No
Fortescue	38.75	49.68	Private	99.98	0	0	0	0.02	92.93	0	0	7.07	No
Anglo American	33.62	80.22	Private	22.62	0	34.97	0	42.41	68.39	5.87	19.37	6.37	Yes
Franco-Nevada	30.62	99.32	Private	0	0	0	0	100	0	84.93	0	15.07	No
Glencore	30.29	74.17	Private	0	0	36.68	0	63.32	43.25	17.72	35.21	3.82	No

Peer Group Multiples 2020F			
Multiple	**EV/SALES**	**EV/EBITDA**	**EV/CFO**
BHP	3.26	6.51	8.3
Vale	1.92	12.29	8.22
Anglo American	1.02	3.2	5.48
Median	1.92	6.51	8.22
Mean	2.07	7.33	7.33
Rio Tinto	2.54	6.71	7.51
Dif. using median	32.29%	3.07%	-8.64%
Dif. using mean	22.90%	-8.50%	2.41%
Average Mean Dif.		5.60%	

Multiple Valuation			
Enterprise Value Multiple	**EV/SALES**	**EV/EBITDA**	**EV/CFO**
Multiple	2.07	7.33	7.33
Enterprise Value Multiple (US$m)	**89,208**	**146,373**	**109,355**
Net Debt (US$m)	6,031	6,031	6,031
Equity (US$m)	83,177	140,342	103,324
Target Price (US$)	51.41	86.74	63.86
Average Target Price (US$)		**67.34**	

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Associations

Bureau of International Recycling

World Steel Organization

International Aluminum Institute

Company Reports and Presentations

Alcoa

Fortescue

BHP Biliton

Rio Tinto

Norsk Hydro

Vale

Rusal

Consultancies

CRU

Ducker Worldwide

Wood Mackenzie

Data Provider

CSIMarket

Investopedia

Reuters

Statista

Nasdaq

Yahoo Finance

Databases

IMF World Economic Outlook

World Bank Commodity Markets Outlook

Institutions

European Commission

International Agency for Energy

U.S. Geological Survey

NYU Stern

Abbreviations

ADR	American Depositary Receipts
AGM	Annual General Meeting
ASX	Australian Stock Exchange
Bn	Billion
Capex	Capital Expenditure
CAGR	Compound Annual Growth Rate
CAPM	Capital Asset Pricing Model
CFF	Cash Flow from Financing Activities
CFI	Cash Flow from Investing
CFO	Cash Flow from Operations
COGS	Cost of Goods Sold
DCF	Discounted Cash Flow
DDM	Dividend Discount Model
DMT	Dry Metric Ton
D&A	Depreciations & Amortizations
EBIT	Earnings before Interest and Taxes
EBITDA	Earnings before Interest, Taxes and D&A
EV	Enterprise Value
F	Forecast
FCFF	Free Cash-Flow to the Firm
FY	Fiscal Year
G	Growth Rate
GDP	Gross Domestic Product
GGM	Gordon Growth Model
Kd	Cost of Debt
Ke	Cost of Equity
LTIP	Long-Term Incentive Plan
NED	Non-Executive Director

NWC	Net Working Capital
Rf	Risk Free Rate
ROA	Return on Assets
ROE	Return on Equity
ROCE	Return on Capital Employed
STIP	Short-Term Incentive Plan
WMT	Wet Metric Ton
YE	Year End
YTM	Yield to Maturity

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Recommendation System

Level of Risk	SELL	REDUCE	HOLD	BUY
High Risk	<-10%	>-10% & <30%	>15% & <30%	>30%
Medium Risk	<-10%	>-10% & <10%	>10% & <20%	>20%
Low Risk	<-10%	>-10% & <5%	>5% & <15%	>15%