



VALE S.A. RESEARCH REPORT

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VALE S.A.

Recommendation: **BUY**

Target: **\$ 18**

Applied Portfolio Management

Professor Dr. John M. Longo, CFA



Analyst Note.

While researching on the metals and mining industry and selecting Vale S.A. comes with lots of thorough analysis and mathematics behind it. Keeping it simple for every reader, I would recommend it a buy for targets of \$18, which are conservative from my perspective. Looking at current price levels and market volatility, we can get opportunity to buy at low levels. Buying level around \$11 - \$12 can be a good entry point. Looking at this entry, we still have more than 50% upside move. But I will recommend holding the stock atleast till 2027 on basis of projects in pipeline.

Last 2-3 three years after 2021 price rise have been challenging for metals & mining industry, with iron ore prices plummeted from \$ 220 to \$ 100. Slowing Chinese economy, a major buyer of iron ore further added by real estate collapse which accounts for 40% of Chinese steel demand posed significant concerns. Even if production levels for Vale increases, but low demand can change the dynamics for mining industry. This concern is further fuelled by slowing growth in EV sector, reducing the demand for nickel and copper, used in battery manufacturing. Looking at risk from company's perspective, incidents like Brumadinho dam failure has turned out costly for the company. Also, news of political interference in appointment of CEO followed by board member resignation is a rising concern. Additionally, higher operational cost (C1) compared to two giants RIO and BHP can create an opportunity cost for the company.

Someone may wonder, if this is the scenario then why a BUY recommendation? Being an analyst, my efforts are to give an unbiased view about the company. But here's a catch. Looking deep into the valuations, company is heavily discounted from its intrinsic value which gives you a "Margin of Safety" as per Graham's principles. Isn't it a simple business to understand with long history of operations and dividend records. On top of that, company is huge not just in the terms of global presence but also in terms of numbers (assets, revenues and income). ROE of 20% and profit margins of 19% brings financial principle of Buffet's in focus. It's noteworthy to be mentioned that Warren Buffet has holdings in the mining and metals sectors through his investments in five Japanese giants. On top of that, Buffet's portfolio consists of Mitsui & Co., which holds 6.31% stakes of Vale.

Focusing on the quality and purchase of mines, Vale produces higher quality iron ore (64% iron ore content) compared to industry standards of 62%. Its iron ore quality is best in the industry and even better than its competitors (RIO and BHP). The global push towards cleaner steelmaking processes has increased demand for high-grade ore. Vale's premium ores are well-positioned to meet this demand, contributing to a pricing premium of approximately 15-20% over the benchmark. Company is also working on ESG factors and has seen appreciable results compared to 2019 which plays crucial role in this industry. Also, I would like to bring one interesting point at front about it's purchase and sales of mines. If we look at historical purchases of mines, company has always tried to acquire



during the recession phase at lower valuation and has sold at appreciated rates which plays a crucial role in profitability of a mining company.

To discuss the risk factors mentioned above, especially regarding China's economic slowdown and the real estate crisis, they are real. It is important to understand that such events do have a significant impact on commodity demand. Chinese Government \$1 trillion Renminbi infrastructure and property plan is expected to impact the steel demand positively. Also, some players (like India because of duties and domestic demand) exiting seaborne export market has made the supply market tight. Even though EV sales were below expectations but saw 34% Y-o-Y growth. Also, commitments from OEMs and policy incentives for EV will keep the demand for copper and nickel on a rise.

The reason for me conveying to stay invested atleast till 2027 is because of projects in pipelines and reduction in expenses. Vargem and Capanema project are expected to be in operation by start of 2025, whereas S11D and Sohar plant have anticipated date of 2026 end. The projects are expected to contribute additional \$ 4 billion of EBITDA. Also, Brumadinho reparation costs \$3 billion every year for Vale which will fall to \$1 billion from 2026 till 2030. This will increase the free cash flow and EPS, directly benefitting the shareholders.

If Vale S.A. can maintain operational efficiency and cost-effectiveness during these turbulent times, it could be well-positioned to capitalize on the resurgence in demand when the market conditions improve. Technological advancements have helped them reduce the C1 cost to around \$ 22.3 per tonne which is below industry average. But Vale has to bear the extra mile transportation cost from Brazil compared to RIO and BHP (located in Australia) to export to China. I wish we could change the world map by placing Brazil next to China, but yes company is working on reducing operating cost by investing in innovative technologies.

Lastly, question raised on government interference lacks historical precedent. However, mining sector is critical in terms of national security and economic health of the nation. Government oversight is expected, especially when it aligns with the broader interest of the nation and its people. For such instances, Brazil government holds 12 golden shares in the company, ensuring the government's special voting rights or control over certain decisions of the company.

To Sum up, even significant challenges persist in front, but attractive valuations and strong business model with long operational history makes it strong buy. If my note was able to create some interest, will recommend everyone to go through the report. In-depth fundamental and quantitative analysis about the company will give a better picture about the company. Thanks

Happy Investing.



1. Executive Summary

Vale SA stands as a prominent entity in the global mining industry, pivotal in supplying essential materials like iron and nickel. The assessment herein supports a "Buy" recommendation with an \$18 price target, underpinned by comprehensive financial analysis, strategic growth prospects, and a tempered view of inherent risks.

Recent Positives:

Vale's operational prowess is reflected in its enhanced copper production, steadfast nickel output, and historical peaks in iron ore production. Such feats, coupled with prudent financial stewardship marked by substantial dividends, are remarkable, given the economic volatility on a global scale.

Recommendation	Buy
Price Target	\$ 18
Ticker	Vale
Sector	Basic Materials
Industry	Metals & Mining
Key Data Points	
Average Trading Volume	27,990,566
Current Price	\$ 11.60
52 Week Range	\$ 11.52 - \$ 16.06
Number of Employees	67,000
Dividend Yield	9.86%
Current P/E	6.66
Current Ratio	1.28
Debt to Equity	0.35
Financial Leverage	2.33
ROE	21.44
ROA	8.92
Asset Turnover	0.46
Inventory Turnover	5.34
Operating Margin	39.78%
Profit Margin	18.58%
Revenues	\$ 41.66 billions
Market Cap	\$ 52.37 billions
Enterprise Value	\$ 64.58 billions

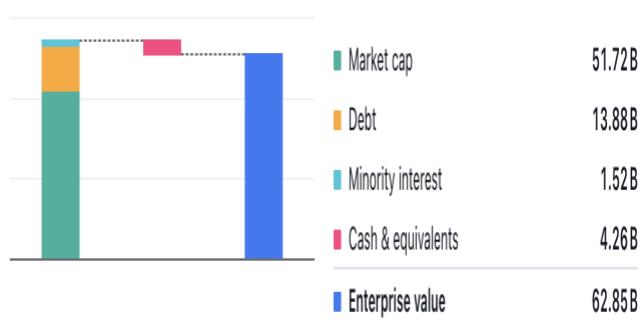
Investment Rationale:

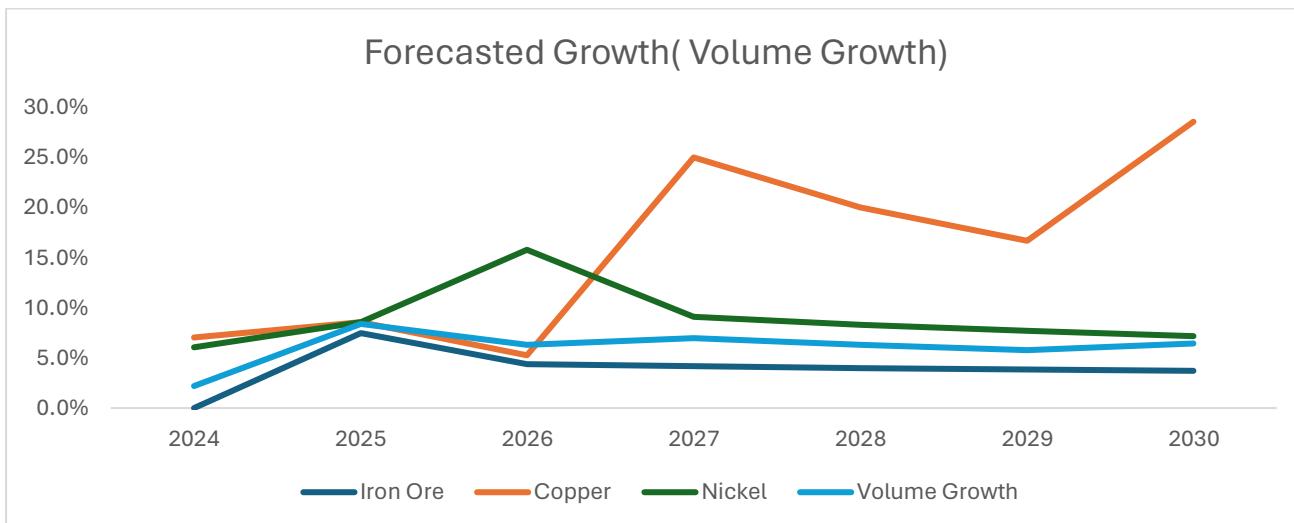
Rooted in fundamental valuation principles, Vale presents a valuable opportunity marked by an appealing valuation gap. The firm's commanding presence, bolstered by a robust cost base and superior-grade commodities, suggests a potential upside that is not fully priced in by the current market valuation.

Financial Outlook:

Vale's financials are resilient, showcasing robust margins and a firm commitment to maximizing shareholder value. The long-term outlook for commodity prices points towards a reversion to marginal production costs, favouring Vale's well-established operational efficiencies and sound capital allocation.

Capital structure





Strategic Growth:

Through deliberate capital investments and strategic partnerships, Vale is poised for both organic and inorganic expansion. Initiatives like the iron ore briquette plant signify Vale's innovative drive, aiming to secure a competitive edge in a rapidly evolving market.

a. Organic Growth:

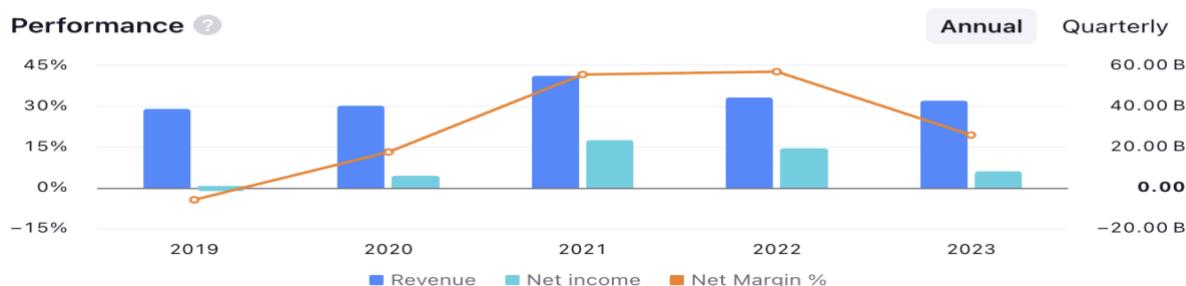
Vale S.A.'s organic growth strategy is underscored by significant investments in increasing production and efficiency, particularly in iron ore. By 2026, the company aims to bolster its output to 340-360 million tonnes through key projects like the ramp-up of the Vargem Grande and Capanema sites and the expansion of the S11D mine, each designed to enhance productivity while minimizing costs. These efforts are complemented by technological innovations such as the start-up of the briquette plant in Tubarão, which targets a reduction in steel industry emissions.

b. Inorganic Growth:

In contrast, Vale's inorganic growth is characterized by strategic acquisitions and partnerships, aimed at diversifying its portfolio and entering new markets. A pivotal move in this direction is the formation of Vale Base Metals (VBM), driving forward its energy transition metals business with a hefty valuation implicating strong future equity stakes. The company has also laid down investment agreements in the Energy Transition Metals sector totalling USD 3.4 billion. These initiatives are part of Vale's broader strategy to capitalize on growth sectors and build a more resilient, diversified business with sustainability as a core tenet.

Growth and profitability >

Company's recent performance and margins





2. Company Profile

Corporate Overview

Vale SA is one of the world's largest mining companies, primarily involved in the extraction of iron ore, nickel, and copper. With its headquarters in Rio de Janeiro, Brazil, Vale has a presence on every continent, showcasing a truly global operation that reaches far beyond its Brazilian roots.

History and Milestones

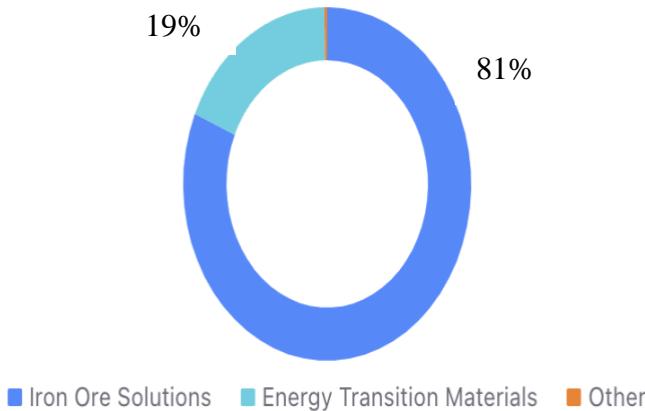
Founded in 1942 as Companhia Vale do Rio Doce, Vale was initially focused on domestic iron ore extraction but has since grown into a multinational corporation through various phases of expansion, acquisitions, and diversification. Vale was privatized in 1997, which marked a significant turning point, allowing it to expand internationally. Through strategic acquisitions, including the notable purchase of Canadian nickel mining company Inco Limited in 2006, Vale has diversified its mineral production portfolio, which also includes manganese, copper, and cobalt.

Business Segments

Vale's operations are segmented into two primary areas:

1. **Ferrous Minerals:** This segment, Vale's largest, is dedicated to the extraction of iron ore and its transformation into pellets, and the logistical services associated with the transport of these products.

2. **Base Metals:** This segment handles the production and sale of nickel – the primary product – and copper, which are key components for a wide range of industrial applications and new technologies.



Others: This includes operations in logistics services and other mineral exploration.

The company sells precious metals extracted from its operations through streaming transactions. One significant deal involves Wheaton Precious Metals Corp., to which Vale has sold an aggregate of:

1. 75% of the by-product gold contained in concentrate from its Salobo copper mine in Brazil for the life of the mine.
2. 70% of the by-product gold from its Sudbury nickel mines in Canada for 20 years.
3. Vale also engaged in a cobalt streaming transaction with Wheaton and Cobalt 27 Capital Corp., selling a combined 75% of the cobalt produced as a by-product at its Voisey's Bay mine.



Vale SA- Major Products and Services

Products: <ul style="list-style-type: none"> Iron Ore and Pellets Nickel Coal Cobalt Copper Ferroalloys Manganese Bauxite Aluminum Platinum-Group Metals (PGMs) Gold Silver 	Services: <ul style="list-style-type: none"> Logistics: Shipping and Port Services Railroad Services 	
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Mineral	Maximum % of total Sale	Region
Iron Ore	70%	China
Copper	50%	Europe
Nickel	65%	USA + Europe

Strategic Vision

Vale is on a continuous quest for operational excellence, seeking to leverage its rich resource base and harness technology to be at the vanguard of the industry. The company has a strong commitment to sustainable practices, targeting a reduction in carbon emissions and investing in renewable energy projects. Post the Samarco dam disaster, Vale has reinforced its operational protocols to enhance safety and environmental care, crucial for maintaining its social license to operate.

Growth Strategy

The company's growth strategy involves optimizing and expanding existing operations, exploring new reserves, and deploying capital efficiently. With a focus on quality and sustainability, Vale is positioning itself to meet the global demand for essential minerals while maintaining high standards of environmental stewardship.

Leadership

Vale SA's management, under CEO Eduardo Bartolomeo, aims to steer the company towards safety, sustainability, and operational excellence. The leadership is focused on overcoming past challenges, notably the fallout from the tailings dam failures, which have necessitated comprehensive overhauls in safety protocols and risk management practices. These incidents have highlighted issues within previous leadership frameworks, emphasizing the need for stringent corporate governance and accountability.

The Brazilian government plays a significant role in Vale's operations, holding "golden shares" that allow it to influence major strategic decisions, including the veto power over disposals of



the company's mining assets. This government involvement ensures that Vale's operations align with national interests, but it also poses risks of political interference that could impact business operations and investor perceptions.

The current management has responded to these challenges by committing to transparent communication and implementing robust environmental and safety standards. They are also focusing on technological advancements to enhance efficiency and reduce environmental impact. This approach aims to restore stakeholder trust and position Vale as a leader in sustainable mining practices. However, the ongoing need for vigilance in governance and environmental management remains critical to sustaining their operational license and safeguarding the company's future.

At the helm of Vale's strategic direction is its experienced management team, with a track record of industry expertise. The team's combined skill set drives the company's vision of sustainable mining operations and strategic growth in the global market.

Key team members:

Eduardo Bartolomeo, CEO



Daniel André Stieler, Chairman of the Board of Directors

Alexandre Pereira, Executive Vice President (Projects)

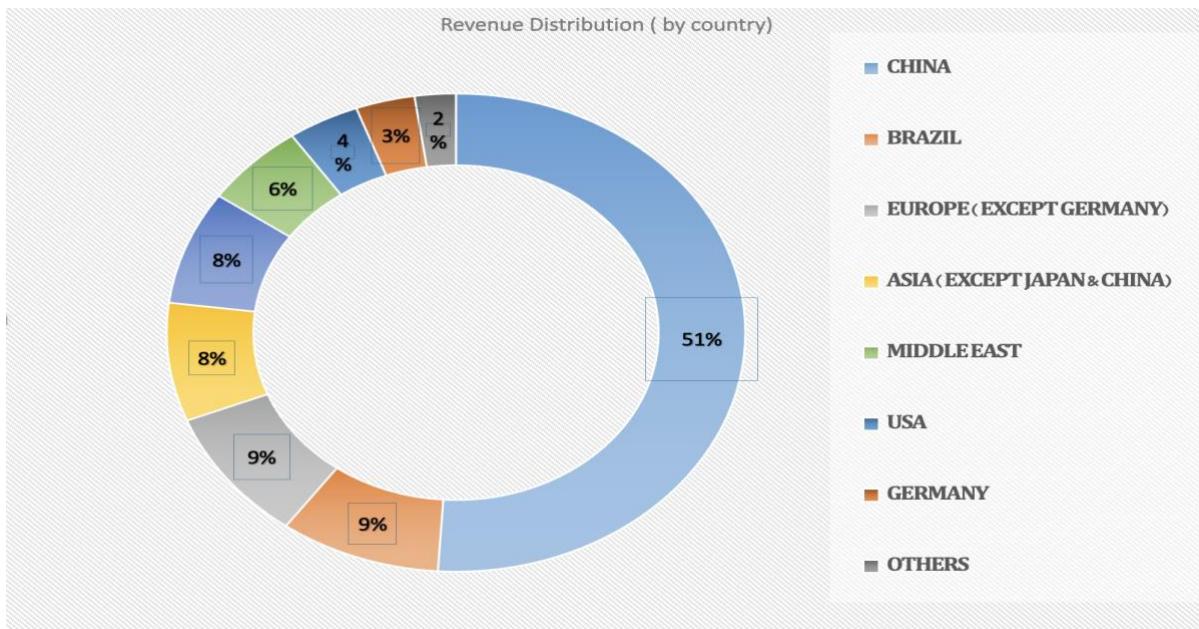
Gustavo Pimenta, Executive Vice President, (Finance)

Marcello Spinelli, Executive Vice President, (Iron Solutions)

Global Presence

Vale's network of operations, joint ventures, and projects spans across the Americas, Africa, Europe, and Asia, demonstrating a competitive global reach with significant logistical advantages.



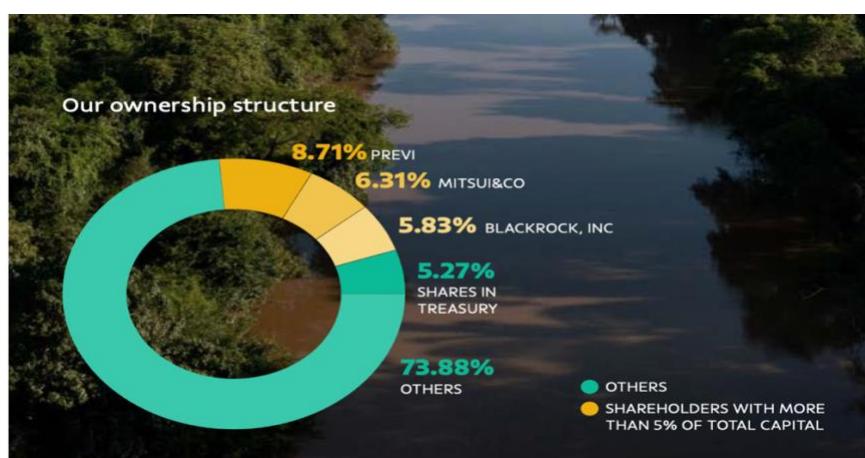


Innovation and Technology

Vale SA is cementing its position in innovation and technology as part of its future strategy, having launched a \$100 million corporate venture capital arm, Vale Ventures, to invest in startups that are pioneering sustainable mining initiatives and new technologies pertinent to the industry. This initiative shows Vale's commitment to backing innovations that can potentially revolutionize mining practices, such as decarbonization, zero-waste mining, operational technology shifts, and the development of energy transition metals. Specifically, the venture arm looks to hold small stakes in these companies, fostering innovation that could aid in Vale's own environmental targets and mining operations.

One of the prominent investments by Vale is in Boston Metal, which is developing steel decarbonization technology. This step reflects Vale's broader strategic vision, which involves increasing productivity and operational efficiency, improving safety, and propelling financial performance through digital transformation. By integrating Artificial Intelligence, Internet of Things, and autonomous equipment, Vale aims to reduce iron ore production costs significantly.

Vale Ownership Structure:





SWOT analysis for Vale SA:

Strengths:

1. Market Leadership: Vale is one of the world's largest producers of iron ore and nickel, essential for global steel and battery production.
2. Resource Base: Extensive high-quality mineral reserves with long life spans provide a competitive edge in operational sustainability.
3. Technological Innovation: Investment in automation and digital technologies enhances operational efficiency and safety.
4. Strong Financial Position: Consistent revenue generation and robust cash flow enable strategic investments and shareholder returns.
5. Global Operations Network: Diversified operations across several continents mitigate regional risks and enhance market reach.

Weaknesses:

1. Past Safety Failures: Historical incidents like the Samarco and Brumadinho dam failures have tarnished its reputation and imposed financial burdens due to penalties and reparations.
2. Dependence on Commodity Prices: Heavy reliance on the volatile commodity market, especially iron ore, which affects financial stability.
3. High Operational Costs: Relative cost disadvantages in transporting ore from Brazil to major markets like China compared to closer Australian competitors.
4. Regulatory Challenges: Operations in multiple countries expose Vale to a complex regulatory environment that can impact business operations.
5. Labour Relations: Ongoing challenges in maintaining stable relations with labor unions, which can lead to strikes and operational disruptions.

Opportunities:

1. Growing Demand for Nickel and Copper: Increasing use of these metals in batteries and renewable technologies presents significant growth opportunities.
2. Expansion in Emerging Markets: Investing in emerging markets could reduce operational costs and open new revenue streams.
3. ESG Initiatives: Enhancing environmental, social, and governance credentials can attract socially responsible investors and improve corporate image.
4. Acquisitions and Partnerships: Strategic acquisitions and partnerships can provide access to new markets and technologies, enhancing growth prospects.
5. Infrastructure Investments: Investing in infrastructure improvements, especially in logistics and export facilities, can reduce costs and improve efficiency.

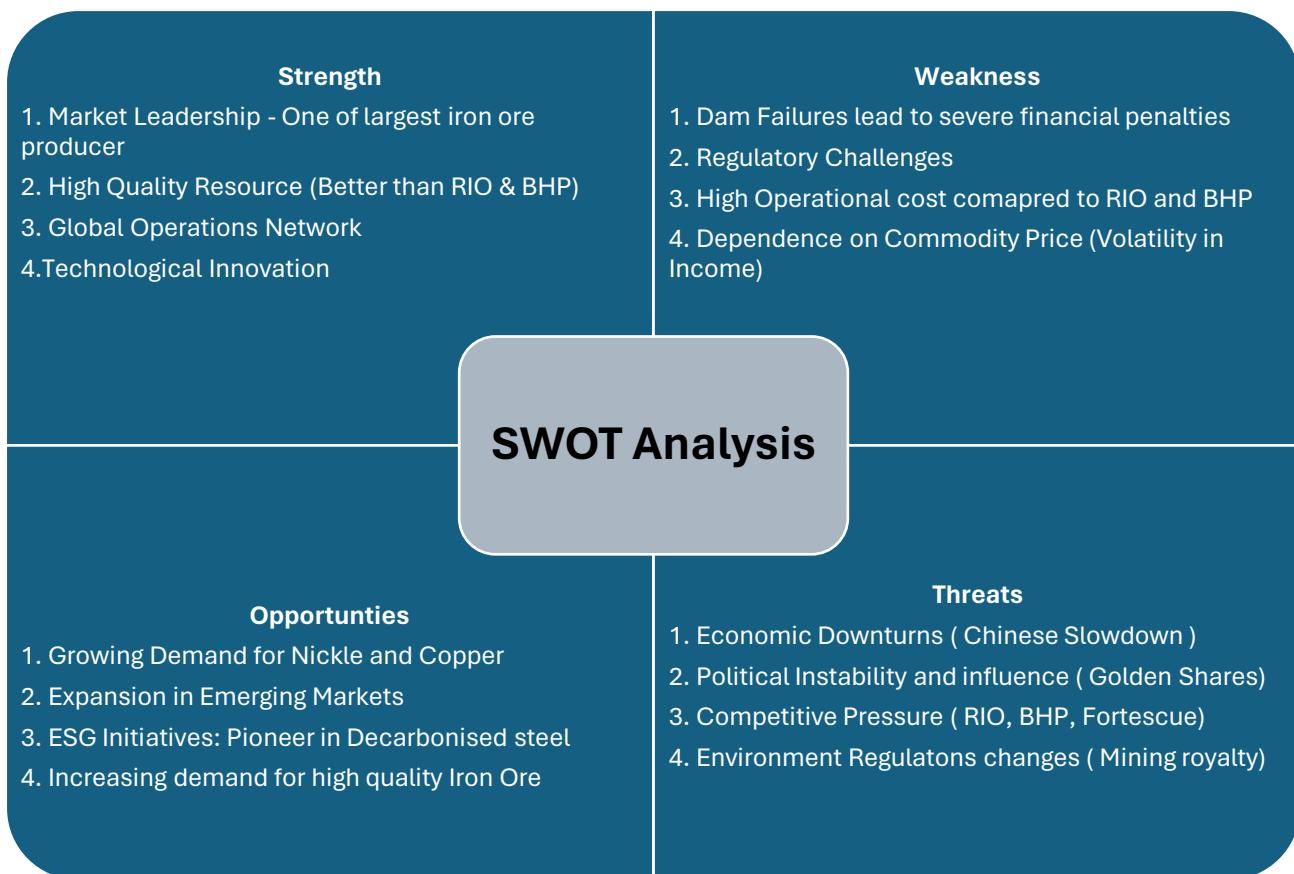
Threats:

1. Economic Downturns: Global economic slowdowns, particularly in China, can significantly reduce demand for iron ore and other minerals



2. Environmental Regulations: Stricter global environmental regulations could increase operational costs and restrict mining activities.
3. Political Instability: Operations in politically unstable regions can disrupt business activities and affect profitability.
4. Competitive Pressure: Intense competition from other global mining giants like BHP and Rio Tinto, who have lower cost bases and more direct access to key markets.
5. Technological Disruptions: Advances in recycling technologies and alternative materials could reduce the demand for primary minerals.

This **SWOT analysis** provides a comprehensive view of Vale SA's internal and external factors, which are crucial for strategic planning and decision-making processes.





3. ESG Overview for Vale SA

Environmental Initiatives:

- Sustainalytics Rating:** Vale's environmental rating by Sustainalytics improved dramatically from 54.5 in 2019 to 31.2 in 2024 (as per April rating). This indicates a substantial enhancement in environmental management and a strong commitment to sustainability practices.
- Carbon Emission Reductions:** 100% renewable electricity consumption by company in Brazil, achieved 2 years before target. Also, Vale has set a target to reduce direct and indirect carbon emissions by 33% by 2030 compared to 2017 levels, aligning with the Paris Agreement's goals.

Social Responsibility:

- Community Investment:** Vale invests significantly in local development, allocating millions annually to community health, education, and economic development programs. Also 100% population close to risky areas have been removed.
- Safety Measures:** Following the Brumadinho disaster, Vale has revamped its safety protocols, reducing accident rates by over 40% since 2019. Dams at emergency level 1, 2 and 3 have been reduced in numbers from 35 (2020) to 19 (2024)
- Workforce Diversity:** Increased the percentage of female employees from 13% in 2020 to 24% by the end of 2023.

Governance:

- Governance Score Improvement:** ISS Governance rating improved from 10 in 2019 to 2 in 2023, showing enhanced governance practices.
- Transparency and Ethics:** Vale has enhanced its corporate governance framework to ensure greater transparency and accountability. This includes the adoption of international best practices and regular sustainability reporting.
- Executive Accountability:** Performance-linked executive compensation includes ESG criteria, directly tying leadership remuneration to sustainability performance.
- Board Oversight:** Vale's board includes a Sustainability Committee responsible for overseeing ESG strategies and initiatives, ensuring they align with broader corporate goals

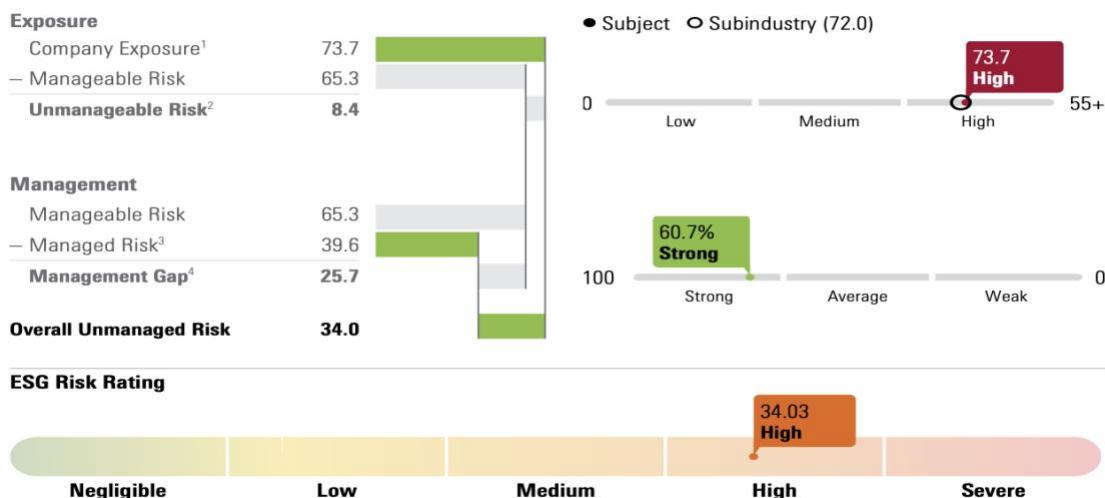
Company Name	Exposure	Management	ESG Risk Rating
Vale SA	73.7 High	0 ————— ● 55+	34.0 High
BHP Group Ltd	68.1 High	0 ————— ● 55+	27.4 Medium
Fortescue Ltd	62.0 High	0 ————— ● 55+	22.0 Medium
Rio Tinto Ltd	66.1 High	0 ————— ● 55+	32.5 High

Comparative ESG Assessment:

The ESG assessments comparing 2019 to 2024 show improvements in MSCI, Sustainalytics, and ISS Governance ratings, reflecting a positive trajectory in ESG performance.



ESG Risk Rating Breakdown

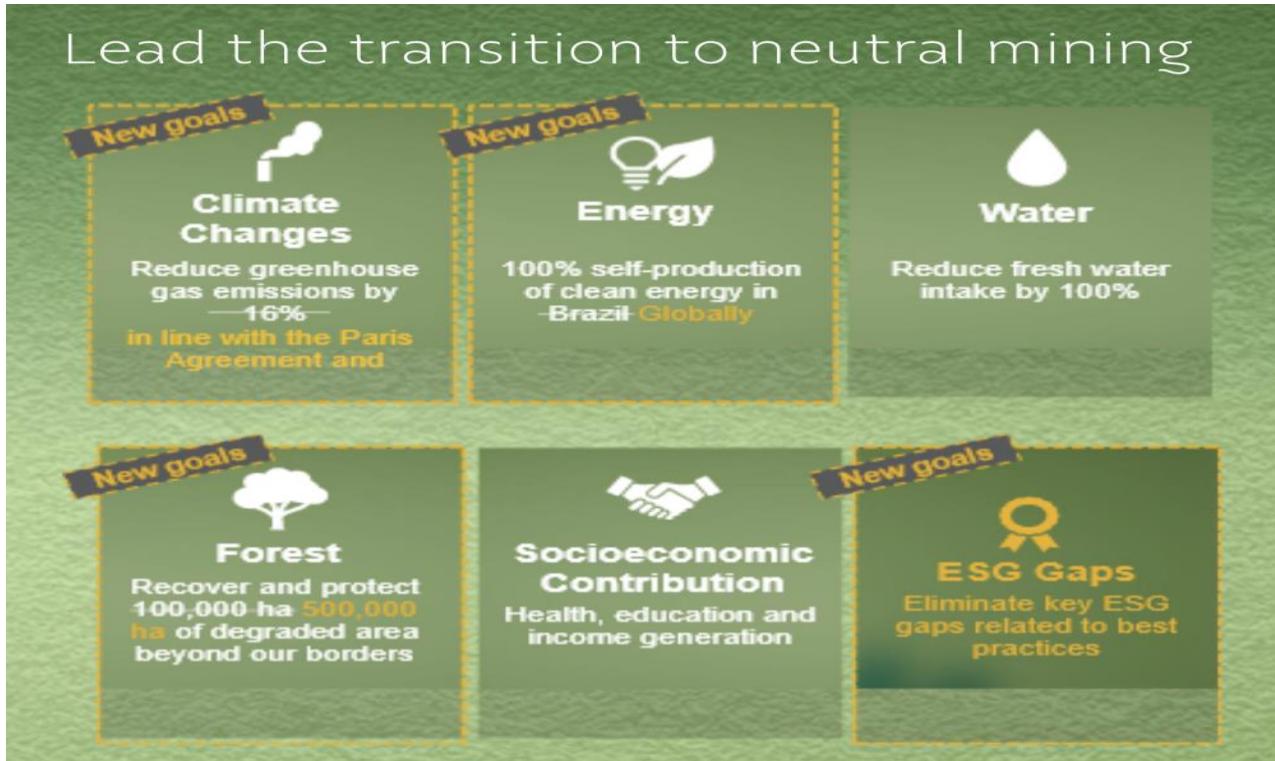


ESG Risk Ratings measure the degree to which a company's value is impacted by environmental, social, and governance risks, by evaluating the company's ability to manage the ESG risks it faces.

Financial Implications of ESG Factors:

- Vale's investments in community and safety likely involve significant expenditures that could impact their financials, especially related to Burmardinho dam accident.
- Vale being a pioneer in decarbonised iron ore mining, steel manufacturers may prefer Vale to work on carbon emissions limitations, benefitting company in increasing revenues.
- The competitiveness of high-grade ore is supported by a cost gap of almost \$100 per ton in the production of metallics compared to low-grade ores. Vale's high-grade iron ore contributes to this efficiency, presenting a compelling value proposition to clients focused on reducing emissions and energy use.

Lead the transition to neutral mining





4. Industry Analysis

Peer Analysis and Competition:

- Market Positioning:** Vale is the world's largest producer of iron ore. It competes directly with other mining giants like BHP (market cap: USD 214.78 billion), Rio Tinto (market cap: USD 189.77 billion), and Fortescue Metals Group (market cap: USD 73.77 billion). Vale's market cap stands at USD 55.20 billion as of April 2024.
- Production Output:** In 2023, Vale's iron ore production was approximately 300 million tonnes, closely competing with Rio Tinto and BHP, which both have similar outputs but with slightly lower production costs due to geographical advantages.

Production Forecast

	Minerals production growth forecast	2022	2023	2024	2025	2026	2027	2028	2029	2030
Iron ore solutions	Iron ore (in Mt)	308	321	321	345	360	375	390	405	420
	Growth rate		4.22%	0.00%	7.48%	4.35%	4.17%	4.00%	3.85%	3.70%
	Iron Pellets (in Mt)	33	37	40	45	50	55	60	65	70
	Growth rate		12%	8%	13%	11%	10%	9%	8%	8%
Energy Transition minerals	Copper (in Kt)	253	327	350	380	400	500	600	700	900
	Growth rate		29.25%	7.03%	8.57%	5.26%	25.00%	20.00%	16.67%	28.57%
	Nickel (in Kt)	179	165	175	190	220	240	260	280	300
	Growth rate		-7.82%	6.06%	8.57%	15.79%	9.09%	8.33%	7.69%	7.14%

Revenue (by source)	percentage	2023	2024	2025	2026	2027	2028	2029	2030
Iron Ore Solutions	85%	NA	1.22%	7.11%	4.71%	4.42%	4.16%	3.94%	3.75%
Energy Transition Minerals	15%	NA	0.98%	1.29%	1.58%	2.56%	2.13%	1.83%	2.68%
Forecasted Production Growth	100%	NA	2.20%	8.39%	6.29%	6.97%	6.29%	5.77%	6.43%

Competitive Advantage:

- Cost Efficiency:** Vale's break-even price for iron ore is around USD 45 per tonne, which is competitive but higher than Rio Tinto and BHP, primarily due to the latter's logistical advantages in Australia. Vale's investment in its fleet of Valemax ships helps reduce its cost disadvantage in transporting ore to Asia.
- Quality Differentiator:** Vale's iron ore has an average iron content of 64%, higher than the industry benchmark of 62%, allowing it to fetch a premium in the market.

Trend Analysis:

- Demand for High-Grade Ore:** The global push towards cleaner steelmaking processes has increased demand for high-grade ore. Vale's premium ores are well-positioned to meet this demand, contributing to a pricing premium of approximately 15-20% over the benchmark.
- High-Quality Iron Ore Benefits Due to China's Demand:** Vale anticipates an increased demand for high-grade iron ore from China as the country transitions to higher-quality steel production. The company expects China's steel industry to require more pig iron, which necessitates high-grade iron ore, and this demand is reinforced by a \$1 trillion Renminbi infrastructure and property initiative in China.
- Sustainability Initiatives:** As part of its sustainability drive, Vale aims to reduce its direct and indirect carbon emissions by 33% by 2030 from its 2017 levels, aligning with the goals of the Paris Agreement.



Factors Impacting Industry:

- **Chinese Market Dynamics:** China remains the largest consumer of iron ore, accounting for 70% of global demand. Any fluctuation in China's infrastructure spending significantly impacts Vale's market, given its reliance on iron ore exports.
- **Regulatory Impacts:** Brazilian mining regulations and environmental laws, such as a recent increase in royalties from 2% to 3.5%, directly affect Vale's operational costs and profitability.

Technology Advancements:

- **Innovation in Operations:** Vale is pioneering the use of autonomous drills and trucks in its mines, which has decreased operational costs by reducing fuel usage by up to 10% and increasing equipment life.
- **Beneficiation Technologies:** Vale continues to develop advanced processing technologies that increase iron ore quality, which reduces the use of raw materials and emissions in steelmaking.

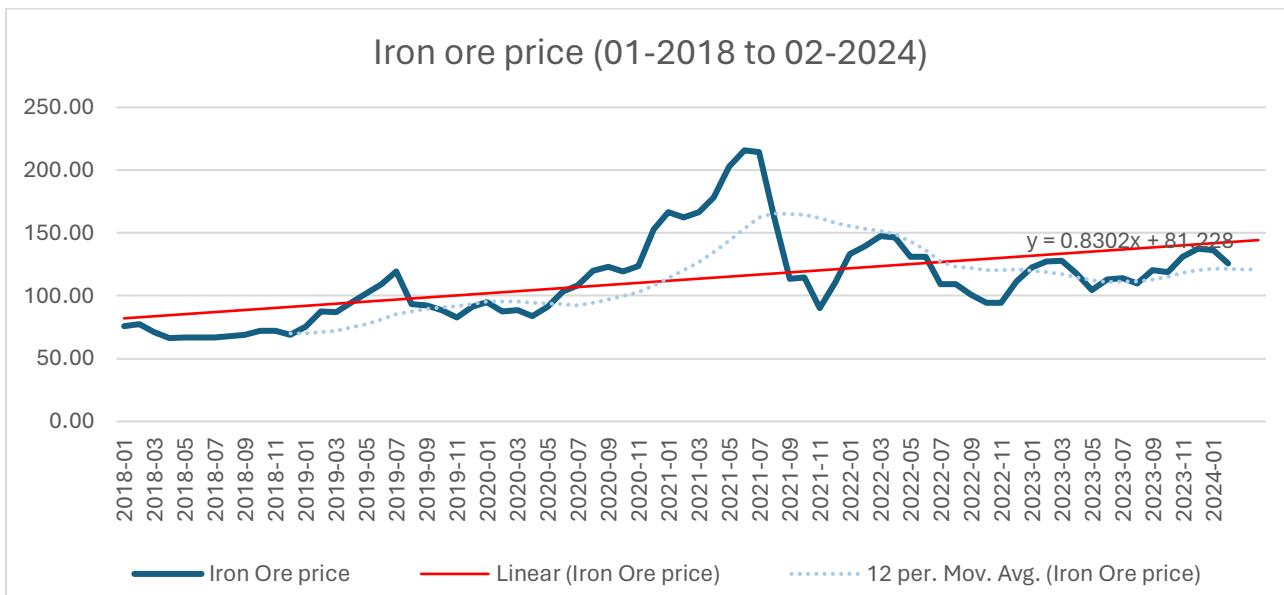
Financial Metrics:

- **Cost and Revenue Metrics:** Vale's cost of goods sold (COGS) for iron ore stood at USD 22.30 per tonne in 2023, with iron ore prices averaging USD 108 per metric ton. This cost efficiency supports strong EBITDA margins, despite price volatilities.
- **C1 Cost Comparison:** Vale's C1 cost for iron ore production is approximately USD 22.30 per tonne, slightly higher than Rio Tinto and BHP due to differences in operating expenses and geographical factors but below industry average of USD 230 per tonne.
- **Investment in Sustainability:** Vale has committed USD 2 billion towards environmental reparation and water management projects, enhancing its ESG profile and operational sustainability.

Commodity Analysis for Vale SA

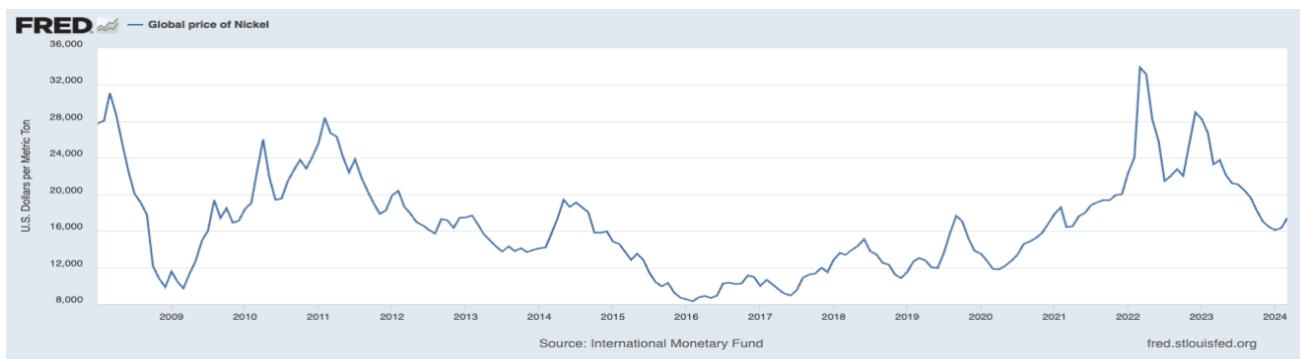
Iron Ore:

- **Market Dynamics:** Iron ore is the cornerstone of Vale's business, constituting the bulk of its revenue. The global iron ore market is heavily influenced by Chinese demand, which accounts for approximately 70% of seaborne trade. In recent years, the market has experienced volatility due to fluctuating Chinese industrial activity and global economic conditions.
- **Pricing Trends:** As of 2024, iron ore prices have shown variability, with recent prices around \$100 per ton, down from historical highs of around \$200 per ton in previous years. This fluctuation is largely due to changes in demand from China, production adjustments by major miners, and global economic shifts.
- **Vale's Position:** Vale is well-positioned with some of the world's largest iron ore mines, boasting high-grade reserves. Its cost-efficiency, driven by scale and resource quality, gives it a competitive edge, with C1 costs around \$22.30 per ton.



Nickel:

- **Market Dynamics:** Nickel is essential for stainless steel and growingly significant in lithium-ion batteries for electric vehicles (EVs), which has spurred demand growth. The global shift towards EVs and renewable energy technologies has positioned nickel as a strategic commodity.
- **Pricing Trends:** Nickel prices have been highly volatile, influenced by both demand in the EV sector and global supply chain adjustments. Current prices hover around \$16,000 per metric ton, subject to rapid changes based on market speculation and industrial demand.
- **Vale's Position:** Vale is one of the top nickel producers globally. It benefits from high-quality nickel reserves primarily in Canada and Indonesia. Despite facing operational challenges and market volatility, Vale's extensive nickel operations allow it to capitalize on technological shifts towards green energy.



Copper:

- **Market Dynamics:** Copper is critical for electrical applications and is seeing increased demand from infrastructure, power generation, and automotive industries, especially in clean technologies like electric vehicles and renewable energy installations.



- **Pricing Trends:** Copper prices have generally been strong, reflecting robust demand, with current levels around \$3.50 per pound. Prices are expected to remain elevated due to supply constraints and growing technological applications. Copper breakeven cost reduced from \$4.5k/t to \$ 3.3k/t below the 2024 guidance price range (\$ 4 – 4.5k /t) because of higher volumes.
- **Vale's Position:** While not as dominant in copper as in iron ore or nickel, Vale's copper operations contribute significantly to its revenue. It is expanding its copper projects to leverage the metal's broad utility in green technologies and infrastructure and production levels are expected to be around 900 kt by 2030 which is three times the present production.



Foreign Exchange and Currency Impact:

1. **Foreign Exchange Impact on Vale:** Vale is significantly impacted by foreign exchange fluctuations due to its extensive global operations, with 91% of its sales in FY2022 coming from international customers. The company actively manages this risk by engaging in **dollar swap** and **forward transactions**, along with swaps involving CDI and TJLP versus US dollar fixed and floating rates. These strategies are crucial for mitigating the impact of currency exchange rate fluctuations on Vale's operational costs and capital expenditures, which are largely denominated in Brazilian Reais. For instance, gains from currency and interest rate swaps were significant enough in FY2023 income statement.
2. **Currency Impact on Operations and Debt:** Vale's operations are further influenced by its approach to managing debts in different currencies. The **company's debts** are strategically denominated in **US dollars** and **euros**, which serve as a hedge against its investments in international subsidiaries. This currency hedging is reflected in its financial outcomes, particularly impacting other comprehensive income. Additionally, Vale transitioned from using the LIBOR reference rate to the Secured Overnight Financing Rate (**SOFR**) in its financial contracts, adjusting the spread to align with transaction costs. This strategic management of currency exposures plays a critical role in stabilizing Vale's financial performance against the volatility of global currency markets.



5. Financial Statement Analysis

Balance Sheet Analysis:

The balance sheet for 2023 shows that the company's total assets decreased by 9.31%, signalling a slight shrink in the company's asset base. Total liabilities saw a minor increase of 1.07%, maintaining relative stability in the company's obligations. The total equity, reflecting the net value held by shareholders, increased by 10.60%, which suggests that the company's value to shareholders has improved, indicating possibly retained earnings or capital contributions.

Currency: USD	2017 Dec 2017	2018 Dec 2018	2019 Dec 2019	2020 Dec 2020	2021 Dec 2021	2022 Dec 2022	2023 Dec 2023
▼ Total assets	98.91B -0.24%	88.17B -10.86%	91.90B +4.23%	92.05B +0.17%	89.61B -2.65%	85.87B -4.17%	93.87B +9.31%
> Total current assets	18.90B	15.29B	17.08B	24.41B	22.41B	15.34B	18.64B
▼ Total non-current assets	80.01B	72.88B	74.82B	67.64B	67.20B	70.53B	75.23B
▼ Long term investments	8.76B	8.08B	7.84B	4.35B	3.00B	3.17B	3.20B
Note receivable - long term	2.77B	1.76B	1.69B	982.59M	0.00	-	-
Investments in unconsolidated subsidiaries	3.56B	3.22B	2.80B	2.03B	1.75B	1.78B	1.87B
Other investments	2.43B	3.09B	3.35B	1.34B	1.24B	1.39B	1.34B
> Net property/plant/equipment	54.73B	48.37B	46.67B	41.17B	42.01B	44.41B	48.23B
Deferred tax assets	6.62B	6.91B	9.24B	10.34B	11.46B	10.64B	9.53B
> Net intangible assets	8.47B	7.96B	8.52B	9.30B	9.03B	10.12B	11.59B
Deferred charges	528.78M	543.64M	-	-	-	-	-
Other long term assets, total	901.69M	1.01B	2.56B	2.48B	1.71B	2.19B	2.67B
▼ Total liabilities	54.26B -6.56%	43.35B -20.10%	52.83B +21.86%	57.21B +8.23%	54.23B -5.20%	48.96B -9.72%	53.04B +8.34%
> Total current liabilities	13.07B	9.10B	13.87B	14.60B	15.23B	13.73B	14.61B
▼ Total non-current liabilities	41.19B	34.25B	38.96B	42.61B	39.00B	35.23B	38.44B
> Long term debt	21.96B	15.86B	16.02B	18.26B	16.03B	12.08B	12.86B
Provision for risks & charge	7.68B	7.93B	19.78B	21.89B	20.45B	21.52B	24.56B
Deferred tax liabilities	1.71B	1.53B	1.89B	1.77B	1.88B	1.40B	866.68M
Deferred income, non-current	1.84B	1.60B	-	-	-	-	-
Other non-current liabilities, total	8.00B	7.33B	1.27B	688.86M	639.68M	236.00M	154.40M
> Total equity	44.65B +8.69%	44.81B +0.37%	39.07B -12.82%	34.84B -10.81%	35.38B +1.53%	36.91B +4.34%	40.83B +10.60%
Total liabilities & shareholders' equities	98.91B	88.17B	91.90B	92.05B	89.61B	85.87B	93.87B
Total debt	23.14B	16.63B	17.47B	20.12B	17.63B	12.56B	13.88B
Net debt	18.70B	10.78B	9.27B	5.85B	5.70B	7.82B	9.62B
Book value per share	8.34	8.58	7.83	6.97	7.14	7.91	9.14



Income Statement Analysis:

The income statement data shows that total revenue has experienced a slight decline of about 5.02% in 2023 from the previous year. However, the company managed to significantly reduce the cost of goods sold by 10.89% within the same period. The operating expenses also saw a decrease, contributing to an increase in operating income, which rose by 18.68% in 2023. Net income took a hit in 2021 but then saw an increase by 333.04% in 2022, indicating a strong recovery, although it then fell by 56.95% in 2023. The basic EPS followed a similar trend with an impressive increase in 2022 but a substantial decline of 54.27% in 2023.

Currency: USD	2017 Dec 2017	2018 Dec 2018	2019 Dec 2019	2020 Dec 2020	2021 Dec 2021	2022 Dec 2022	2023 Dec 2023
Total revenue	33.99B +25.22%	36.78B +8.20%	37.68B +2.44%	39.96B +6.04%	54.39B +36.14%	43.86B -19.37%	41.66B -5.02%
> Cost of goods sold	-21.44B	-22.54B	-21.67B	-18.05B	-22.03B	-24.30B	-24.23B
Gross profit	12.55B +34.75%	14.25B +13.47%	16.01B +12.39%	21.90B +36.80%	32.36B +47.75%	19.56B -39.57%	17.43B -10.89%
> Operating expenses (excl. COGS)	-1.08B	-1.03B	-8.67B	-5.50B	-2.97B	-1.59B	-2.82B
Operating income	11.48B +38.45%	13.22B +15.16%	7.34B -44.45%	16.41B +123.43%	29.39B +79.12%	17.96B -38.87%	14.61B -18.68%
> Non-operating income, total	-3.78B	-6.16B	-9.50B	-7.95B	1.39B	1.42B	-2.40B
Pretax income	7.70B +3.59%	7.06B -8.32%	-2.16B -130.60%	8.46B -	30.78B +264.02%	19.38B -37.04%	12.21B -37.00%
Equity in earnings	94.59M	-189.54M	-680.37M	-1.01B	-1.29B	312.90M	-1.09B
> Taxes	-1.44B	264.20M	636.03M	-897.02M	-4.69B	-2.94B	-3.00B
Non-controlling/minority interest	-20.36M	-32.00M	513.24M	350.90M	-21.31M	-79.97M	-122.93M
After tax other income/expense	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net income before discontinued operations	6.33B	7.10B	-1.69B	6.90B	24.78B	16.67B	8.00B
Discontinued operations	-810.00M	-84.79M	0.00	-1.72B	-2.31B	1.90B	0.00
Net income	5.52B +44.59%	7.02B +27.10%	-1.69B -124.10%	5.18B -	22.47B +333.80%	18.57B -17.32%	8.00B -56.95%
Dilution adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preferred dividends	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diluted net income available to common stockholders	5.52B	7.02B	-1.69B	5.18B	22.47B	18.57B	8.00B
Basic earnings per share (Basic EPS)	1.06 +44.58%	1.35 +27.52%	-0.33 -124.36%	1.01 -	4.48 +343.94%	4.00 -10.65%	1.83 -54.27%
Diluted earnings per share (Diluted EPS)	1.06 +44.58%	1.35 +27.52%	-0.33 -124.36%	1.01 -	4.48 +343.94%	4.00 -10.74%	1.83 -54.26%
Average basic shares outstanding	5.20B	5.18B	5.13B	5.13B	5.01B	4.64B	4.37B



Cash Flow Analysis:

The cash flow statement reveals a company maintaining strong cash generation from operations with an increase of 16.57% in 2023. Despite fluctuations in net income, the cash from operating activities has been relatively stable, indicating effective cash management. The funds from operations have also seen a substantial increase, emphasizing the company's ability to generate liquidity. The changes in working capital, particularly the change in inventories and accounts payable, have shown effective capital management in 2023 with an increase of 818.53M and 318.53M respectively. However, the cash from investing activities has seen a significant outflow, likely due to capital expenditures which saw a decrease, indicating a slowdown in the investment in capital assets for 2023. Cash from financing activities was also down, potentially due to a lower net issuance/retirement of stock and less net issuance/retirement of debt. Free cash flow showed an increase, signifying more cash available for various uses such as dividend pay-outs or further investments.

	2017 Dec 2017	2018 Dec 2018	2019 Dec 2019	2020 Dec 2020	2021 Dec 2021	2022 Dec 2022	2023 Dec 2023
Currency: USD							
▼ Cash from operating activities	12.75B +103.84%	13.36B +4.76%	12.35B -7.57%	14.76B +19.51%	25.54B +73.07%	11.49B -55.00%	13.40B +16.57%
▼ Funds from operations	12.31B	14.23B	14.05B	19.03B	27.76B	14.90B	16.23B
Net income (cash flow)	7.79B	6.87B	-2.84B	7.45B	29.49B	19.69B	11.12B
> Depreciation & amortization (cash flow)	3.71B	3.35B	3.74B	3.22B	3.04B	3.17B	3.06B
Deferred taxes (cash flow)	-	0.00	0.00	0.00	0.00	0.00	0.00
Non-cash items	806.87M	4.02B	13.15B	8.37B	-4.77B	-7.97B	2.04B
▼ Changes in working capital	440.71M	-875.21M	-1.70B	-4.27B	-2.22B	-3.41B	-2.83B
Change in accounts receivable	1.25B	-276.78M	-10.54M	-2.74B	853.20M	-350.86M	318.53M
Change in taxes payable	-	-	-	-	-	-	-
Change in accounts payable	216.44M	-386.73M	718.71M	-148.50M	238.32M	442.06M	620.24M
Change in accrued expenses	387.15M	-	-80.66M	279.36M	15.75M	-	-
Change in inventories	-322.62M	-818.87M	169.38M	-133.96M	-476.63M	40.86M	-223.43M
Change in other assets/liabilities	-1.09B	607.18M	-2.50B	-1.53B	-2.85B	-3.54B	-3.55B
▼ Cash from investing activities	-3.84B +20.74%	-563.14M +85.32%	-7.93B -1307.60%	-4.68B +40.92%	-6.73B -43.76%	-4.90B +27.15%	-6.49B -32.40%
> Purchase/sale of business, net	916.50M	1.34B	-1.59B	190.18M	701.42M	592.89M	0.00
> Purchase/sale of investments, net	-171.65M	-21.61M	-936.90M	-369.12M	451.06M	253.27M	87.29M
> Capital expenditures	-3.83B	-3.80B	-3.75B	-4.21B	-5.06B	-5.46B	-6.03B
> Other investing cash flow items, total	-747.98M	1.92B	-1.65B	-293.52M	-2.83B	-293.54M	-546.16M
▼ Cash from financing activities	-8.78B -969.74%	-11.07B -26.08%	-2.93B +73.50%	-3.69B -25.70%	-20.24B -448.88%	-13.75B +32.08%	-7.41B +46.12%
> Issuance/retirement of stock, net	0.00	-1.06B	0.00	0.00	-5.40B	-5.93B	-2.72B
> Issuance/retirement of debt, net	-7.10B	-6.45B	-2.53B	158.20M	-1.04B	-968.15M	1.28B
> Total cash dividends paid	-1.46B	-3.40B	0.00	-3.63B	-13.58B	-6.61B	-5.60B
> Other financing cash flow items, total	-222.08M	-173.67M	-176.20M	-15.12M	-13.34M	-10.46M	-130.73M
Free cash flow	8.92B +596.60%	9.56B +7.16%	8.60B -9.99%	10.54B +22.59%	20.48B +94.21%	6.04B -70.53%	7.36B +21.98%



Also, considering the other side, Vale SA's financial analysis exposes potential vulnerabilities, including liquidity risks from reduced cash reserves, which may hamper the company's operational agility and strategic investments. The heavy reliance on volatile iron ore prices, alongside an apparent uptick in operational costs signified by declining EBITDA, raises concerns about sustained profitability and margins. Additionally, manageable but noteworthy debt levels warrant monitoring against an environment of potential interest rate hikes and credit market shifts, which could influence Vale's cost of capital and dividend sustainability, directly affecting investor returns.

Currency: USD	2017 Dec 2017	2018 Dec 2018	2019 Dec 2019	2020 Dec 2020	2021 Dec 2021	2022 Dec 2022	2023 Dec 2023	Current
Key stats								
Total common shares outstanding	5.20B	5.13B	5.13B	5.13B	4.84B	4.48B	4.30B	4.30B >
Float shares outstanding	-	-	-	-	-	-	-	4.30B >
Number of employees	69.35K	70.27K	71.15K	74.32K	72.27K	64.52K	66.81K	- >
Number of shareholders	-	-	-	-	-	-	-	- >
Valuation ratios								
Price to earnings ratio	11.52	9.74	-	16.60	3.13	4.24	8.67	6.62 >
Price to sales ratio	1.87	1.86	1.80	2.15	1.29	1.80	1.66	1.26 >
Price to cash flow ratio	4.98	5.12	5.48	5.83	2.75	6.85	5.17	3.93 >
Price to book ratio	1.47	1.54	1.69	2.40	1.96	2.15	1.73	1.33 >
Enterprise value	83.57B	79.98B	75.89B	90.90B	76.81B	88.08B	80.44B	63.32B >
Enterprise value to EBITDA ratio	5.50	4.83	6.85	4.63	2.37	4.17	4.58	3.59 >
Profitability ratios								
Return on assets %	6.39	7.59	-1.88	7.50	27.28	19.00	8.90	8.92 >
Return on equity %	15.36	16.27	-4.02	18.18	70.48	47.65	21.39	21.44 >
Return on invested capital %	9.53	11.35	-2.92	12.52	47.38	34.00	16.04	16.08 >
Gross margin %	36.93	38.73	42.49	54.82	59.50	44.59	41.84	46.92 >
Operating margin %	33.77	35.94	19.49	41.06	54.03	40.96	35.07	39.70 >
EBITDA margin %	44.68	45.04	29.41	49.12	59.61	48.19	42.18	45.98 >
Net margin %	18.62	19.31	-4.49	17.27	45.55	38.01	19.20	18.58 >



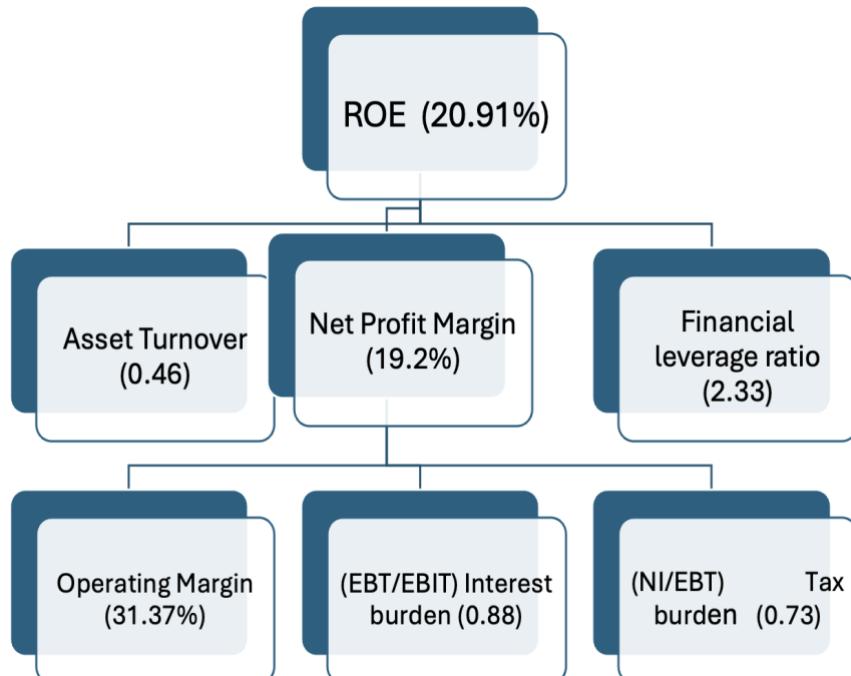
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Liquidity ratios									
Quick ratio	1.15	1.19	0.92	1.39	1.18	0.80	0.96	0.96	>
Current ratio	1.45	1.68	1.23	1.67	1.47	1.12	1.28	1.28	>
Inventory turnover	5.90	5.39	4.97	4.33	5.22	5.51	5.33	5.34	>
Asset turnover	0.34	0.39	0.42	0.43	0.60	0.50	0.46	0.46	>
Solvency ratios									
Debt to assets ratio	0.23	0.19	0.19	0.22	0.20	0.15	0.15	0.15	>
Debt to equity ratio	0.53	0.38	0.44	0.56	0.51	0.35	0.35	0.35	>
Long term debt to total assets ratio	0.22	0.18	0.17	0.20	0.18	0.14	0.14	0.14	>
Long term debt to total equity ratio	0.51	0.36	0.40	0.51	0.46	0.34	0.33	0.33	>

Liquidity ratios, such as the quick ratio, have remained relatively consistent, maintaining near 0.96 in recent years, indicating a stable position in covering current liabilities. Notably, the inventory turnover rate has maintained a steady rise from 4.97 in 2019 to 5.34 in 2023, illustrating an efficient conversion of inventory into sales.

Asset turnover has stayed uniform at 0.46, implying consistent efficiency in asset utilization to generate revenue. The solvency of the company, as shown by the debt-to-equity ratio, has improved from 0.53 in 2017 to 0.35 in 2023, reflecting a healthier balance sheet and better financial resilience.

DuPont Analysis:

Vale's DuPont analysis reveals a Return on Equity (ROE) of 20.91%, driven primarily by a high Net Profit Margin of 19.2%, leveraging a Financial Leverage Ratio of 2.33, despite a moderate Asset Turnover of 0.46. The robust Operating Margin of 31.37% before interest and taxes underlines Vale's operational efficiency. The company's interest and tax management are reflected in an interest burden of 0.88 and a tax burden of 0.73, respectively, indicating prudent financial stewardship and effective leverage use.





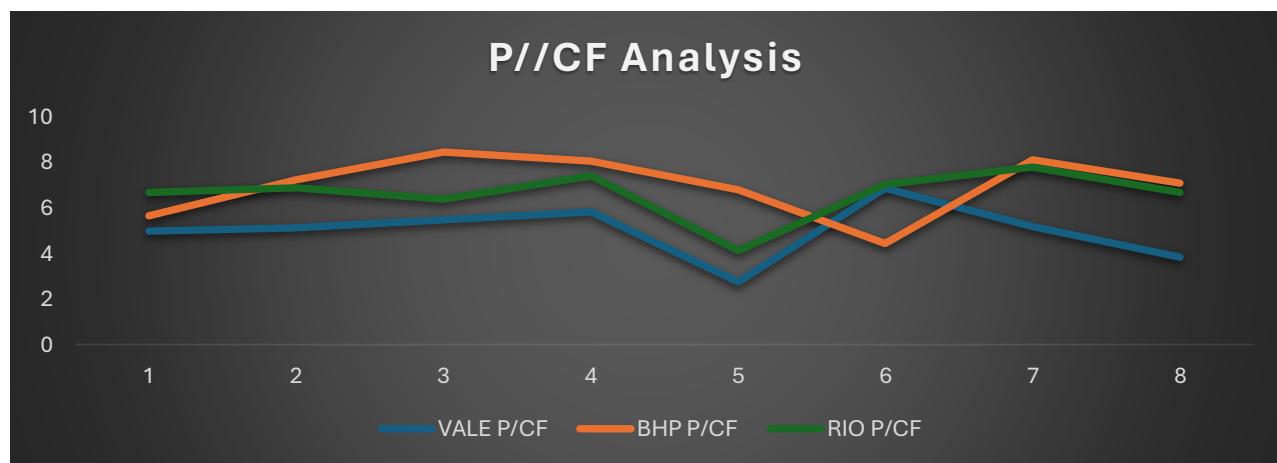
Relative Valuation:

In a relative valuation of Vale SA compared to industry peers, key metrics indicate a potential undervaluation in the market. The Price to Free Cash Flow (P/FCF) suggests a share price of \$14.29, with Price to Book (P/B) at \$15.84, highlighting the company's strong financials against lower market pricing. The EV/EBITDA ratio at \$14.96 and a relative yield derived share price of \$15.80 further reinforce Vale's attractive valuation. These figures collectively suggest that Vale's stock might be priced conservatively relative to its fundamental value.

Tickers	VALE	RIO	BHP
Metrics	Vale SA	Rio Tinto PLC	BHP Group Limited
Revenues	41.66	54.04	53.82
Full-Time Employees	67000	57000	80000
Valuation Ratios			
P/FCF	7.11	9.32	11.7
P/B	1.33	1.87	3.49
EV/EBITDA	3.65	5.46	6.74
Liquidity Ratios			
Current Ratio	1.28	1.69	1.57
Quick Ratio	0.96	1.17	1.22
Profitability Ratios			
Operating Margin	39.78%	25.43%	26.82%
Profit Margin	18.58%	18.05%	3.40%
ROE	21.44	19.13%	17.53%
ROA	8.92	10%	7.84%
Solvency Ratios			
LTD to Total Assets	0.14	0.13	0.2
Debt to Equity	0.35	0.24	0.54
Effeciency Ratios			
Inventory Turnover	5.34	6.07	7.09
Asset Turnover	0.46	0.54	0.59

VALE P/CF	BHP P/CF	RIO P/CF
4.98	5.65	6.67
5.12	7.23	6.86
5.48	8.44	6.38
5.83	8.03	7.4
2.75	6.78	4.12
6.85	4.43	7.01
5.17	8.09	7.78
3.84	7.07	6.67

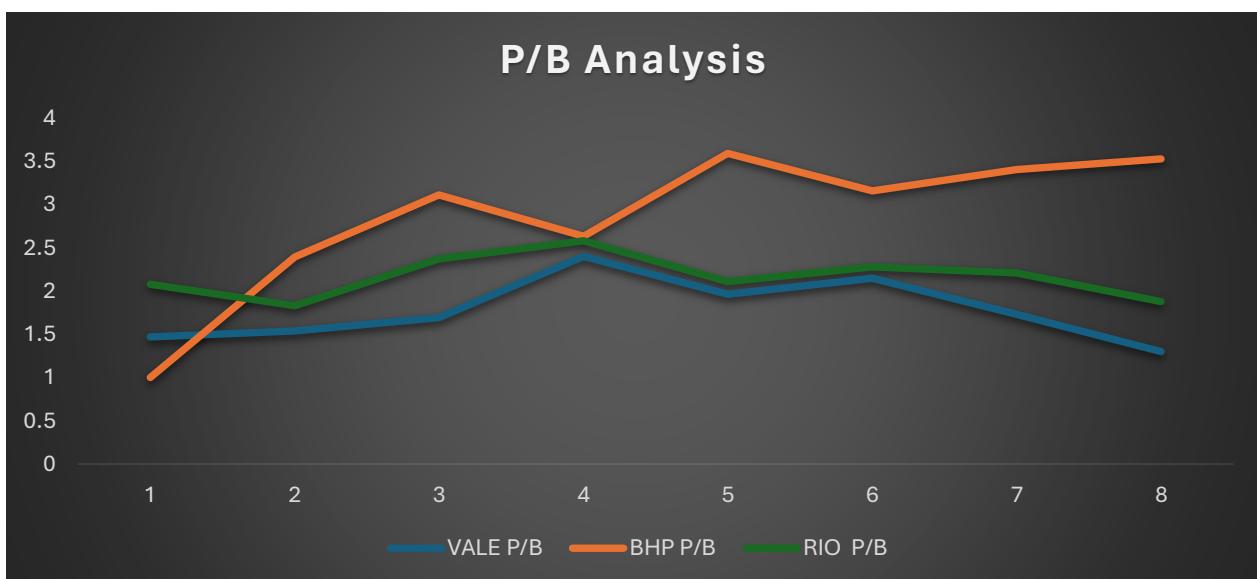
vale	avg p/cf
4.98	5.77
5.12	6.40
5.48	6.77
5.83	7.09
2.75	4.55
6.85	6.10
5.17	7.01
3.84	5.86





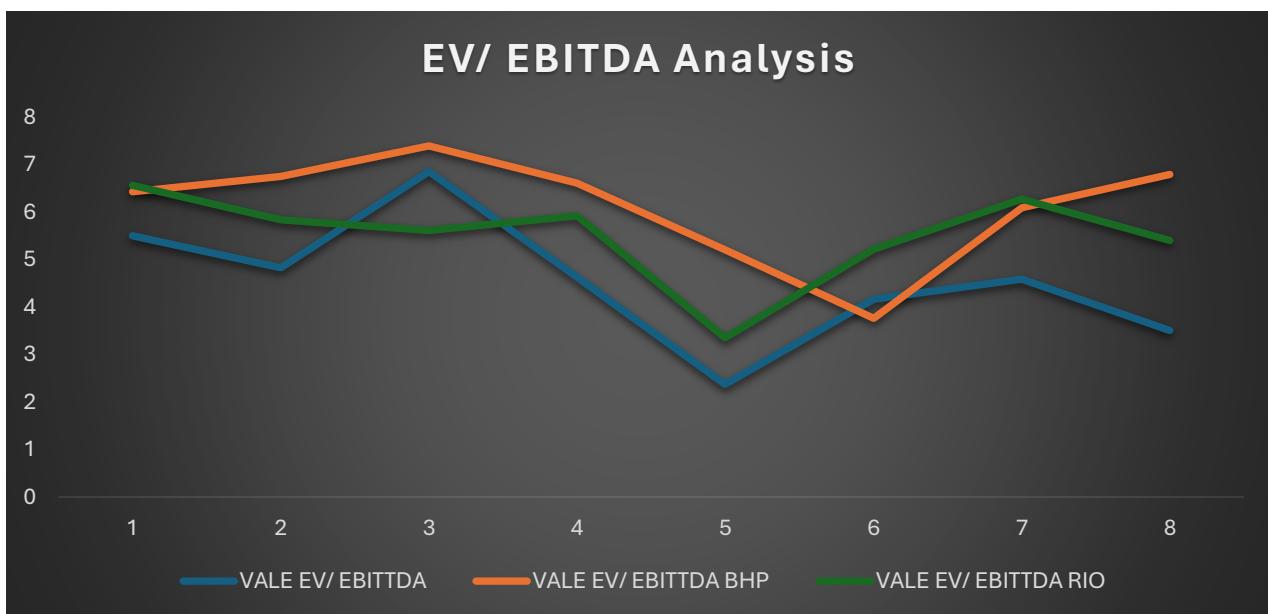
VALE P/B	BHP P/B	RIO P/B
1.47	1	2.08
1.54	2.39	1.83
1.69	3.11	2.37
2.4	2.63	2.58
1.96	3.59	2.11
2.15	3.16	2.28
1.73	3.4	2.21
1.3	3.53	1.88

vale	avg P/B
1.47	1.52
1.54	1.92
1.69	2.39
2.4	2.54
1.96	2.55
2.15	2.53
1.73	2.45
1.3	2.24



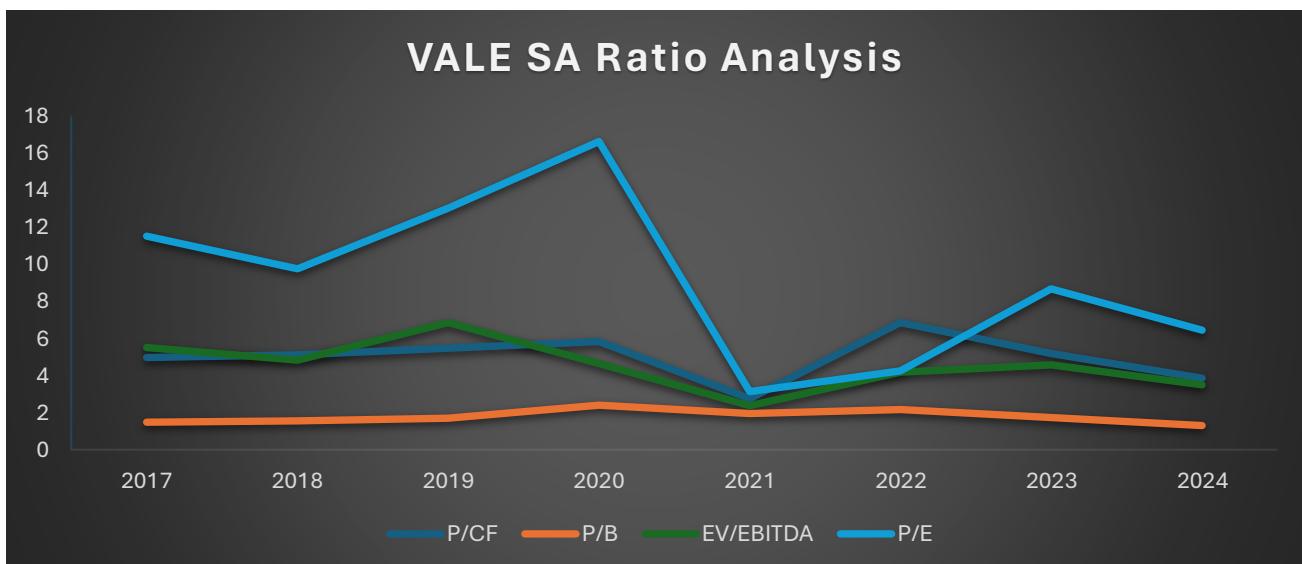
VALE EV/EBITDA	BHP	RIO
5.5	6.42	6.56
4.83	6.74	5.83
6.85	7.39	5.61
4.63	6.61	5.92
2.37	5.2	3.35
4.17	3.76	5.22
4.58	6.09	6.27
3.5	6.79	5.4

EV/EBITDA	AVG EV/EBITDA
5.5	6.16
4.83	5.80
6.85	6.62
4.63	5.72
2.37	3.64
4.17	4.38
4.58	5.65
3.5	5.23



Vale Ratio Analysis (Year on Year Basis)

Date	P/CF	P/B	EV/EBITDA	P/E
2017	4.98	1.47	5.5	11.52
2018	5.12	1.54	4.83	9.74
2019	5.48	1.69	6.85	13
2020	5.83	2.4	4.63	16.6
2021	2.75	1.96	2.37	3.13
2022	6.85	2.15	4.17	4.24
2023	5.17	1.73	4.58	8.67
2024	3.84	1.3	3.5	6.44





Financial Model (Vale S.A.)

OPERATING ASSUMPTIONS

	Historical			Projected						
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenue	44737	45302.0	41613	43485.585	45442.436	47487.346	49624.27653	51857.36897	54190.951	56629.54335
<i>Growth</i>			1.3%	(8.1%)	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
<i>Cost of Goods Sold:</i>										
COGS (Excl. Depn.)	23,453.0	24,839.0	24,003.0	23,047.4	24,084.5	25,168.3	26,300.9	27,484.4	28,721.2	30,013.7
% Sales	52.4%	54.8%	57.7%	53%	53%	53%	53%	53%	53%	53%
Depreciation	3,275.8	3,277.2	3,060.0	3,174.4	3,317.3	3,466.6	3,622.6	3,785.6	3,955.9	4,134.0
% Sales	7.3%	7.2%	7.4%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%
Total COGS	26728.8	28116.2	27,063.0	26,221.8	27,401.8	28,634.9	29,923.4	31,270.0	32,677.1	34,147.6
% Sales	59.7%	62.1%	65.0%	60.3%	60.3%	60.3%	60.3%	60.3%	60.3%	60.3%
<i>SG&A Expense:</i>										
SG&A Expense (Excl. Amt.)	474.8	489.4	504.6	521.8	545.3	569.8	595.5	622.3	650.3	679.6
% Sales	1.1%	1.1%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Other Expenses	1,748.0	1,762.0	1,500.0	1,565.5	1,635.9	1,709.5	1,786.5	1,866.9	1,950.9	2,038.7
% Sales	3.9%	3.9%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Total SG&A Expense	2222.8	2251.4	2,004.6	2,087.3	2,181.2	2,279.4	2,382.0	2,489.2	2,601.2	2,718.2
% Sales	5.0%	5.0%	4.8%	5%	5%	5%	5%	5%	5%	5%
EBITDA	19061.2	18211.6	15,605.4	18,350.9	19,176.7	20,039.7	20,941.4	21,883.8	22,868.6	23,897.7
<i>Margin</i>			40.2%	37.5%	42.2%	42.2%	42.2%	42.2%	42.2%	42.2%
<i>Growth</i>			(4.5%)	(14.3%)	17.6%	4.5%	4.5%	4.5%	4.5%	4.5%
Operating Profit (EBIT)	15785.4	14934.4	12,545.4	15,176.5	15,859.4	16,573.1	17,318.9	18,098.2	18,912.6	19,763.7
<i>Margin</i>			35.3%	33.0%	30.1%	34.9%	34.9%	34.9%	34.9%	34.9%
Total Capital Expenditures	5,460.2	5,636.8	5,889.2	6,500.0	6,816.4	7,123.1	7,443.6	7,778.6	8,128.6	8,494.4
% of Sales	12.2%	12.4%	14.2%	15%	15%	15%	15%	15%	15%	15%

INCOME STATEMENTS

	Historical			Projected					
	2023	2024	2025	2026	2027	2028	2029	2030	
Revenue	41,613.0	43,485.6	45,442.4	47,487.3	49,624.3	51,857.4	54,191.0	56,629.5	
Less: Total COGS	(27,063.0)	(26,221.8)	(27,401.8)	(28,634.9)	(29,923.4)	(31,270.0)	(32,677.1)	(34,147.6)	
Gross Profit	14,550.0	17,263.8	18,040.6	18,852.5	19,700.8	20,587.4	21,513.8	22,481.9	
Less: Total SG&A	(2,004.6)	(2,087.3)	(2,181.2)	(2,279.4)	(2,382.0)	(2,489.2)	(2,601.2)	(2,718.2)	
EBIT	12,545.4	15,176.5	15,859.4	16,573.1	17,318.9	18,098.2	18,912.6	19,763.7	
<i>Interest & Other Expense / (Income):</i>	<i>Rate</i>								
Total Interest Expense		5.8%		1,392.6	1,165.0	1,255.2	2,251.2	1,553.4	1,553.4
Less: Interest Income		4.0%		(94.0)	(91.0)	(95.1)	(99.4)	(103.9)	(108.6)
Financing Costs Amortization		7.0 y		17.1	17.1	17.1	17.1	17.1	17.1
Pretax Income				13,860.7	14,768.4	15,395.9	15,150.0	16,631.6	17,450.7
Less: Income Taxes		34.00%		(4,712.7)	(5,021.2)	(5,234.6)	(5,151.0)	(5,654.8)	(5,933.2)
Net Income				9,148.1	9,747.1	10,161.3	9,999.0	10,976.9	11,517.5
Shares Outstanding				4,300	4,300	4,300	4,300	4,300	4,300
Earnings per Share (EPS)				\$2.1	\$2.3	\$2.4	\$2.3	\$2.6	\$2.7
<i>EBITDA Reconciliation:</i>									
EBIT				15,176.5	15,859.4	16,573.1	17,318.9	18,098.2	18,912.6
Plus: Depreciation & Amortisation				3,174.4	3,317.3	3,466.6	3,622.6	3,785.6	3,955.9
EBITDA				18,350.9	19,176.7	20,039.7	20,941.4	21,883.8	22,868.6



WORKING CAPITAL ASSUMPTIONS

	Pro Forma				Projected			
	2023	2024	2025	2026	2027	2028	2029	2030
Sales	\$41,613	\$43,486	\$45,442	\$47,487	\$49,624	\$51,857	\$54,191	\$56,630
Total COGS	(27063.0)	(26221.8)	(27401.8)	(28634.9)	(29923.4)	(31270.0)	(32677.1)	(34147.6)
Current Assets								
Required Cash	2349.2	2276.2	2378.6	2485.7	2597.5	2714.4	2836.6	2964.2
Accounts Receivable	4063.0	4245.8	4436.9	4636.6	4845.2	5063.2	5291.1	5529.2
Inventory	4536.0	4395.0	4592.8	4799.5	5015.4	5241.1	5477.0	5723.4
Prepaid Expenses	429.0	415.7	434.4	453.9	474.3	495.7	518.0	541.3
Other	7577.0	7341.5	7671.9	8017.1	8377.9	8754.9	9148.8	9560.5
Current Assets	18105.0	18674.2	19514.6	20392.7	21310.4	22269.3	23271.5	24318.7
Current Liabilities								
Accounts Payable	4101.0	3973.5	4152.3	4339.2	4534.5	4738.5	4951.7	5174.6
Accrued Expenses	637.0	617.2	645.0	674.0	704.3	736.0	769.1	803.8
Other	9451.6	9157.8	9569.9	10000.6	10450.6	10920.9	11412.3	11925.9
Current Liabilities	14189.6	13748.5	14367.2	15013.8	15689.4	16395.4	17133.2	17904.2
Net Cash Impact								
Net Working Capital	3915.4	4925.7	5147.3	5379.0	5621.0	5873.9	6138.3	6414.5
Cash (Used by) / Generated from Work. Cap.	-1010.3	-221.7	-231.6	-242.1	-252.9	-264.3	-276.2	
Ratios								
Required Cash % of COGS	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%	8.7%
A/R % of Sales	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%	9.8%
Days Receivable	35.6 d							
Inventory % of COGS	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%
Inventory Turns	61.2x							
Prepaid % of COGS	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%
Accts Payable % of COGS	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%	15.2%
Accrued % of COGS	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
Other Assets % COGS	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%
Other Liabilities % COGS	35%	35%	35%	35%	35%	35%	35%	35%

BALANCE SHEETS

	Historical				Projected			
	Dec-23	Dec-24	Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30
ASSETS:								
Required Cash	\$2,349.2	\$2,955.4	\$3,088.4	\$3,227.4	\$3,372.6	\$3,524.4	\$3,683.0	\$3,848.7
Excess Cash	\$1,195.8	\$479.4	\$501.0	\$523.5	\$547.1	\$571.7	\$597.4	\$624.3
Total Cash	\$3,545.0	3,434.8	3,589.4	3,750.9	3,919.7	4,096.1	4,280.4	4,473.0
Accounts Receivable	4,063.0	4,245.8	4,436.9	4,636.6	4,845.2	5,063.2	5,291.1	5,529.2
Inventory	4,536.0	4,395.0	4,592.8	4,799.5	5,015.4	5,241.1	5,477.0	5,723.4
Prepaid Expenses	429.0	415.7	434.4	453.9	474.3	495.7	518.0	541.3
Other	5,532.0	7,341.5	7,671.9	8,017.1	8,377.9	8,754.9	9,148.8	9,560.5
Current Assets	18,105.0	19,832.8	20,725.3	21,657.9	22,632.5	23,651.0	24,715.3	25,827.5
PP&E - Gross	78,884.8	85,384.8	92,201.2	99,324.3	106,767,908.8	114,546,514.2	122,675.16	131,169,588.3
Less: Accum. Depn.	(32,024.4)	(35,198.8)	(38,516.1)	(41,982.7)	(45,605.3)	(49,390.9)	(53,346.8)	(57,480.8)
Net PP&E	46,860.4	50,186.0	53,685.0	57,341.5	61,162.6	65,155.6	69,328.3	73,688.8
Intangibles	11,261.8	12,318.0	11,793.6	15,576.2	17,217.2	19,014.6	20,899.9	22,877.3
Other Non-Current assets	14,850.3	20,199.4	29,631.0	35,157.9	42,413.3	50,599.6	59,205.4	68,250.4
Financing cost	119.7	102.6	85.5	68.4	51.3	34.2	17.1	0.0
Total Assets	\$91,197	\$102,639	\$115,920	\$129,802	\$143,477	\$158,455	\$174,166	\$190,644
LIABILITIES & EQUITY:								
Accounts Payable	4,101.0	3,973.5	4,152.3	4,339.2	4,534.5	4,738.5	4,951.7	5,174.6
Accrued Expenses	637.0	617.2	645.0	674.0	704.3	736.0	769.1	803.8
Other	9,451.6	9,157.8	9,569.9	10,000.6	10,450.6	10,920.9	11,412.3	11,925.9
Current Liabilities	14,189.6	13,748.5	14,367.2	15,013.8	15,689.4	16,395.4	17,133.2	17,904.2
Capital Lease Obligations	1,161.0	1,427.8	1,712.7	2,009.6	2,301.8	2,622.6	2,959.1	3,312.2
Long Term Loan	10,807.5	13,297.0	15,949.9	18,715.5	21,436.5	24,423.6	27,557.8	30,845.5
Total Debt	11,968.0	14,724.8	17,662.6	20,725.1	23,738.3	27,046.2	30,516.9	34,157.7
Other Liabilities	25,374.2	25,351.9	25,330.0	25,341.2	25,328.3	25,315.6	25,300.6	25,284.4
Total Liabilities	51,531.8	53,825.3	57,359.8	61,080.0	64,756.0	68,757.2	72,950.7	77,346.3
Common Equity	39,665.4	48,813.5	58,560.6	68,721.9	78,720.9	89,697.8	101,215.28	113,297.6823
Liabilities & Equity	\$91,197	\$102,639	\$115,920	\$129,802	\$143,477	\$158,455	\$174,166	\$190,644
Check	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000



CASH FLOW STATEMENTS

	Projected						
	<u>Dec-24</u>	<u>Dec-25</u>	<u>Dec-26</u>	<u>Dec-27</u>	<u>Dec-28</u>	<u>Dec-29</u>	<u>Dec-30</u>
<u>Operating Activities:</u>							
Net Income	9148.09	9747.12	10161.32	9999.00	10976.87	11517.48	12082.41
Depreciation	3174.45	3317.30	3466.58	3622.57	3785.59	3955.94	4133.96
Non-Cash Expense	950.0	997.5	1,047.4	1,099.7	1,154.7	1,212.5	1,273.1
Subtotal	13,272.5	14,061.9	14,675.3	14,721.3	15,917.2	16,685.9	17,489.5
Changes in Working Capital	(1,010.3)	(221.7)	(231.6)	(242.1)	(252.9)	(264.3)	(276.2)
Cash Flow from Operations	12,262.3	13,840.3	14,443.6	14,479.3	15,664.2	16,421.6	17,213.2
<u>Investing Activities:</u>							
Less: Capital Expenditures	(6,500.0)	(6,816.4)	(7,123.1)	(7,443.6)	(7,778.6)	(8,128.6)	(8,494.4)
Plus: Investment Gains/(Losses)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cash Flow from / (Used by) Investing	(6,500.0)	(6,816.4)	(7,123.1)	(7,443.6)	(7,778.6)	(8,128.6)	(8,494.4)
Cash Available for Debt Repayment	5,762.3	7,023.9	7,320.5	7,035.6	7,885.6	8,292.9	8,718.8
<u>Financing Activities Capital Inflow / (Outflow):</u>							
Revolver	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Term Loan	(1,709.7)	(1,709.7)	(1,709.7)	(1,709.7)	(1,709.7)	(1,709.7)	(1,709.7)
Sr. Sub. Notes	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest paid	(94.0)	(91.0)	(95.1)	(99.4)	(103.9)	(108.6)	(113.5)
Proceeds from borrowings	2,300.0	2,300.0	2,300.0	2,300.0	2,300.0	2,300.0	2,300.0
Dividends Paid	(5,488.9)	(5,848.3)	(6,096.8)	(5,999.4)	(6,586.1)	(6,910.5)	(7,249.4)
Cash Flow from / (Used by) Financing	(4,992.5)	(5,349.0)	(5,601.6)	(5,508.5)	(6,099.7)	(6,428.8)	(6,772.6)
Net Increase / (Decrease) in Cash	769.7	1,674.9	1,718.9	1,527.1	1,785.9	1,864.1	1,946.2

Debt Structure

	Projected						
	<u>Dec-24</u>	<u>Dec-25</u>	<u>Dec-26</u>	<u>Dec-27</u>	<u>Dec-28</u>	<u>Dec-29</u>	<u>Dec-30</u>
<u>Scheduled Debt Retirement</u>							
Revolver	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Term Loan	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7
Sr. Sub. Notes	0.0	0.0	0.0	0.0	0.0	0.0	0.0

USES OF FUNDS

<u>Required Debt Retirement</u>	<u>Years to Amortize</u>	<u>Dec-24</u>	<u>Dec-25</u>	<u>Dec-26</u>	<u>Dec-27</u>	<u>Dec-28</u>	<u>Dec-29</u>	<u>Dec-30</u>
Revolver	7y	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Term Loan		1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7
Sr. Sub. Notes		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Debt Retirement		1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7
Uses of Funds Subtotal		1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7	1,709.7
Excess Cash Added to Balance Sheet		5,248.3	5,793.6	6,111.8	5,849.4	6,723.0	7,154.9	7,606.5
Total Uses of Funds		6,958.0	7,503.3	7,821.5	7,559.2	8,432.7	8,864.6	9,316.2

SOURCES OF FUNDS

<u>Existing Excess Cash</u>	<u>Dec-24</u>	<u>Dec-25</u>	<u>Dec-26</u>	<u>Dec-27</u>	<u>Dec-28</u>	<u>Dec-29</u>	<u>Dec-30</u>
Cash Available for Debt Repayment	\$1,195.8	\$479.4	\$501.0	\$523.5	\$547.1	\$571.7	\$597.4
	5,762.3	7,023.9	7,320.5	7,035.6	7,885.6	8,292.9	8,718.8
Subtotal	6,958.0	7,503.3	7,821.5	7,559.2	8,432.7	8,864.6	9,316.2
Incremental Revolver Borrowings	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Sources of Funds	6,958.0	7,503.3	7,821.5	7,559.2	8,432.7	8,864.6	9,316.2
Check	0.000	0.000	0.000	0.000	0.000	0.000	0.000



6. Valuations

1. Discounted Cash Flow (DCF) Valuation:

The DCF model suggests a valuation that results in a DCF value per share of approximately \$20.94. This figure significantly exceeds the current share price of \$12, indicating that Vale SA may be undervalued by the market if the company achieves the forecasted cash flows. Sensitivity analysis showcases stock price for multiple assumptions of WACC and growth.

Beta estimates

Source	Beta
YahooFinance	0.93
ValueLine	1.2
TradingView	1.24
MarketWatch	1.06
Average Beta	1.11

Risk free rate	5.70%
Equity risk premium	5.50%
Extra risk premium	0.80%
CAPM	11.8%
Cost on equity	12.00%
Cost of debt	5.80% as per MD&A
tax rate	34%
Weightage of debt	0.26
Weightage of equity	0.74

	Brazil	USA	Weighted Average
risk free rate	10.0%	4.3%	5.7%
MRP	8.0%	4.6%	5.5%

WACC 10%

Extra risk premium. = china slowdown + company operational risk history

VALUATION ANALYSIS

PV	Projected						
	Dec-24 0	Dec-25 1	Dec-26 2	Dec-27 3	Dec-28 4	Dec-29 5	Dec-30 6

Free Cash Flow Calculation

EBIT	15176.47	15859.41	16573.08	17318.87	18098.22	18912.64	19763.71
Plus: Depreciation	3,174.4	3,317.3	3,466.6	3,622.6	3,785.6	3,955.9	4,134.0
EBITDA	18,350.9	19,176.7	20,039.7	20,941.4	21,883.8	22,868.6	23,897.7
Less: Capex	(6,500.0)	(6,816.4)	(7,123.1)	(7,443.6)	(7,778.6)	(8,128.6)	(8,494.4)
EBITDA Less Capex	11,850.9	12,360.3	12,916.6	13,497.8	14,105.2	14,739.9	15,403.2
Less: Taxes on EBIT	(4,712.7)	(5,021.2)	(5,234.6)	(5,151.0)	(5,654.8)	(5,933.2)	(6,224.3)
Less: Changes in Working Capital	(1,010.3)	(221.7)	(231.6)	(242.1)	(252.9)	(264.3)	(276.2)
Unlevered Free Cash Flow	6,128.0	7,117.4	7,450.3	8,104.7	8,197.5	8,542.4	8,902.7

DCF Enterprise Value Calculation

Terminal Value Calculation

Terminal Value Growth Rate	3.00%
Projected Free Cash Flow	9,169.8
Discount Rate (WACC)	10.00%
Terminal Enterprise Value	130,997.5
Implied Term. Value EBITDA Multiple	5.5x

Discounted Cash Flows at WACC

Unlevered Free Cash Flow	5,570.9	5,882.2	5,597.5	5,535.7	5,090.0	4,821.9	4,568.5
Terminal Value							67,222.4
Total Discounted Cash Flows	104,289.2	5,570.9	5,882.2	5,597.5	5,535.7	5,090.0	4,821.9



Summary DCF Valuation (PreDeal)		
DCF Enterprise Value	\$104,289.2	6.7x
Less: Net Debt (PreDeal)	(14,724.8)	
Add : Excess Cash	479.4	
Equity Value	90,043.8	
Shares (PreDeal)	4,300,000	
DCF Value per Share	\$20.94	9.8x Forward

DCF Equity Sensitivity Analysis					
Growth	WACC				
	9.0%	10.0%	11.0%	12.0%	13.0%
2.0%	22.12	18.85	16.32	14.29	12.63
3.0%	25.06	20.94	17.85	15.45	13.53
4.0%	29.17	23.72	19.83	16.91	14.64
5.0%	35.35	27.62	22.47	18.78	16.02

2. Dividend Discount Model (DDM):

Based on Vale's dividend history and a projected long-term growth rate, the DDM valuation presents a share price of \$18.01 to \$19.51. These values are derived from an actual dividend of \$5,593 million and forecasted dividends that increase over time, factoring in a long-term growth rate and cost of equity.

Dividend History	2020	2021	2022	2023
Total income (in millions)	7,681.0	31,829.4	20,340.8	11,110.8
Diluted Net Income (in millions)	5,342.6	24,245.6	19,184.8	7,988.0
Total Dividend paid (in millions)	3,741.80	14,657.40	6,831.40	5,593.40
Diluted Normalised EPS	2.586	5.92	3.816	2.09
Dividend Paid per share	0.482	2.930	1.516	1.216
Dividend Yield	6.77	19.04	6.11	8.43
Dividend payout ratio (diluted)	70%	60%	36%	70%
Dividend payout ratio (total)	49%	46%	34%	50%
			Average rates	
			59%	
			45%	

Dividend Gordon Growth Model
Based Valuation

Assumptions
Dividend (2023) (in millions)
Long-term growth rate
Cost of Equity
Number of Outstanding shares
Forecasted Dividend payout(historical analysis)

Output

Year	Dividend Forecast : Finite Horizon							
	2023	2024	2025	2026	2027	2028	2029	2030
Dividend	\$5,593	\$5,488.85	\$5,848.27	\$6,096.79	\$5,999.40	\$6,586.12	\$6,910.49	\$7,249.44
Terminal value							\$103,563.49	
Dividend + Terminal Value	\$488,853.682	\$488,271.313	\$696,789.3	\$999,401.1	\$586,124.1	\$110,473.97		
Present value	\$77,421.97							

Growth	DDM Sensitivity Analysis				
	Cost of Equity				
Growth	10.0%	11.0%	12.0%	13.0%	14.0%
	19.76	17.24	15.29	13.73	12.46
Growth	22.02	18.85	16.48	14.63	13.16
	25.19	21.00	18.01	15.76	14.01
Growth	29.95	24.01	20.04	17.20	15.08

Share Price		\$18.01
Dividend Growth Model		
Year	2023	2024
Dividend	\$5,593	\$5,872.65
Terminal value		\$3895.00
Dividend + Terminal Value		\$3895.00
Present value	\$83,895.00	

DCF Forecast	20.94
DDM (Historical analysis) forecast	18.01
DDM gordon Growth Model	19.51

Share Price \$19.51



3. Relative Valuation:

Relative valuation techniques yield share prices ranging from \$14.29 to \$15.84 based on P/FCF and P/B multiples, suggesting that Vale's operational earnings and assets may not be fully accounted for in the current stock price.

Comparable Company Analysis			Market Data				Financial Data						Valuation				
Company	Ticker	Share price	Shares Outstanding	Market Value	Net Debt	Enterprise Value	All values in billions						P/FCF	P/B	EV/EBITDA	Relative Yield	
							Cash	Revenue	EBITDA	Net Income	Free Cash Flow/Share	Book Value/Share					
Vale SA	VALE	12.18	4.3	52.37	16.2	64.3	3.544	41.66	17.44	8.00	1.712	9.02	9.86%	7.11	1.33	3.65	129.74%
Rio Tinto PLC	RIO	63	1.25	78.75	14.35	114.78	10.79	54.04	15.98	10.06	6.832	32	7.19%	9.32	1.87	5.46	94.61%
BHP Group Limited	BHP	57.04	2.53	144.31	22.4	163.17	10.35	53.82	27.67	12.92	4.885	16.11	5.75%	11.7	3.49	6.74	75.66%
Minimum													5.75%	7.11	1.33	3.65	
Maximum													9.86%	11.7	3.49	6.74	
Median													7.19%	9.32	1.87	5.46	
Mean													7.60%	9.38	2.23	5.28	
Regression based weighted ratios														8.35	1.76	4.42	

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.900177553
R Square	0.810319627
Adjusted R Squ	0.778706232
Standard Error	0.623000727
Observations	8

ANOVA

	df	SS	MS	F	Significance F
Regression	1	9.94860806	9.94860806	25.6321606	0.00230425
Residual	6	2.32877944	0.38812991		
Total	7	12.2773875			

Coefficients	standard Err	t Stat	P-value	Lower 95%	Upper 95%	lower 95.0%	upper 95.0%
Intercept	-2.105290167	1.33359821	-1.578654	0.1654933	-5.3684874	1.15790709	-5.3684874
AVG EV/EBITDA	1.233250745	0.24358962	5.0628214	0.00230425	0.63720842	1.82929307	0.63720842

Equation	EV/EBITDA	(1.2332 * Avg EV/EBITDA) - 2.1
Equation	P/B	(0.6555 * Avg P/B) + 0.2944
Equation	P/CF	(1.05125* Avg P/CF) - 1.508

Relative Valuation Calculation		Share Price
P/FCF		14.29
P/B		15.84
EV/EBITDA		14.96
Relative yeild		15.80



4. Stock Prediction Regression Model:

The multi-variable regression model, enhanced by ARIMA for residual auto-correlation analysis and ARCH/GARCH for volatility prediction, offers a range of potential price forecast. For price prediction initially 26 variables were selected which on executing the whole procedure showed that final model had correlation with 12 variables as mentioned below.

Volume	Free Cash Flow
Rio Tinto price	Tangible Book Value
BHP Price	Total Debt
VIX	Ordinary Shares Number
Iron ore price	Capital Expenditures
Copper price	Total Assets
Enterprise Value	Cash And Cash Equivalents
ResearchAndDevelopment	Inventory
TotalRevenue	FinancialAssets
CostOfRevenue	Working Capital
TaxProvision	Repurchase Of Capital Stock
DepreciationAmortizationDepletion	Cash Dividends Paid
ChangeInWorkingCapital	Long Term Debt Payments
	CashFlowFromContinuingFinancingActivities

Multi-Variable Regression based Stock recommendation with Time Series based Residual and Volatility analysis

```
y ~ x2 + x4 + x5 +x9 + x11 + x12 + x13 + x17 + x18 + x19 + x21 + x22
y = Share price
x2 = Rio Tinto price = 76
x4 = VIX = 21.67
x5 = Iron ore price = 120.53
x9 = Total revenue = 10871400000
x11 = Tax provision = 1178317500
x12 = depreciation = 742740000.00; 804583333.33(average)
x13 = change in working capital = -123140000
x17 = shares outstanding = 4303392869
x18 = capital expenditure = -1625160000
x19 = total assets = 102639700000
x21 = inventory= 5426685000; 4660350000.00(average)
x22 = financial assets = 205291666
```

Forecasted on basis of 2024 annual statement forecasts

Based on our chosen model and the new data obtained from the values of 2024 Financial model, we get a stock price prediction of **16.5796** for 2024.

Current stock price: 11.60

Hence, we provide a long recommendation.

```
> x <-predict(model_2, newdata=new)
> x
 1
16.57961
```

Final Model Analysis for Vale:

- Share price is influenced by Iron ore prices majorly and not much by copper and nickel price fluctuations because company's 80% revenues are from Iron Ore segment.
- Share price is more correlated to Rio Tinto than BHP which is also confirmed from the relative valuations line graphs mentioned above.
- Mining companies are heavy on assets and play a significant role in share price fluctuations as per final model.
- Capital expenditure plays significant role in improving volume production and quality of production. Capex has influence on the share price as per the developed model.
- ARIMA and ARCH effect was insignificant for Vale's stock price case.



5. Equity Analyst Targets

Price target

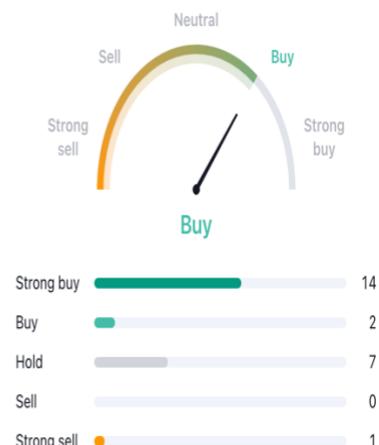
16.20 USD
+4.02 +33.03%

The 22 analysts offering 1 year price forecasts for VALE S.A. have a max estimate of 19.50 and a min estimate of 11.10.



Analyst rating

Based on 24 analysts giving stock ratings to VALE S.A. in the past 3 months.



Per-Share Earnings, Actuals & Estimates Vale S.A. ADR



FY 2024 Estimate Trends

Current:	\$2.47
1 month ago:	\$2.59
3 months ago:	\$2.56

FY 2025 Estimate Trends

Current:	\$2.29
1 month ago:	\$2.35
3 months ago:	\$2.38

Analyst Ratings Vale S.A. ADR



Stock Price Target VALE

High	\$20.50
Median	\$18.00
Low	\$12.60
Average	\$17.46

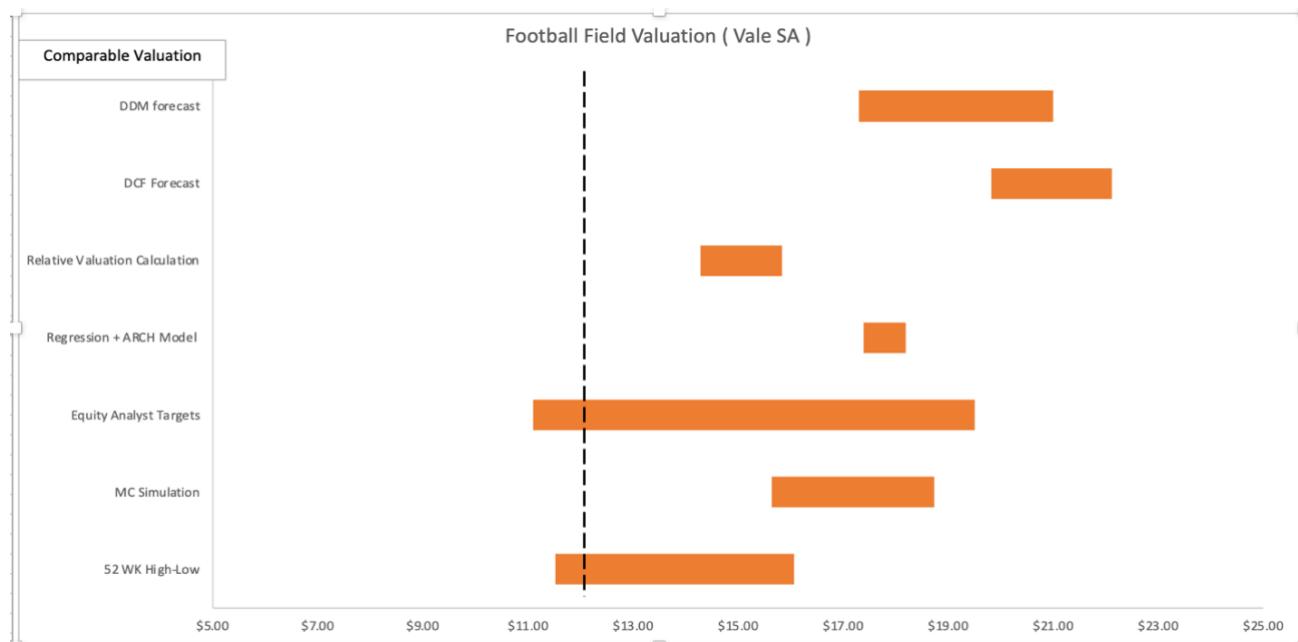
Time	Symbol	Headline	Provider
5 days ago	▼	Barclays Raises Price Target on Vale to \$17 From \$16, Keeps Overweight Rating	MT Newswires
5 days ago	▼	Vale SA Is Maintained at Overweight by Barclays	Dow Jones Newswires
Apr 12	▼	JPMorgan Trims Price Target on Vale to \$20 From \$20.50, Maintains Overweight Rating	MT Newswires
Apr 12	▼	Vale SA Is Maintained at Overweight by JP Morgan	Dow Jones Newswires
Apr 9	▼	UBS Lowers Vale's Price Target to \$13 From \$15, Maintains Neutral Rating	MT Newswires
Apr 9	▼	Vale SA Cut to Neutral From Buy by B of A Securities	Dow Jones Newswires
Apr 4	▼	Vale SA Is Maintained at Hold by Deutsche Bank	Dow Jones Newswires
Mar 8	▼	Vale SA Is Maintained at Outperform by RBC Capital	Dow Jones Newswires
Mar 8	▼	RBC Trims Price Target on Vale to \$18.50 From \$19, Keeps Outperform Rating	MT Newswires
Feb 12	▼	Vale SA Price Target Maintained With a \$19.00/Share by RBC Capital	Dow Jones Newswires
Dec 14, 2023	▼	UBS Adjusts Vale Price Target to \$15 From \$14, Maintains Neutral Rating	MT Newswires



Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment¹
11.96 USD 15 Mar 2024	15.00 USD 6 Mar 2024 06:27, UTC	0.80	51.20 USD Bil 15 Mar 2024	None	Large Value	High	Poor	6 Mar 2024 06:00, UTC
Competitors								
Vale SA ADR VALE	BHP Group Ltd BHP	Fortescue Ltd FMG	Rio Tinto Ltd RIO					
Economic Moat	None	None	None	None				
Currency	USD	AUD	AUD	AUD				
Fair Value	15.00 6 Mar 2024 06:27, UTC	42.00 20 Feb 2024 12:00, UTC	17.30 16 Jan 2024 04:04, UTC	116.00 16 Jan 2024 03:38, UTC				
1-Star Price	23.25	56.70	26.82	156.60				
5-Star Price	9.00	29.40	10.38	81.20				
Assessment	Undervalued 17 Mar 2024	Fairly Valued 18 Mar 2024	Overvalued 18 Mar 2024	Fairly Valued 18 Mar 2024				
Morningstar Rating	★★★★ 15 Mar 2024 21:21, UTC	★★★ 18 Mar 2024 07:06, UTC	★★ 18 Mar 2024 07:06, UTC	★★★ 18 Mar 2024 07:06, UTC				
Analyst	Jon Mills, Equity Analyst	Jon Mills, Equity Analyst	Jon Mills, Equity Analyst	Jon Mills, Equity Analyst				
Capital Allocation	Poor	Standard	Standard	Standard				
Price/Fair Value	0.80	1.01	1.37	1.01				
Price/Sales	1.25	2.58	2.65	2.34				
Price/Book	1.30	3.44	2.52	2.30				
Price/Earning	6.54	19.29	8.48	12.57				
Dividend Yield	11.83%	5.53%	8.78%	5.56%				
Market Cap	51.20 Bil	214.78 Bil	73.77 Bil	189.77 Bil				
52-Week Range	11.88 – 16.60	41.66 – 50.84	18.91 – 29.95	102.51 – 136.73				
Investment Style	Large Value	Large Value	Large Value	Large Value				

6. Football Field Valuation

In the Football Field Valuation chart, these varying valuations from different methodologies are visualized, showing a spread of potential fair values for Vale SA's stock, all lying above the \$12 mark, thus indicating a potential undervaluation. The Median of Estimated End-of-Period Prices is \$17.09, and the 5% Value at Risk (VaR) is calculated at \$6.18, providing a risk-adjusted perspective on stock price expectations. This array of valuations highlights the potential undervaluation of Vale SA based on these different financial models and suggests that the current market price may not reflect the full value indicated by these various valuation methods.





7. Trend and Momentum Analysis

Key takeaway:

1. Buy Zone (\$ 11 – \$ 12) is a good entry point (Strong support zone)
2. **Descending triangle pattern** formation. Stock price crossing the triangle upwards will be a good bullish signal.
3. RSI oscillates between 25 and 75 but overtime every 75 was with lower price which conveys stock is in **downtrend**.
4. **MACD** is forming symmetric triangle which gives probability of both side movement possible. Will be interesting to which side the triangle is breached with time.
5. If triangle pattern is broken in downward side or MACD breached in downside then stock may turn bearish and can be expected to be range from \$9.8 to \$ 11.4
6. Upside resistance (S15.9 and \$ 18.71) are two crucial levels.





8. Risks

1. Geopolitical Risk:

- **Political Golden Shares Risk:** The Brazilian government holds 'golden shares' in Vale, giving it the ability to block changes that could affect the company's strategic direction. This control can introduce uncertainty for investors, especially during political shifts, as seen in the recent years with Brazil's political landscape's volatility.
- **Economic Instability:** Brazil's GDP growth has been tepid, with the country experiencing a modest average GDP growth rate of about 1.1% from 2017 to 2021. A continuation of this slow growth could dampen domestic infrastructure investments and, consequently, the demand for iron ore within Brazil, impacting Vale's local sales.
- **Regulatory Risk:** Vale's operations could be affected by changes in mining regulations or tax policies. For example, a new mining royalty regime introduced in 2017 in Brazil, which increased rates for iron ore producers, could affect Vale's operational costs and reduce profitability.
- **Operational Interruptions:** Unrest or regulatory changes can lead to operational disruptions. For instance, a nationwide truckers' strike in Brazil in 2018 significantly impacted Vale's ability to transport goods, affecting its distribution chain and sales volume for that period.
- **Environmental Policy Shifts:** Brazil's environmental policies can also significantly influence Vale's operations. After the environmental disasters involving dam failures, stricter environmental policies were put in place, which could lead to higher compliance costs and affect Vale's license to operate.

2. Commodity Price Fluctuation:

- Iron ore, which constitutes roughly 80% of Vale's total revenue, experienced price volatility, with prices swinging from a high of \$200 per metric ton in 2021 to around \$95 per metric ton in 2023. This volatility directly affects Vale's top-line growth and profitability.

3. China's Economic Fluctuations:

- China accounts for about 50% of global iron ore demand and is a key market for Vale. China's economic fluctuations pose a crucial risk for Vale SA, particularly due to the recent slowdown in growth and the real estate crisis. As the world's largest importer of iron ore, China's reduced construction activity amidst the real estate sector's turmoil—where several key developers face liquidity crises—threatens to diminish iron ore demand significantly. This sector's decline, previously responsible for approximately 40% of the nation's steel consumption, could lead to a contraction in iron ore prices.
- A hypothetical 10% slump in China's steel demand might prompt a comparable decline in iron ore prices, which, considering Vale's reported \$21.5 billion revenue from iron ore in the previous year, could materially impact earnings. This underscores Vale's vulnerability to China's economic pulse and the need for strategic diversification and market adaptability.



4. Operational and Environmental Compliance:

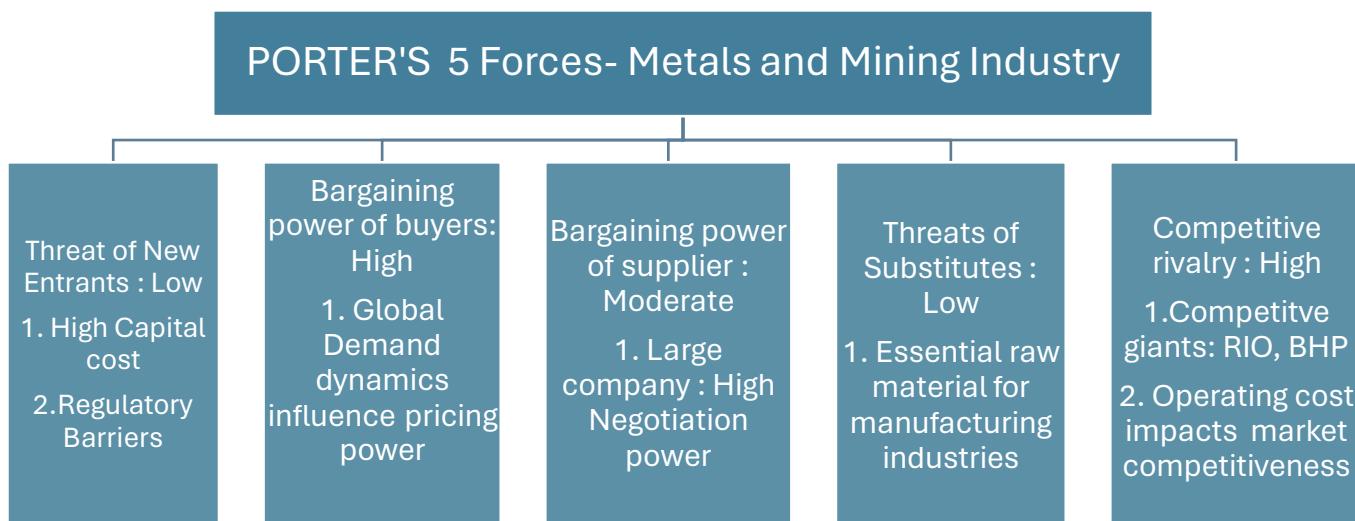
Following the Brumadinho dam collapse, Vale committed to decommissioning 10 dams, with related expenses contributing to a \$2.4 billion provision for de-characterization in its 2021 financial results, showcasing the financial impact of environmental risks.

5. Currency and Foreign Exchange Risk:

Exchange rate volatility, such as the 15% depreciation of the Brazilian real against the U.S. dollar in 2020, impacts Vale's earnings. The company's financial expenses were affected by \$561 million in 2020 due to currency exchange losses.

6. Competition and Market Share:

Vale competes in a global market with mining giants like BHP and Rio Tinto. As of 2023, Vale's global market share in iron ore was approximately 18%, and any price war or increased production from these competitors could lead to pressure on Vale's market share and earnings. Major takeovers at attractive valuations of premium quality mines by competitors can have impact in long term on company's margins.





9. Grahams And Buffet's View

1 Benjamin Graham's Principles:

- **Margin of Safety:** The current price of Vale SA at \$12 against the target price of \$ 18 suggests a potential upside of approximately 50%, offering a substantial margin of safety, well above 20% threshold.
- **Adequate Size of Enterprise:** Vale SA, with a market capitalization of \$ 55.37 billions and ranking among the largest iron ore producers globally, comfortably meets Graham's criteria for company size and stability.
- **Sufficiently Strong Financial Condition:** As of the latest financial data, Vale's current ratio and quick ratio suggest liquidity well above Graham's minimum requirements. For instance, a current ratio of 1.28 and debt to equity standing at 0.35, suggest financial resilience.
- **Moderate Ratios of Price to asset and earnings:** Vale is trading at lower ratios compared to its historical values also is trading at lower relative values compared to its peers on weighted regression basis.
- **Dividend Record:** Vale has a consistent dividend history, with a dividend yield averaging around 7-8% in recent years, satisfying Graham's preference for companies with a strong dividend record.

2. Warren Buffett's Principles

- **Business Understandability:** Vale's business model, focused on mining essential commodities, is straightforward, aligning with Buffett's emphasis on investing in businesses that are easy to understand.
- **Consistent Operating History:** Vale's longstanding presence in the mining industry and consistent production outputs meet Buffett's preference for companies with a solid operational track record.
- **Favourable Long-term Prospects:** Vale's investments in expanding its operations and sustainable mining practices align with long-term growth, a principle valued by Buffett.
- **Financial Health:** Vale's strong profitability margins and free cash flows adhere to Buffett's criteria of financial health and operational efficiency.
- **Valuation:** With the share price below intrinsic value estimates based on free cash flow and earnings projections, Vale offers the potential for significant capital appreciation, in line with Buffett's investment philosophy.

Vale S.A., operating within the metals and mining sector, aligns with certain investing principles shared by Ben Graham and Warren Buffett. The company exhibits a simple business model, marked by long-term growth potential, and its shares present a Margin of Safety based on current valuations, indicating a potential undervaluation. This investment profile resonates with the value investing ethos advocated by both Graham and Buffett, emphasizing intrinsic value and a favourable price-to-value ratio.



10. Primary Research

For my primary research, I tried to reach the employers and company's investor relations team via mail and LinkedIn connection. I was successful in getting few responses from LinkedIn employees but didn't receive a response from investor relation team. Interestingly, did get opportunity to attend the earning call for 1Q24 which was very insightful to answer my questions.

While reaching the employers, my focus was to connect with employees from investors relations, FP&A and risk department with a perspective of quality answers. To build trust and receive genuine response, did share my valuation sheets with few connections and it was helpful to get few rough answers but on a honest note, the responses were more neutral and generic. Major insights I received was from the earning call because many buy and sell side analysts attended the call and raised questions, which were on track of my listed questions.

List of questions and response summary in regards of the company analysis:

1. 50% sales are from China, but Chinese economy is struggling. Also supply in market is not impacted but the demand has fallen. How do you see the impact of all this event on revenues of Vale S.A.?
 - Company estimates that Chinese Government \$1 trillion Renminbi infrastructure and property plan is expected to impact the demand positively. In addition, company mentioned about China leading the world in energy transformation and is heavily involved in production of EVs, batteries and BEVs. Forecasted production requires high quality steel products which keeps company optimistic about China's resilience. But for 2024 iron ore shipments are expected to be similar as last year with Chinese demand still unchanged and constrained.
2. What level of long-term growth (in %) you predict in the "metals and mining" industry and for Vale S.A.?
 - Company didn't give precise estimate of growth but expects additional \$ 4 billion EBITDA from projects in pipeline by 2026 and improved cash flow with Burmadinho reparations cost reducing to \$ 1 billion from \$ 3 billion.
3. EV sales growth is slowing, and prices of battery metals are falling. How do you see the impact on Energy transition metals?
 - EV sales were below estimates but saw 34% Y-o-Y growth. Also, commitments from OEMs and policy incentives will keep the demand for copper and nickel on a rise is what company expects. Company is also trying to diversify its revenue streams region wise by focusing on sales of base metals (nickel and copper) in EU and North America which will diversify its revenues. I felt management was concerned about low nickel prices, because they are not generating great profits from nickel business. Revenues from nickel business is just above breakeven cost.



4. Dividend yield is 9.86% and dividend payout ratio is 72%. How do you plan to continue to the same level of dividend payments?
 - Response was clear that company will try to give the dividends considering the revenues generated and financial health of the company. But company is no way committed with the current dividend levels
5. Will like to know more about debt schedule, financing cost and debt repayments structure as company has considerable debt levels.
 - Present debt levels is not a concern for the company. Rather company plans to raise debt levels to around \$ 16 billions from current levels of \$ 14 billions and is confident about its debt servicing capability.

Extra information from earnings call 1Q24:

Positives:

1. Company expects the forecasts for 2024 are on track and have performed better than expected in 1Q24.
2. Iron ore production output is highest since 2019 for 1Q and shipments increase 15% y/y
3. Copper production increased 22% y/y and breakeven cost reduced from \$4.5k/t to \$ 3.3k/t below 2024 guidance range because of higher volumes.
4. Sustainalytics Score improved from 35.3 to 31.2 (Major impact on ESG)
5. 100% renewable electricity consumption by company in Brazil

Negatives

1. Spike in rates of coke and coal can increase operating cost which I felt company was concerned about in regards of margins.
2. Realized prices for Iron-ore in 1Q24 were \$ 100.7/ tonne way lower in comparison to \$123.6/tonne for 4Q23. But reason for low price realization was because of higher port stockpiles, squeezed steel mill margins and a slow restart of construction activity in China.

Other:

1. Questions were raised on BHP bid for Anglo American copper mines and its impact on Vale. Company responded positively with more favorable and cheaper investment options available in-house and in its mining regions. So, company won't bid for the assets.



11. References

1. <https://finance.yahoo.com/quote/VALE/>
2. <https://login.proxy.libraries.rutgers.edu/login?url=https://advantage.marketline.com%2fCompany%2fSummary%2fvale-sa>
3. <https://finviz.com/screener.ashx?v=151&ft=2&t=RIO,TINTO,VALE,BHP>
4. <https://www.tradingview.com/symbols/NYSE-VALE/>
5. <https://fred.stlouisfed.org/series/PIORECRUSDM>
6. <https://investor.morningstar.com/mm/learn/>
7. https://www.marketwatch.com/?mod=WSJ_NavHat
8. https://www.wsj.com/?mod=MW_NavHat
9. <https://vale.com/leadership>
10. <https://www.macrotrends.net/stocks/charts/VALE/vale-sa/revenue>
11. <https://www.youtube.com/watch?v=jHYOLmgZJsl>
12. <https://vale.com/Investors>
13. <https://www.reuters.com/markets/deals/bhp-considering-potential-buyout-offer-anglo-american-bloomberg-reports-2024-04-24/>
14. <https://wrds-www.wharton.upenn.edu/login/?next=/pages/get-data/compustat-capital-iq-standard-poors/compustat/north-america-daily/security-monthly/>
15. <https://advantagemarketlinecom.proxy.libraries.rutgers.edu/Analysis/ExportFullReportToPdfViewer/brazil-metals-mining-ml-193847?viewertype=embed>
16. <https://pages.stern.nyu.edu/~adamodar/>