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Financial determinants of the value of exploration companies listed on the Australian Securities Exchange in the context of the national raw materials policy

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Abstract
Stock price is the most frequently cited financial parameter forming the basis for the valuation of stock exchange listed companies. It is supposed to reflect the market value of the company – however, is such a correlation applicable in the case of exploration companies, peculiar in terms of the huge expenditure related to capital outlays and generated as a consequence of revenues and costs? The analysis and research conducted were intended to identify factors that influence the market value of junior mining companies. The first part of the article dealt with the influence of political instruments assisting exploration entities on their participation in financing through the listing of stocks on the Australian Securities Exchange (ASX). Classifying companies in terms of their market capitalisation, the authors carried out a market analysis, assisted by selected methods of technical analysis, the aim of which was to find a correlation between the prices of stocks and the market value added, understood as a part of the market value. The final part of the study includes a statistical analysis using the multiple regression method to identify the factors (drivers) of value, which are statistically considered in the process of creation of the market value of junior companies. As a result, they obtained mathematical correlations describing the impact of the identified variables on the market value of exploration companies.

Keywords
value drivers, value management, company valuation, junior mining, australian market, raw materials economy, raw materials policy, statistical model

Introduction

The operations of mining exploration companies have evolved over the years with the development of the business models of enterprises that would fit the specifics of implementing projects of this type. Financial risk in a national raw materials policy arises from market volatility, regulatory changes, and geopolitical factors that can impact the stability and profitability of resource extraction. Mining exploration companies face additional operational risks due to uncertain resource estimates, high upfront investment costs, long development timelines and quality (Zimon, 2016). This industry is an economic sector with different meanings for today's anthropogenic society. On the one hand, it provides the dispersal of local resources and supports short and long-term prosperity as well as various economic systems; on the other hand, it generates socio-economic disparities and disturbs the environment (Pavolová, 2022, Šimková 2023). Since the first junior mining companies were listed in 1945, the share of exploration companies on stock markets increased to more than 3000 entities worldwide (Hughes, 2021). The increase in the share of companies listed on stock markets has also attracted the interest of investors who, despite the high risk involved in the investment, place their capital in exploration projects. Such conduct of companies in the process of raising capital, especially at the initial stages of exploration projects, has been linked to the fact that they were unable to make use of debt and loan capital. It has therefore become the norm that the operating model of junior mining companies is based on funding from external but own sources – which may be institutional investors or private companies that are industry investors. There has been a particular rise in the interest in stocks of this type in the markets of countries that favour this type of activity and have created mechanisms at the macroeconomic level to support and develop the resource base and mining – in this case, the countries in question being Australia and Canada (Kustra et al., 2021; Zhu et al., 2020).Australia is one of particularly friendly countries that support exploration work but also rely on mining to build their gross domestic product (GDP). Australia mines nineteen useful types of minerals in 350 active mines (Geoscience Australia, 2022). Australia's natural resources, represented in Figure 1, attract investors who hope for high rates of return. At the same time, intervention from state authorities is required to ensure the priority of own interests, treating mineral resources as a common good in the long run, as the mining sector accounts for 14.6% of Australia's total GDP (Reserve Bank of Australia, 2023).This approach to the value of mining projects has resulted in a legal framework intended to improve the comfort of exploration operations – thus reducing the level of risk resting with entrepreneurs. At the same time, the Australian government has been making efforts to make the Australian Securities Exchange (ASX) become a global platform for materialising the value of enterprises in the mining sector – encouraging enterprises from around the world to list company stocks on its stock markets (Australian Securities Exchange, 2019, 2012; Cunsolo, 2020). The presence of junior mining companies on the stock market is also an indication of how expensive exploration work is at the initial stage (Bustillo Revuelta, 2018). At the same time, the valuation of such a specific type of activity is a recurring theme in research articles (Bell and Guj, 2012; Friedrich-W et al., 2008; Iddon et al., 2015; Klossek and Klossek, 2014; Kreuzer et al., 2007). The correlation between stock price and the market value of companies has been the subject of numerous analyses, which resulted in the isolation of factors determining the value of exploration entities listed on the ASX and in the formulation of precise conclusions regarding the impact of individual parameters on value.

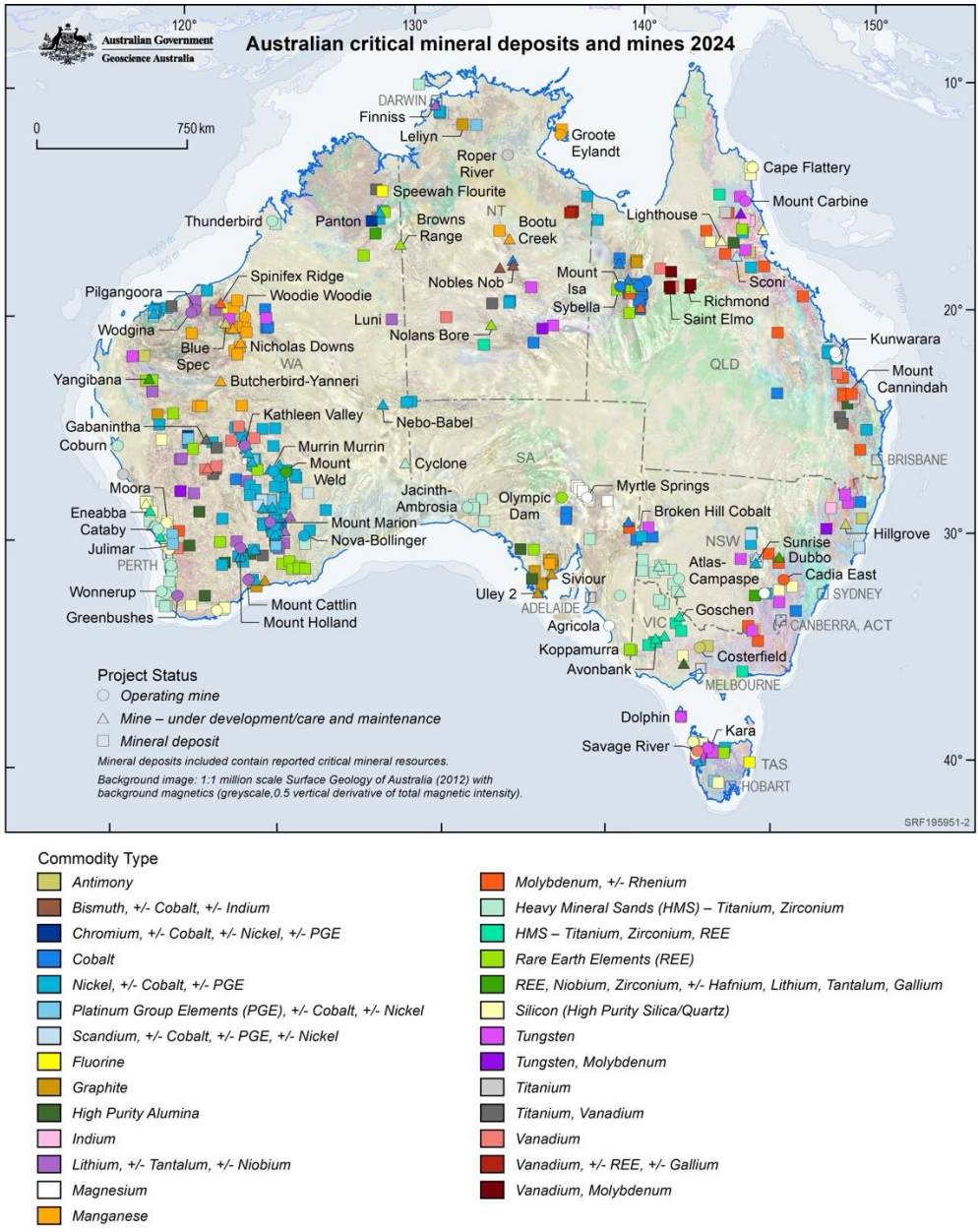

Fig.1 Map of Australia's critical mineral mines and deposits 2023 (Colclough, Pheeney 2024)

Research methodology

The first stage of the research involved the analysis of literature, including academic publications and government materials, describing the percentage share of the Australian junior mining companies market in the global market of companies engaged in the exploration of new deposits.

Analysis of political conditions and stock prices in selected market capitalisation segments

In the next step, companies were divided according to their market capitalisation. The division into segments with low, medium, and high capitalisation provided the basis for the analysis of companies in terms of stock prices. Five companies with the highest capitalisation in a given segment were selected to examine the companies' stock prices. Selected elements of technical analysis, such as Bollinger Bands®, Moving Average Convergence/Divergence (MACD), moving average method using the Relative Strength Index (RSI) signal and momentum indicator (Jiménez-Preciado et al., 2021; Srushti Dongrey, 2022). Bollinger Bands® is a technical analysis method that allows for the determination of price channels in time and signals too high levels of stock selling and buying (Chen et al., 2022; Pinakin and Manubhai, 2015). The calculation of channel values involves

the calculation of the upper and lower limits, taking into account the typical price of a stock and the number of days in the period examined.

The correlations were described with equations 1 and 2:

$$Upper\ Band = MA\ (TP, n) + m * \sigma\ [TP, n] \quad (1)$$

$$Lower\ Band = MA\ (TP, n) - m * \sigma\ [TP, n] \quad (2)$$

where: *MA* – moving average, *TP* – typical price of stocks calculated as the arithmetical mean of the closing price, the highest and the lowest price, *n* – number of days in the period examined, *m* – value of the standard deviation, $\sigma[TP,n]$ –standard deviation during the last *n* periods *TP*.

Another technical analysis tool applied is the Moving Average Convergence/Divergence method, developed in the 1970s, which allows for the identification of moving averages by converting two trend-tracking indicators - moving averages - into an oscillator, by subtracting the longer moving average from the shorter moving average. The MACD line is a 12-day exponential moving average (EMA) reduced by the 26-day EMA value. Closing prices are used for these moving averages. The 9-day EMA of the MACD line is plotted to act as a line identifying possible returns. The MACD fluctuates above and below the zero line when the moving averages converge, intersect, and diverge. Investors can look for intersections of signal lines, intersections of midlines, and divergences, to generate signals. The MACD line can be expressed by equation 3:

$$MACD = 12\text{-period EMA} - 26\text{-period EMA} \quad (3)$$

Where the *EMA* is a type of moving average (*MA*) that puts more weight on the most recent data points. The set of technical indicators used in the market analysis is completed by the RSI momentum indicator, which makes it possible to identify the volume of stock buying and selling in time. The RSI measures the volatility and magnitude of the direction of stock price movement. The value of the momentum is the rate at which the stock price rises or falls. Stocks that saw greater positive changes have a higher RSI, while stocks that saw greater negative changes have a lower RSI. The RSI is measured on a 0 to 100 scale, with the low level being 30 and the high level being 70, and can be expressed by equation 4:

$$RSIn = 100 - (100/1+(Previous\ average\ gain * 13 + Current\ gain)/Previous\ average\ loss * 13 + Current\ loss)) \quad (4)$$

Investors can use RSI to predict the behaviour of security prices. It can help investors confirm trends and trend reversals. It may indicate that securities have been overbought or oversold. It can provide short-term investors with buy and sell signals. It is a technical indicator that can be used with other indicators to support trading strategies.

Shareholder expectations matrix for the leading junior mining companies

The shareholder expectations matrix methodology in relation to market value creation was proposed by Dobbs and Koller in 2005 (Dobbs and Koller, 2005). It aims to compensate for the shortcomings of the Total Shareholder Return (TSR) measure by complementing stock market performance with the dynamics of value creation in the period examined. The examination of dynamics is based on the link between TSR, expressed by equation 5, and the Market Value to Capital Ratio (MVCR), expressed by equation 6.

$$Total\ Shareholder\ Return\ (TSR) = [(Current\ Price - Purchase\ Price) + Dividends]/\ Purchase\ Price \quad (5)$$

$$Market\ Value\ to\ Capital\ Ratio\ (MVCR) = Market\ capitalisation\ /\ (Cash + Working\ Capital\ Requirements + Net\ Tangible\ Assets) \quad (6)$$

Median TSR values were used for the y-axis and median MVCR values were used for the x-axis in the construction of the expectation matrix. The intersection of these points is the origin of the coordinate system and is situated at various points, depending on the segment examined. The positions of individual companies on the matrix not only reflect their current situation, but also indicate the potential for future over- or undervaluation relative to the median for a given market. In this way, analysis of the expectations matrix helps to identify companies that may be more valuable in the future, as well as those that may be overvalued.

A company can fall into one of four positions on the matrix*:*

- Quadrant 1 (Q1) is where both TSR and MVCR are above the median. Quadrant 1 contains companies with high levels of return and high market valuations associated with potential project continuation prospects.
- Quadrant 2 (Q2) is the range where only the TSR is above the median. Quadrant 2 contains companies that are both high yielding and undervalued - companies that have delivered high yields with low market expectations.
- Quadrant 3 (Q3) is where both TSR and MVCR are below the median. Quadrant 3 contains companies with low returns and low equity ratios - indicating a lack of prospects, which is reflected in low shareholder returns.
- Quadrant 4 (Q4) is where only the MVCR is above the median. Quadrant 4 contains companies that are not yet generating returns but have potential - they are overvalued but not yet generating shareholder value.

Analysis of the market value added (MVA)

Market value, expressed by equation 7, was defined in the paper by Platt and Demirkan as the sum of the value of market capitalisation and market value of debt adjusted for the level of cash (Platt et al., 2010).

$$Enterprise\ Value = Market\ capitalisation + Market\ value\ of\ debt - Cash \tag{7}$$

This measure is used as an alternative to ordinary market capitalisation. The value of the enterprise expressed in the above manner – based on market capitalisation, also takes into account debt and adjustment for cash, thus being an adjusted determination of the value of a company, taking into account the party financing the company's investments.

$$Market\ capitalisation = Shares\ Outstanding * Stock\ Price \tag{8}$$

The level of market capitalisation is determined by equation 8, which is the product of the stock price and the number of stocks on the market – including traded stocks held by institutional investors, managers, and insiders (Kuvshinov and Zimmermann, 2021). Unlike the market value, book value, expressed by equation 9, is based on the difference between the total value of assets and debt (Ohlson, 1995).

$$Book\ Value\ of\ Equity = Total\ Assets - Total\ Liabilities \tag{9}$$

Book value, or the value of a company as presented in the balance sheet, is a measure used, above all, to determine the ex post value of assets or to check the extent in which a given company is undervalued or overvalued in relation to the current market value. Book value reflects the nominal value of equity. The excess capitalisation value reflecting the market value of equity above the book value is called the market value added, expressed by equation 10.

$$Market\ Value\ Added\ (MVA) = Market\ capitalisation - Book\ Value\ of\ Equity \tag{10}$$

This indicator is calculated as the difference between the total market value of a company's stocks and the value of equity recorded on the balance sheet and defined as book value (Nugroho, 2018). A positive MVA level indicates an overvaluation of the market value over book value and very often serves as the basis for the determination of the surplus emerging from the market. This indicator reevaluates the value on the basis of off-balance sheet factors related to intangible capital.

Identification of factors influencing the EV value using the multiple regression method

Value creation indicators are a set of drivers that describe relations between elements of a financial statement. It should be noted that they can be identified in the operating, investing, and financing areas. In the operating area, we talk about the operating profit, hereinafter referred to as Earnings Before Interest and Taxes (EBIT) and arising from the correlation between accounts receivable and Working Capital Requirements (WCR) accounts payable. EBIT is a component of the profit and loss statement, which is calculated by subtracting all operating expenses from sales revenue. It is often referred to as operating income and it is also used to calculate the operating margin. Meanwhile, the net working capital requirement, described by equation 11, indicates the level of funds needed to cover costs, operating expenses, and debt repayments.

The WCR depends on the sum of inventory levels and accounts receivable, reduced by accounts payable (Barros et al., 2021).

$$\textit{Working Capital Requirements (WCR)} = \textit{Inventory} + \textit{Accounts receivable} - \textit{Accounts payable} \quad (11)$$

The measure of value creation in the investment area is Capex, which stands for the value of capital expenditures. Equation 12 presents the method of calculating the level of capital expenditures, which include investments in new real estate, land, machinery, products, and technologies (Hamidi et al., 2013).

$$\textit{Capital Expenditures (Capex)} = \textit{PP\&E (current)} - \textit{PP\&E (prior)} + \textit{Depreciation} \quad (12)$$

The measure of value creation in the financing area is the cost of equity, described by the CAPM model, and the effective tax rate. The CAPM model, expressed by equation 13, describes the correlation between the expected return and risk (Villadsen et al., 2017). It is used to calculate the weighted average cost of capital, where the CAPM refers to the cost of equity, where R_a is the level of expected profit, R_f is the risk-free rate, β is a coefficient determining the level of correlation of stock prices in relation to the stock market, while R_m is the expected market return. The difference between the expected return from the market and the risk-free rate is called the market premium. In the case of Australian Securities Exchange, S&P ASX 200 was used to calculate the market premium.

$$R_a = R_f + ß(R_m - R_f) \quad (13)$$

The level of the effective tax rate was calculated according to equation 14 and it is the ratio of pre-tax profits to after-tax profits (Aronmwan and Okaiwele, 2020).

$$\textit{Effective Tax} = \textit{Income Taxes} / \textit{Income before Tax} \quad (14)$$

In the statistical part, the multiple regression method was used, which allowed for the extraction of statistically insignificant parameters (Ganesh, 2010). The remaining parameters are part of the equation of multiple variables, which takes the form of equation 15.

$$y_i = ß_0 + ß_1 x_{i1} + ß_2 x_{i2} + \ldots ß_p x_{ip} + \varepsilon_i \quad (15)$$

In the case of the analysis performed, y_i is the value of the dependent variable – the market value of exploration companies listed on the Australian Securities Exchange, ε_i is the intercept, while $ß_p x_{ip}$ is the value of the independent variable.

Determinants of the raw materials policy concerning exploration companies in Australia

In 2019, in a statement on natural resources, Minister for Resources and Minister for Northern Australia Matthew Canavan outlined an updated vision for the resources strategy, supporting activities linked to the exploration of mineral resources (Department of Industry & Innovation and Science, 2019). According to the adopted policy, support for junior mining companies is dedicated especially to enterprises whose exploration resources are located in Australia (Australian Trade and Investment Commission, 2022; Senior et al., 2022) According to the adopted strategy, the government has identified the following goals to be achieved:

- Expanding the scope of the "Exploring for the Future" programme and extending it by four years. Its development is aimed at discovering the potential of the southern part of the continent and covering offshore areas with the view to obtaining access to new resources (ACIL Allen Consulting, 2019).
- Expanding cooperation with industry through the Australian Bureau of Statistics (ABS) to identify opportunities to expand research on the exploration and mining of minerals. The proposed expansion aims to improve the quality of information collected on exploration so that it better reflects current exploration activities.
- Cooperation with industry, state and territory governments, and local communities to promote new mining basins and provinces. Its objective is to unify policies, provide information and investment services, and develop a common vision for strategic infrastructure.
- The cooperation with the Northern Territory to accelerate the development of the Beetaloo Basin as a potentially world-class new gas province, and to help maximise the value of the oil industry for the Northern Territory and the Australian economy.

- Exploring, in consultation with the sector, the long-term opportunities to improve the management framework for the rights to exploit oil deposits. The improvements will aim to provide transparency on offshore gas reserves, accelerate the development of offshore resources, and streamline administration processes.
- Examining the rules for dealing with cases when an enterprise is not meeting its obligations under the exploration work programme. This will ensure a transparent, impartial, and consistent approach aimed at encouraging the holders of legal titles to fulfil their exploration obligations, and, in the event of a company's failure to meet its obligations, provision has been made for the reinvestment of expenditures in other activities supporting exploration and resource management.

The raw materials policy also covers Australian exploration entities whose resources are not located on the Australian continent. As part of bilateral cooperation between Australia and Africa, many companies with resources on the African continent are listed on the ASX. The value of Australian investments in Africa is estimated to be about 30bn dollars, which is equivalent to the combined investments in Korea, India, and Thailand (Advisory Group on Australia-Africa Relations (AGAAR), 2016). Most of these are in mining, with more than 200 companies listed on ASX conducting more than 700 projects in 35 countries (Advisory Group on Australia-Africa Relations (AGAAR), 2016). Africa is the largest single market for Australian mining, equipment, technology, and services (METS) companies outside of Australia. In 2015, Minister of Foreign Affairs Julie Bishop MP set up the Advisory Group on Australia and Africa Relations (AGAAR) to provide the government with advice on the advancement and diversification of the expanding relations between Australia and Africa. Members of the group were selected from across the social spectrum - business, academia, government, and community (Advisory Group on Australia-Africa Relations (AGAAR), 2016). As a result, the government is continuously exploring ways to consolidate and grow the role of Australian companies in strategic sectors that have been at the forefront of trade and investment activities:

- exploration and mining of minerals and oil/gas
- processing of minerals and oil;
- production of mining equipment, technology, and services (METS)

In addition to strategic investments in infrastructure and multifaceted international cooperation, Australian policy has a third very important pillar related to supporting local, minor junior miners. In 2018, the Australian government launched the Junior Minerals Exploration Incentive (JMEI) to provide a tax incentive to exploration companies and to encourage them to invest and take risks. On 5 May 2021, the Australian government announced that it would invest 100 million dollars in four years to extend the JMEI until the end of June 2025. JMEI allows eligible companies to generate and issue tax credits by forgoing a part of tax losses from expenses dedicated to greenfield mineral exploration, which can subsequently be distributed to eligible shareholders. Tax credits can only be generated for new stocks issued in a given income year. Shareholders who are Australian residents and who have been granted tax relief are entitled to receive a refundable tax deduction or additional franking credits (paid with dividends against the corporation tax that has already been paid by the Australian company). The losses carried forward by the issuing company will be reduced to reflect the amount of credits created (Australian Taxation Office, 2021).

ASX as a valuation platform for exploration companies and a source for capital raising

The value of exploration companies is monetised through listings on the ASX. The developed system of support for exploration companies and a transparent raw materials policy results in the Australian junior mining companies market making up 23.8% of exploration companies listed on all stock markets in the world. The value of market capitalisation provided the basis for creating the classification of companies represented in Figure 2. The first segment comprises companies with low market capitalisation, the value of which does not exceed A$20 million. 136 companies were identified in this segment, with a total value of A$1.61 billion, and an average total shareholder return of 56%. The second segment comprises companies in the range of A$20mln to A$100 million. 214 companies were identified in this segment.

The total market value in this segment amounts to A$10.23 billion, while the average total shareholder return amounts to 149%. The third segment comprises companies worth more than A$100 million. The segment comprises 196 companies with the total value of A$312 billion and rate of return of 133%. For each of the segments, stock price analysis with selected technical analysis methods was carried out, along with statistical analysis, to identify parameters that influence the market value of junior mining companies. The analysis was conducted on the basis of financial data for the period of three years between 2019 and 2021, downloaded using an API from Twelve Data.

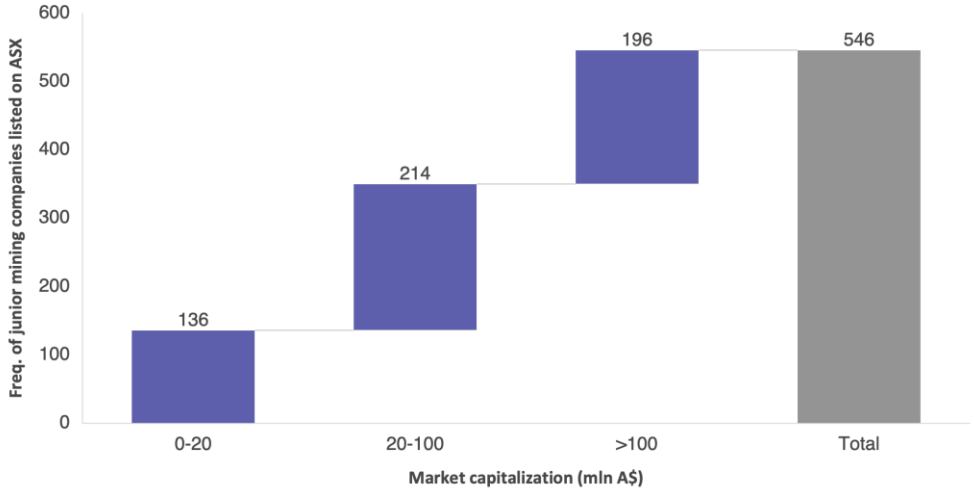

Fig. 2 Classification of exploration companies based on market capitalisation value
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

For junior mining companies classified in the low market capitalisation segment, the period examined (January 2019 – December 2021) ended at an average level of less than A$0.15 per share. Special attention should be paid to companies with a listing start date of less than one year – these are the leaders of this segment in terms of stock price value; Firebird Metals (ASX:FRB) and Akora Resources (ASX:AKO), which began listing in early 2021, and sustained a downward trend, despite initial enthusiasm. Price channels for Firebird and Akora companies, determined using Bollinger Bands®, recorded the greatest width compared to the remaining leaders of the segment, whose price range was represented in Figure 3. This reflects the initial investor interest in their operations and the gradual stabilising of the price at progressively lower values. Akora was analyzed in detail, with its technical analysis shown in Figure 4.

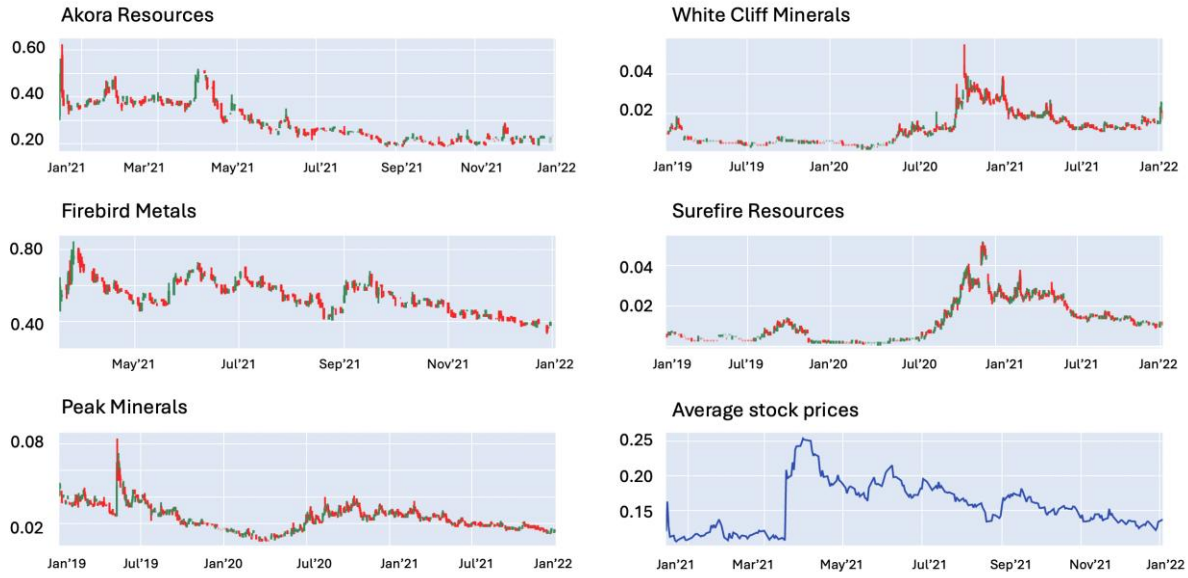

Fig. 3 Analysis of stock prices of exploration companies for the low market capitalisation segment – Bollinger Bands® with average stock prices for the segment in the period examined (January 2021 – December 2021)
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

Akora Resources Limited is engaged in the exploration and development of iron ore projects in Madagascar. The flagship project is Bekisopa, which consists of three granted exploration permits and one granted small-scale mining permit, covering 93.5 km^2, located in south-central Madagascar. The company was formerly known as Indian Pacific Resources Limited. The company was established in 2009 and is based in Carlton North, Australia. Akora Resources half its value in the twelve month period from the peak of A$0.56 noted in December 2020 to A$0.24 noted on 31 December 2021. The sharpest drop in the stock price value occurred in April 2021. It was also the moment in which the MACD line and the signal line intersected, which was a sign of change for investors

and a signal for a change of trend. The sale of blocks of stocks resulted in a drop in the value of the company's stocks, thus, projecting a drop in the RSI by 48% within a month.

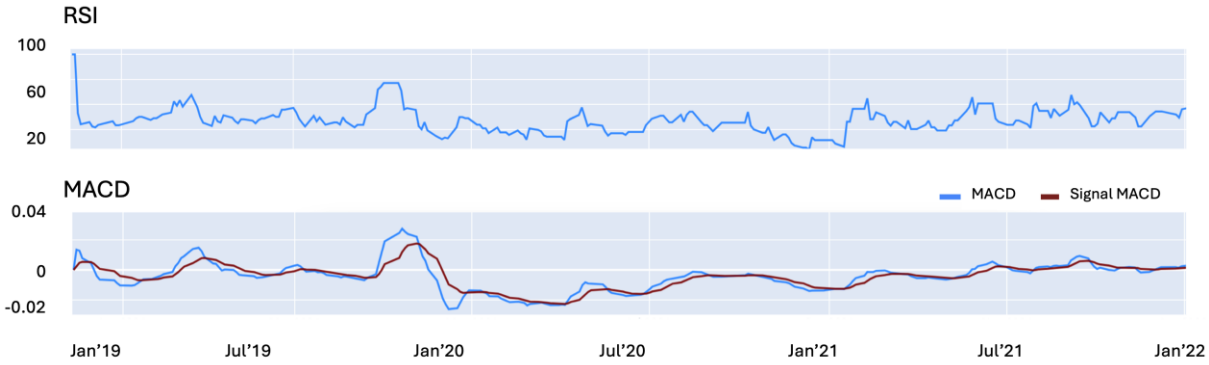

Fig. 4 Moving Average Convergence/Divergence analysis and determination of the RSI for Akora Resources
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

Correspondingly, companies with medium market capitalisation, ranging between A$20mln and A$100mln, recorded results with an average stock price of A$0.23. The results were summarised in Figure 5. Companies listed in this segment reacted most strongly during the coronavirus pandemic, when the average stock price for the segment fell by 100% to the level of A$0.1 per share, to recover and reach its peak of A$0.3 in the following year. Five companies with the highest capitalisation in the segment were selected for the analysis. Analysing the Bollinger Bands for all companies in the first place, it is worth noting their width, especially at the turn of 2021 and 2022. Stock prices were changing rapidly at the time, due to the news about the end of the COVID-19 pandemic and the first signals of the impending Russian aggression against Ukraine. Technology Metals Australia was analyzed in detail as an example of junior mining company in mid level segment, with its technical analysis shown in Figure 6.

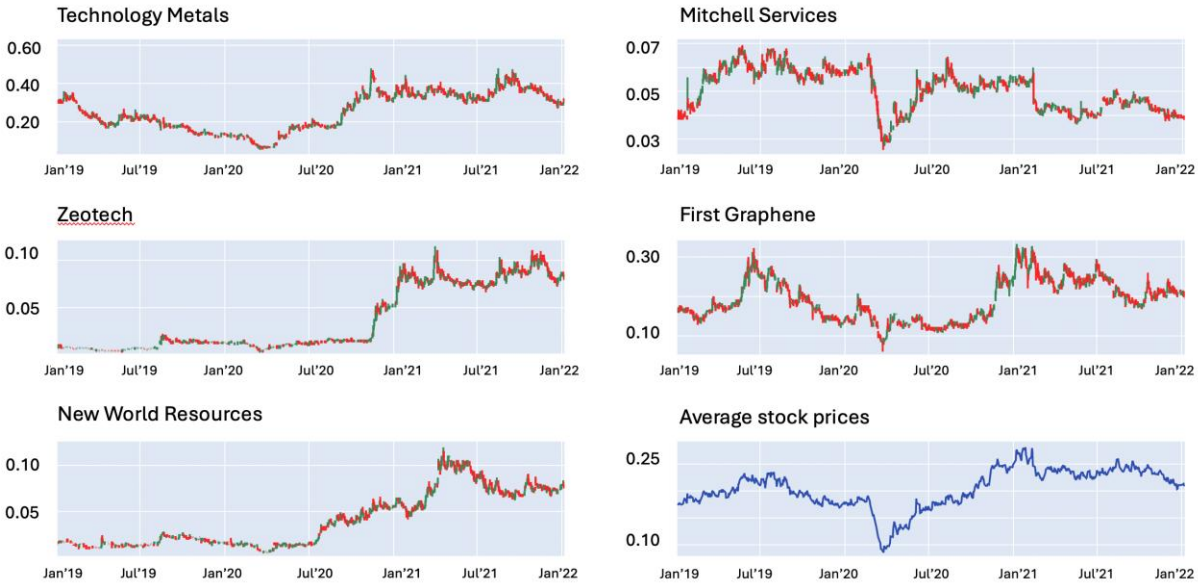

Fig. 5 Analysis of stock prices of exploration companies for the medium market capitalisation segment – Bollinger Bands® with average stock prices for the segment in the period examined (January 2019 – December 2021)
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

Technology Metals Australia Limited (ASX:TMT) is engaged in the identification and exploration of mineral projects in Australia. Its flagship project is the Gabanintha Vanadium Project located in the central-western region of Western Australia. The company was established in 2016 and is based in Subiaco in Australia. In the period examined, prices of the company's stocks fluctuated between A$0.05 and A$0.4 – since the biggest decline recorded in mid-2020, Technology Metals Australia has seen a reversal of the negative trend related to the global crisis caused by the COVID-19 pandemic and reached its maximum value in October of the same year. It is also associated with the large width of price channels in that period, with a record sell-off of the company's stocks and stabilisation of the prices between A$0.3 and A$0.5 in the later period. The analysis of the signal and of the MACD

also points to a high volatility in stock prices in 2020 – this is also confirmed by the RSI trend strength indicator, which has been maintained between 40% and 80%.

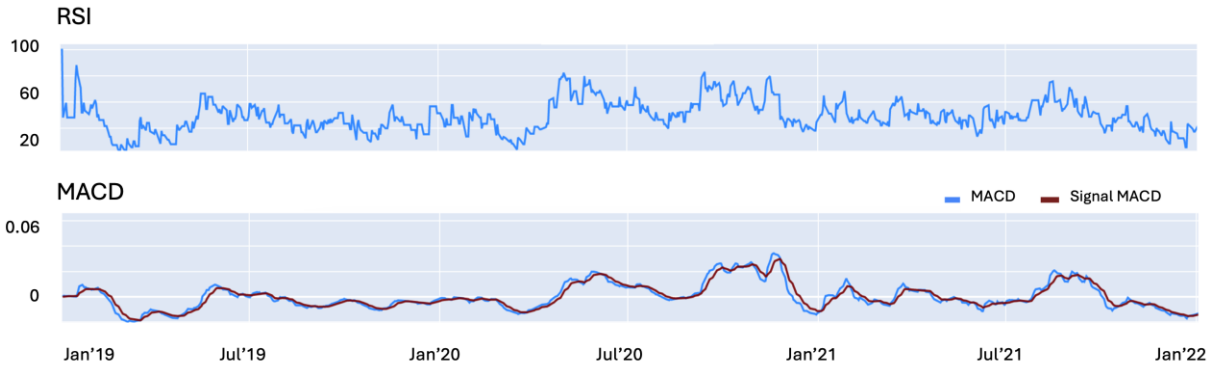

Fig. 6 Moving average convergence/divergence analysis and determination of the RSI for Technology Metals Australia Ltd.
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

The segment of exploration companies with a low market capitalisation value should therefore be considered at two levels:

- High TSR and MVCR values – the companies examined are a potential source of long-term profit and high returns for investors, which is also linked to a high risk of failure or failure to achieve the exploration target. At the same time, high returns may suggest a completely opposite play related to the quick sale strategy – which can also be periodically seen on the moving average MACD graphs.
- Low stock prices – which is inevitably related to the fact that four out of the five analysed companies are already past their stock market peaks of 2007-2012. Such a long market exposure and the finalising of strategic exploration projects may be the cause of the relatively low stock price valuation and market capitalisation.

Despite the low values of stock prices, the market value added in four out of five of the analysed cases was at least two times higher than the level of book value, as shown in the red part of Figure 7.

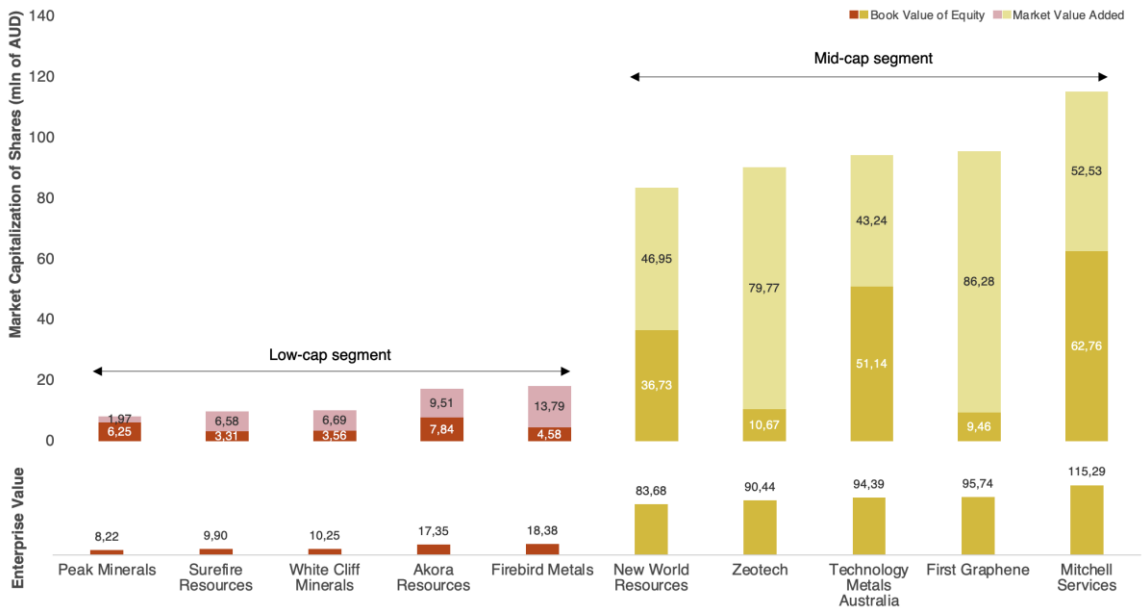

Fig. 7 Analysis of the results of the leaders in terms of share prices in the classification of junior mining companies with the highest market value tested by the MVA indicator in segments with low and mid market capitalization
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

Accordingly, the mid-cap exploration segment, shown in yellow in Figure 7, should be considered on two levels:

- The absolute difference between the share prices of medium and small capitalisation companies is around A$0.08, while the difference in relative values is almost 25%.

- In the case of companies involved in the exploration of specialised resources, we see a high return on capital employed, which is also reflected in the highest level of market value added among the companies analysed (Zeotech A$79.55mln and First Graphene A$86.28 million).

Companies listed in the final segment have a market capitalisation value of more than A$100 million. The average stock price in the period examined amounts to A$12.5 and has been in a downward trend since July 2020. The values of price channels for six companies with the highest level of capitalisation, represented in Figure 8, reach the maximum range for Newcrest Mining (ASX:NCM) and Northern Star Resources (ASX:NST) companies, thus, responding to events related to the coronavirus pandemic.

A case that is also worth noting is South32 (ASX:S32) which, while being a spin-off of BHP Billiton, did not take the impact, remaining a company with stable stock prices in the period examined, which is indicated by the minimum values of the range of price channels in the examined group. Fortescue Metals Group (ASX:FMG) was analyzed in detail as an example of junior mining company in mid level segment, with its technical analysis shown in Figure 9.

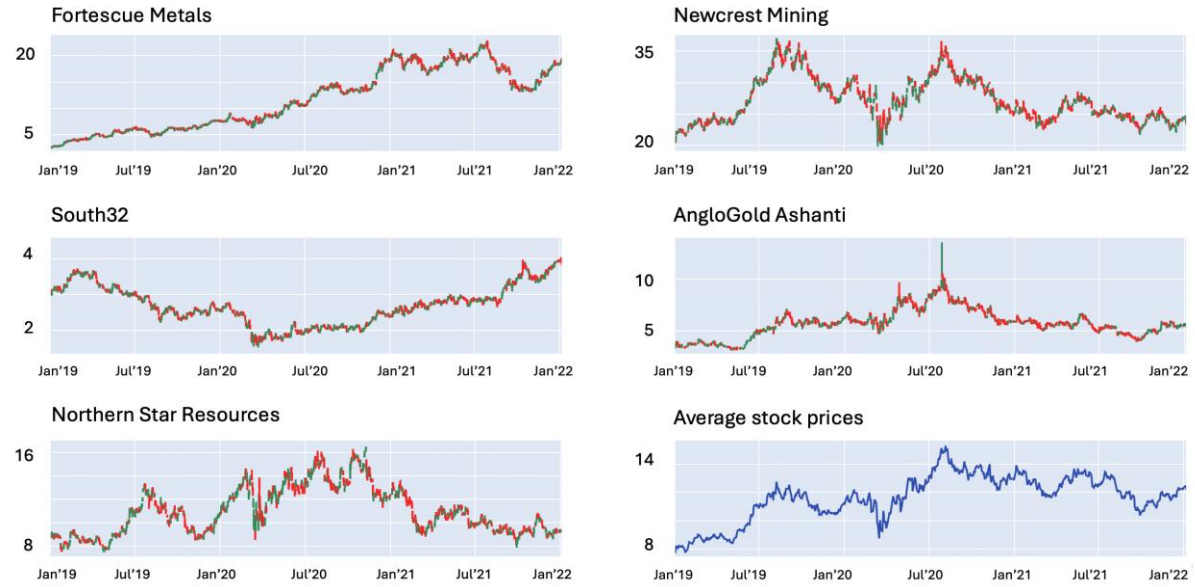

Fig. 8 Analysis of stock prices of exploration companies for the high market capitalisation segment – Bollinger Bands® with average stock prices for the segment in the period examined (January 2019 – December 2021)
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

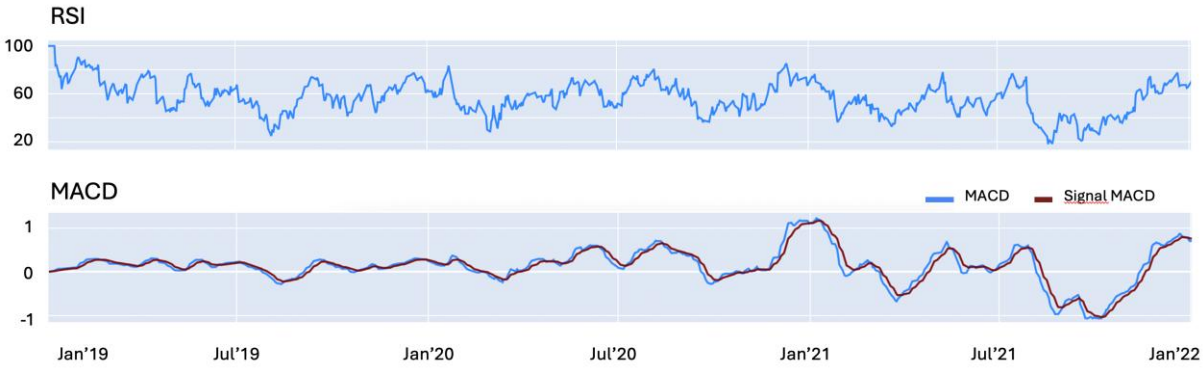

Fig. 9 Moving Average Convergence/Divergence analysis and determination of the RSI for Fortescue Metals Group Ltd.
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

Fortescue Metals Group is enga ged in the exploration, development, production, processing, and sale of iron ore in Australia, China, and the world. It also explores copper and gold deposits. The company is the owner and operator of Chichester centre, which includes Cloudbreak and Christmas Creek mines situated in the Chichester Range, and the Solomon centre, which includes Firetail, Kings Valley, and Queens Valley mines, situated in the Hamersley Range in Pilbara in Western Australia. The company is also developing the Eliwana mine, situated in

the Pilbara region in Western Australia. Moreover, the company owns a portfolio of properties located in Ecuador and Argentina. It also provides harbour towing services.

Fortescue Metals Group Limited was established in 1983 and is based in East Perth in Australia. For Fortescue, the examined period was a time of stable stock price growth, which reached its peak in August 2021 – at the moment when prices were reaching the maximum value, based on RSI indications, a sharp selling trend was noted in the range of 20-80%. The MACD moving average and the signal stabilised around the value of 0 until 2020; the year 2021 started with reports on restructuring in management positions due to a negative internal assessment of the implementation of the Iron Bridge project, which immediately impacted the quality of stock price stabilisation, which was pointed out just before the fact by the MACD indicator.

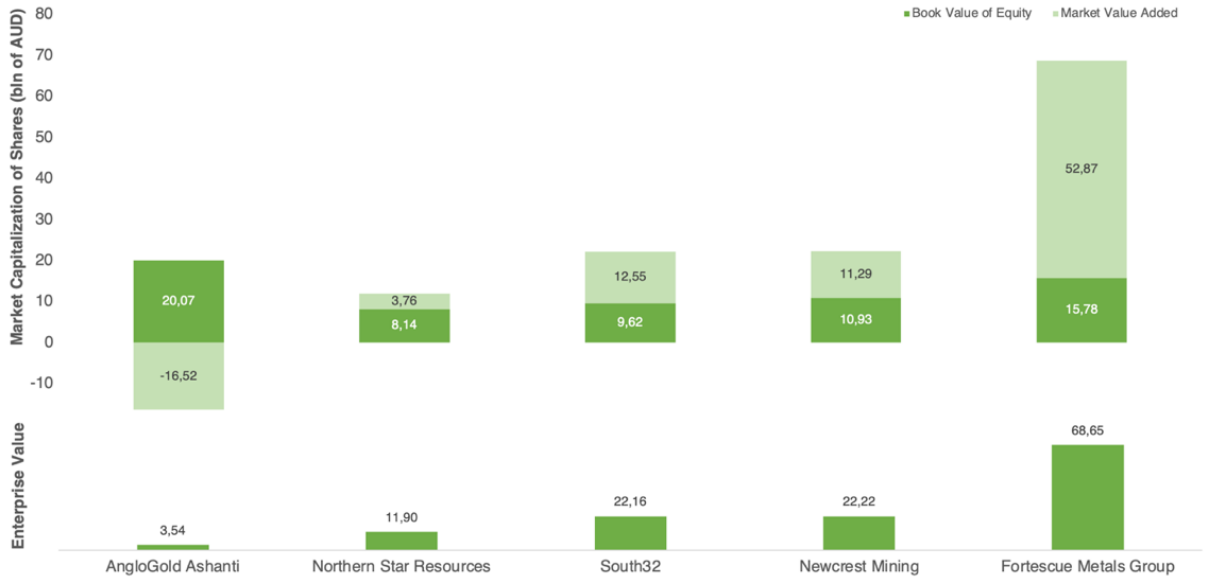

Fig. 10 Analysis of the results of the leaders in terms of share prices in the classification of junior mining companies with the highest market value tested by the MVA indicator in the high market capitalization segment
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

The segment of companies with high market capitalisation should be viewed from a number of perspectives:

- It is worth noting that the companies listed in this segment are those with market capitalizations that are an order of magnitude higher than those in the low and mid-caps, as indicated by the values in A$ billion.
- The policy of the Australian government related to the development and expansion of exploration areas supports exploration companies that have assets in the Australian territory – which also translates into a guarantee of high returns on investments and relatively stable stock prices.
- However, there is a decisive difference between stock prices and the value of companies – the most characteristic example is AngloGold, whose MVA value dropped to negative values, thus, reducing the total market value of the company. High stock prices do not translate into the generation of additional value for the shareholders – the invested capital does not build additional market value according to the expectations of investors who, in the case of the examined companies, have also taken into account their history and the length of successful mining operations.

Expectations matrix of junior mining companies listed on ASX

The previously analysed companies from the three capitalisation segments are summarised in the consolidated view of the expectations and outlook matrix shown in Figure 11. The matrix was constructed using the normalised median TSR and MVCR values for all listed junior mining companies on the ASX, where the x-axis takes the value of -0.07 and the value of the y-axis is equal to 2.36. Companies from the low capitalisation segment are highlighted in red, companies from the mid-cap segment are highlighted in yellow and companies with high market capitalisation are highlighted in green.

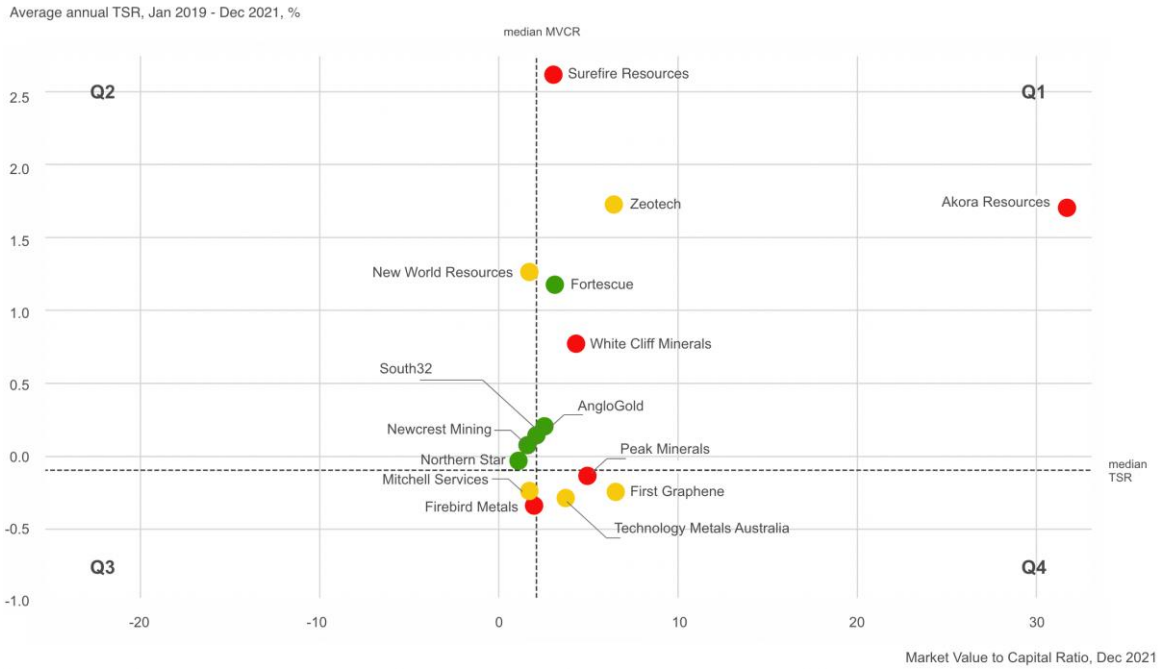

Fig. 11 Consolidated matrix of expectations for examined exploration companies in the period from January 2019 to December 2021
Source: own elaboration based on data from Twelve Data (accessed June 20, 2022)

In light of these considerations, the following implications of the matrix juxtaposition of junior mining companies are worth noting:

- Low-cap segment: As many as three of the five examples discussed are in the first quadrant (Q1) of the matrix, which may indicate a high level of market overvaluation. This also means that between January 2019 and December 2021, the companies have grown in value relative to shareholders and invested capital, with high TSR and MVCR parameters. Peak Minerals is in the upper fourth quadrant of the matrix (Q4), approaching the median TSR. This could be an indication of the company's strong potential, which is reflected in its valuation, although its value has not yet been monetised. In a slightly opposite situation, Firebird Metals is in the right part of the third quadrant of the matrix (Q3), bordering the median MVCR. This in turn may indicate a decline in the company's potential in the eyes of investors, which is also reflected in low TSR returns.
- Mid-cap segment: Only one of the five companies is in the first quadrant of the matrix - this is Zeotech, which is principally involved in kaolin exploration and whose assets include a 100% interest in the Abercorn project, which consists of fifty sub-blocks in Queensland. Zeotech Limited also owns proprietary mineral processing technology for the production of synthetic zeolites, which may also explain the overvaluation that is also reflected in the relatively high TSR. On the other hand, in quadrant three is First Graphene, which is also involved in the exploration of specific deposits (in this case graphene) and has diversified its business processes in the form of the production of graphene components, which could also lead to overvaluation, but has not yet translated into high returns. It is also worth noting that New World Resources is in quadrant two (Q2), which may indicate that it has generated a high return with low market expectations.
- High-cap segment: The companies in this segment are mostly located in the centre of the coordinate system, with a reference to the second quadrant, where three of the five companies are located. The other two companies are in the first quadrant. These results are not surprising given the maturity of these companies and their diversified activities.

The history of exploration companies, told through the analysis of stock prices, the matrix of expectations, and the market value added, shows that the market value of companies is not reflected in the stock price. Excluding external factors, to which companies in different segments responded in similar ways, one cannot fail to notice the disparity between the expectations of shareholders, market valuation, and the possibility of obtaining returns at the level of the invested capital. It is also worth noting that companies seeking rare elements tend to have a higher level of market valuation, which does not always correlate with the expected return to shareholders. The full picture of the story was supplemented with the examination of financial factors which may have an impact on the market value, understood as the value of capitalisation enlarged by the market value of debt, not including cash.

Statistical analysis

The main objective of the statistical analysis was to identify factors that influence market value. The study was conducted in two approaches – traditional and extended. For this purpose, regression analysis was used, involving several iterations during which statistically insignificant factors were eliminated. The outcome of the study is a multiple regression equation, describing the relationship between market value and the values examined.

Parameters determining company value

Average values of factors influencing the value of companies were compiled in Table 2, taking into account the distribution based on the value of market capitalisation.

Tab. 1 Selected parameters influencing the value of junior mining companies

Selected parameters influencing the value of junior mining companies*	Small cap.	Mid cap.	Large cap.
Balance Sheet parameters			
Total assets (TAs)	9 716	26 233	810 746
Total equity (TEq)	8 932	20 973	527 776
Financial leverage (D/TEq)	0.08	0.25	0.54
Income Statement parameters			
Revenues (Rev)	75	4 236	393 762
Operating profits (EBIT)	(1 834)	(2 786)	137 803
Net income (NetInc)	(1 656)	(2 607)	96 333
Cashflow parameters			
Total CF from Operating Activities (CFOA)	(1 349)	(1 364)	154 320
Total CF from Investing Activities (CFIA)	(1 279)	(2 812)	(94 722)
Total CF from Financing Activities (CFFA)	4 237	7 062	(26 000)
Value creation indicators			
Cost of capital (CAPM)	10%	4%	4%
Effective tax (EfT)	2%	3%	16%
Working capital reqiurement (WCR)	(9)	695	38 418
Capital expenditures (Capex)	13 187	34 639	841 693

* '000 of A$

Source: Twelve Data (accessed June 22, 2022)

The average level of assets in companies with low capitalisation is A$9.7million which, compared to the top capitalisation segment, accounts for 1/10 of the total asset budget. At the same time, it is worth noting the average level of the smallest companies, which also determines the possibility of owning assets – A$75 thousand, which accounts for 0.01% of the revenue of the largest exploration companies – whose business model very often assumes the continuation of projects after the exploration stage. Hence, the only segment that generates profits is the segment of companies with the highest capitalisation, which is not always obvious. The example of exploration companies listed at AIM London demonstrates that the largest companies are not necessarily the ones that generate the highest profits (Leśniak et al., 2022) An analysis of cash flows across capitalisation segments shows that companies with high capitalisation cover negative cash flows from financing and investing activities with high cash flows from operating activities – according to the above-mentioned model of continued operations. Smaller companies finance their operations with activity in the markets, at the same time allocating capital for investment purposes and covering current operating obligations. At the same time, the smallest companies are also subject to the lowest tax, of the order of 2-3%.

Companies whose capitalisation exceeds A$100 million have to pay 16% on average - which is also consistent with the policy that encourages companies to locate their exploration assets in Australia. In comparison, the effective tax rate for exploration companies listed on AIM London amounts to 26%.

Traditional drivers of enterprise value

The initial phase of the analysis focused on traditional value drivers as outlined by Koller et al. (2005), including Revenues (Rev), Operating Profits (EBIT), Capital Expenditures (Capex), Net Working Capital Requirement (WCR), Effective Tax Rate (EfT), and Cost of Equity (CAPM). To ensure the robustness of the regression model, statistically insignificant variables were systematically excluded based on two key indicators:

the F-statistic probability, which assesses the joint significance of all model parameters, and the p-value ($p > |t|$), which evaluates the individual significance of each explanatory variable.

In the first iteration, variables such as Cost of Equity, Effective Tax Rate, and Revenues were excluded due to their p-values exceeding the 0.05 threshold, indicating a lack of statistical significance. The resulting model demonstrated a strong fit, with an R-squared value of 0.935, suggesting that approximately 93% of the variance in market value could be explained by the remaining variables.

The second iteration confirmed the statistical relevance of the retained variables, leading to the formulation of Equation 16, which captures the relationship between the market value of exploration companies and the key traditional value drivers:

$$y = -0.0028 + 0.5311 * EBIT + 0.5817 * Capex - 0.1158 * WCR \quad (16)$$

This equation incorporates Operating Profits (EBIT), Capital Expenditures (Capex), and Working Capital Requirement (WCR), all of which exhibit statistically significant effects on enterprise value. The model maintains a high explanatory power, with an R-squared of 0.935. The iterative regression analysis effectively identified the most influential traditional value drivers of junior mining companies' market value. The final model highlights the critical role of operational efficiency and investment in capital assets, while discounting the relevance of revenue, tax rate, and cost of equity in this specific sector.

Complementing the model with selected elements of the financial statement

The second analytical approach focused on variables commonly reported by exploration companies but not traditionally associated with value creation in classical corporate finance frameworks. These complementary value drivers include Total Equity (TEq), Total Assets (TAs), Net Income (NetInc), and Cash Flows from Operating (CFOA), Investing (CFIA), and Financing Activities (CFFA).

Through regression analysis, all six variables were found to have a statistically significant impact on the market value of exploration companies. This relationship is formalized in Equation 17, which models the enterprise value as a function of these complementary factors:

$$y = 1.3584 * TEq. - 1.0581 * TAs + 0.1088 * NetInc + 0.2574 * CFIA + 0.2129 * CFFA + 0.9193 * CFOA + 0.0021 \quad (17)$$

Each coefficient in the equation reflects the magnitude and direction of the variable's influence on market value. Notably, Total Equity and Cash Flow from Operating Activities exhibit strong positive effects, while Total Assets show a negative relationship, suggesting that asset-heavy structures may not necessarily translate into higher valuations in the exploration sector. The complementary approach reveals that non-traditional financial indicators, particularly those related to cash flow and capital structure, play a significant role in shaping the market value of junior mining companies. These findings underscore the importance of integrating both traditional and complementary metrics to develop a more comprehensive and accurate valuation model tailored to the specific characteristics of exploration-focused enterprises.

Statistical model of the market value of junior mining companies listed on ASX

The final stage of the analysis involved the integration of both traditional and complementary value drivers into a unified regression model. This comprehensive approach aimed to capture a more holistic view of the determinants influencing the market value of junior mining companies listed on the Australian Securities Exchange (ASX). The combined model initially included the following nine variables: Operating Profits (EBIT), Working Capital Requirement (WCR), Capital Expenditures (Capex), Total Equity (TEq), Total Assets (TAs), Net Income (NetInc), and Cash Flows from Operating (CFOA), Investing (CFIA), and Financing Activities (CFFA). However, based on the statistical significance threshold ($p > |t| > 0.05$), the Working Capital Requirement (WCR) was excluded due to its limited explanatory power. The final multiple regression model, incorporating eight statistically significant variables, is expressed as follows:

$$Enterprise\ Value = 0.0015 + 0.5026 * EBIT + 1.6150 * Capex - 0.6051 * TEq. - 0.5198 * TAs + 0.0883 * NetInc + 0.4414 * CFOA + 0.3742 * CFIA + 0.3322 * CFFA \quad (18)$$

Model demonstrates a high level of explanatory power, with an R-squared value of 0.935, indicating that 93.5% of the variation in enterprise value can be explained by the selected variables.

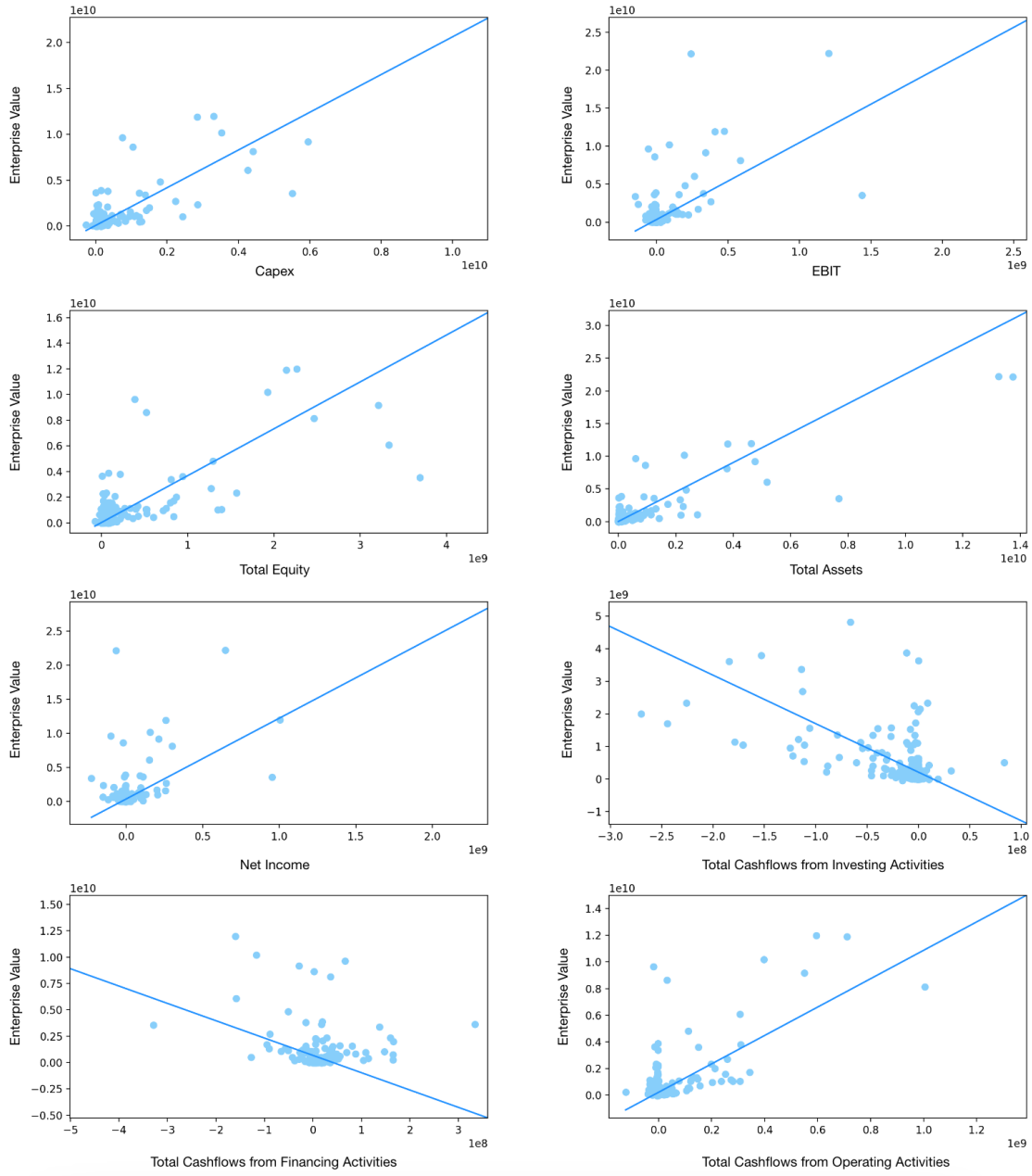

Figure 12 Linear regression model for each of the factors affecting the market value of companies
Source: own elaboration

The regression coefficients reveal that Capital Expenditures (1.6150) and Operating Profits (0.5026) are the most influential positive drivers, followed by the three types of cash flows: CFOA (0.4414), CFIA (0.3742), and CFFA (0.3322). Conversely, Total Equity (–0.6051) and Total Assets (–0.5198) exhibit a negative relationship with market value, suggesting that higher capital intensity does not necessarily translate into increased valuation. The relationships identified in the model were further illustrated through linear regression plots (Figure 12), which confirmed the direction and strength of each variable's impact. Notably, increased capital expenditures are associated with higher asset levels, which in turn contribute to greater invested capital. This capital base supports enhanced operating profits and net income, ultimately driving stronger cash flows from core operations.

The final integrated regression model, combining both traditional and complementary financial indicators, explains 93.5% of the variance in the market value of junior mining companies listed on the ASX ($R^2 = 0.935$). The most influential positive drivers include Capital Expenditures (coefficient: 1.6150), Operating Profits (0.5026), and Cash Flows from Operating (0.4414), Investing (0.3742), and Financing Activities (0.3322). In contrast, Total Equity (-0.6051) and Total Assets (-0.5198) negatively impact valuation, suggesting that excessive capital intensity may be viewed unfavorably by investors. These results underscore the importance of efficient capital allocation and robust cash flow generation in enhancing enterprise value within the exploration sector.

Discussion

Australia's leading position in the global mining sector is supported by its vast mineral resources and a proactive policy framework. Approximately 25% of all exploration companies worldwide are listed on the Australian Securities Exchange (ASX), reflecting the country's favorable investment climate. Several government initiatives have significantly contributed to this status:

- Exploring for the Future: Facilitates access to exploration licenses in underexplored regions (ACIL Allen Consulting, 2019).
- Infrastructure subsidies: Support the development of strategic infrastructure in emerging mining areas.
- Data collaboration: Joint efforts with the Australian Bureau of Statistics (ABS) aim to enhance the quality and scope of exploration data.
- Junior Minerals Exploration Incentive (JMEI): Allows companies to convert tax losses from greenfield exploration into shareholder tax credits, incentivizing early-stage investment (Australian Taxation Office, 2021).

An analysis of junior mining companies on the ASX, segmented by market capitalization, reveals distinct patterns in investor behavior and performance:

- Low-cap companies (≤ A$20 million) exhibit high volatility and speculative trading, with stock price peaks often aligning with the completion of exploration milestones (notably between 2007–2012). Returns are typically driven by short-term gains rather than sustained value creation.
- Mid-cap companies (A$20–100 million) achieve the highest returns when focused on specialized minerals, outperforming peers in traditional sectors such as coal and copper.
- High-cap companies (≥ A$100 million) benefit from economies of scale and policy support, resulting in stable stock prices. However, high capital intensity may limit proportional shareholder value creation.

To comprehensively identify the financial determinants of market value among junior mining companies listed on the ASX, a multiple regression analysis was conducted. This analysis integrated both traditional and complementary financial indicators to capture the multifaceted nature of value creation in the exploration sector. The final model included eight variables that demonstrated statistical significance, achieving a high level of explanatory power with an R-squared (R^2) value of 0.935, indicating that approximately 93.5% of the variance in enterprise value could be explained by the model. The analysis revealed several key value drivers:

- Positive contribiutors to enterprise value included Capital Expenditures (Capex) with a coefficient of 1.6150, Operating Profits (EBIT) (0.5026), Cash Flow from Operating Activities (CFOA) (0.4414), Cash Flow from Investing Activities (CFIA) (0.3742), and Cash Flow from Financing Activities (CFFA) (0.3322). These results underscore the importance of investment in productive assets and the ability to generate and manage cash flows across operational, investment, and financing domains.
- Negative contributors included Total Equity (TEq) with a coefficient of –0.6051 and Total Assets (TAs) (–0.5198), suggesting that higher levels of equity and asset accumulation may not necessarily translate into higher market valuations. This may reflect investor concerns about overcapitalization or inefficient asset utilization in the exploration phase.

These findings indicate that investors place greater emphasis on capital efficiency and liquidity rather than on the absolute size of a company's balance sheet. In particular, capital expenditures appear to be a critical signal of future value creation, as they are closely linked to asset growth, operational profitability, and ultimately, enhanced cash flow generation. The strong positive relationship between cash flows and enterprise value further highlights the market's preference for companies with robust financial performance and sustainable operations.

In summary, the results confirm that stock prices do not always align with the intrinsic market value of junior mining companies. Instead, investors tend to reward firms that demonstrate effective capital deployment and tangible exploration outcomes. These insights provide a valuable foundation for refining valuation methodologies tailored to the specific characteristics of exploration-driven enterprises (Bell and Guj, 2012). Future research should consider incorporating external variables, such as commodity price fluctuations, to further enhance the predictive accuracy of valuation models in this sector.

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