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Climate Change and Corporate Investment Risk: A Comparison of Chevron, BYD, and CATL

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Abstract: Energy is essential for human survival, yet the global climate crisis has intensified challenges and opportunities for the energy sector. This paper focuses on Chevron, BYD, and CATL, examining the relationship between climate change and investment risk in their respective industries—fossil fuels, new energy vehicles, and batteries. Using stock data and financial reports, this study employs SWOT analysis, the Capital Asset Pricing Model (CAPM), and portfolio analysis to conduct both quantitative and qualitative assessments of these companies. Through horizontal comparison, the competitive dynamics and potential synergies among Chevron, BYD, and CATL are explored. The research identifies how climate-related risks influence their market performance and investment appeal. Furthermore, the analysis provides insights into the current state of each company, forecasting future trends and developments in the broader energy landscape. Based on the findings, this study proposes strategic recommendations aimed at improving sustainability and minimizing investment risks. In doing so, it underscores the critical role of innovation and diversification in navigating the evolving challenges of the energy sector.

Keywords: Energy Industry, Climate Change, CVX, CATL, BYD.

1. Introduction

Since the early 21st century, global warming has become increasingly serious, and extreme events caused by climate change have occurred frequently. Rapid sea level rise, melting glaciers, continued increases in carbon dioxide concentrations, and peaks in methane and nitrous oxide are all reminders of significant warming of the atmosphere, oceans and land.

Behind the increasing frequency of extreme weather and climate events is the significant warming of the global climate since industrialization. The extensive use of fossil fuels by industrialization has sharply increased the concentration of carbon dioxide in the atmosphere, resulting in global warming and frequent extreme weather and climate events. The IPCC Sixth Assessment Report (AR6) assessed the change in the global average annual concentration of CO_2 emissions from 1870 to 2019, noting that fossil fuels accounted for 86% of the total anthropogenic CO_2 emissions. These man-made carbon dioxide emissions will be absorbed by the atmosphere, oceans and land, with atmospheric carbon dioxide absorption up to 46 percent. As a result, the more man-made carbon is emitted, the more CO_2 ends up in the atmosphere, increasing its concentration [1].

In order to study the opportunities and challenges of enterprises with fossil fuels and new energy as their main business under the environment of global warming, this paper takes Chevron, BYD and

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CATL as examples to explore the close relationship between climate change and investment risk. During the project, the group used SWOT to analyze the macro advantages, disadvantages, opportunities and threats of climate change to the three companies. On the basis of financial statements and annual reports, the group used CAPM and portfolio to conduct quantitative and qualitative analysis of Chevron, which takes fossil fuels as its main business, BYD, which takes new energy vehicles as its main business, and CATL, which takes batteries as its main business. Based on the obtained data and literature, the group analyzed and compared the competition and complementary relationship between the three companies, summarized the current situation of the three companies, and predicted their future development. The group concluded the close relationship between climate change and the energy industry through the study of three companies, and made recommendations and prospects for the development of the energy industry.

2. Industry Analysis Based on SWOT Analysis

Energy industry refers to the exploitation, production, processing and sale of energy resources. This industry includes the process of taking energy resources from nature, converting them through processing into usable forms of energy, and selling them to end users.

2.1. Strengths

2.1.1. Abundant Resources

In terms of the current global fossil energy reserves, as its main products of coal, oil and natural gas reserves are still considerable. Although the development of fossil fuels has been limited by over-exploitation and policy restrictions in recent years, large reserves can still support and generate profits for companies whose primary business is fossil fuels. As a monopoly in the energy industry, particularly the fossil fuel industry, Chevron is less affected by climate and policy. According to Chevron's 2023 annual report, the Middle East provides a stable supply of oil and coal, while Australia's large natural gas reserves also bring Chevron more revenue. It also demonstrates the huge advantages of abundant reserves in the energy industry [2, 3].

At the same time, renewable energy also plays an important role in the energy industry. Solar, wind, water and other renewable energy sources are different from fossil energy sources, and can be recycled forever. So a large amount of renewable energy also provides an advantage for the energy industry.

2.1.2. High Demand

Human dependence on energy is also an important reason why the energy industry has been prosperous. Energy permeates every aspect of human life, from the fuel used to fuel spacecraft to the power of household items such as water heaters. Everything needed for human life depends on energy to drive.

2.1.3. Government Support

In order to promote carbon-neutral development and curb the over-exploitation of fossil fuels, many countries have enacted policies related to renewable energy. These policies provide technologies and channels for the exploitation and development of renewable energy, and at the same time, they are appropriate for the development concept of green, low-carbon and environmental protection. Policy support is also a huge advantage for the development of the energy industry [4].

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2.2. Weaknesses

2.2.1. Environmental Impact

Anthropogenic impacts have caused significant warming of the atmosphere, oceans and land. Since 1970, global surface temperatures have risen faster than at any time in at least 2,000 years. Sea levels have risen faster in the past 100 years than in any century in at least the past 3,000 years. Arctic summer sea ice cover in September has decreased by about 40 percent since 1979. Arctic sea ice extent in late summer is smaller than at any time in at least 1,000 years. The retreat of the glacier since 1950 is unprecedented in at least 2,000 years. CO_2 concentrations in 2019 were higher than at any time in at least 2 million years, and methane and nitrous oxide concentrations also reached their highest levels in at least 800,000 years. All of the above human-caused climate change and extreme situations reflect the great impact and harm to the natural environment. Environmental issues have become the cause and challenge of the development and transformation of the energy industry [1].

2.2.2. Dependence on Finite Resources

Although the current situation looks like fossil fuel reserves are relatively abundant, energy shortage has become a long-term problem. In today's low-carbon life, fossil fuels are still used as mainstream fuels, which proves people's dependence on fossil fuels. But with excessive exploitation and overdraft, as a non-renewable fossil fuel eventually faced the end of exhaustion.

However, today's renewable energy sources have obvious limitations and disadvantages. Such as the low cost of solar energy, geothermal energy and tidal energy instability. Therefore, how to carry out energy transformation is also the problem and challenge facing the energy industry [5].

2.3. Opportunities

2.3.1. Renewable Energy Growth

With the policy support of countries around the world, the development and technology of renewable energy have been rapidly developed and are now quite effective. Solar energy can convert sunlight into electricity or heat through photovoltaic cells or thermal energy conversion technology for lighting, hot water, electricity, etc. Wind energy can be used to convert wind energy into electricity through wind turbines, meeting some commercial and industrial needs. Water energy is the use of water flow or water level difference to produce mechanical energy, through the turbine into electricity, is one of the earliest development and utilization of renewable energy. Biomass energy is obtained through combustion and anaerobic fermentation for heating and power generation. Geothermal energy uses the heat of the Earth's interior to generate electricity and heating. The rapid development of these renewable energy sources has greatly reduced the pressure on fossil energy sources and provided new opportunities for the development of the energy market [6].

2.3.2. Technological Innovation and Digitalization

Digital technology has played a huge role in the innovation of energy production. Smart grid combines the power system with advanced communication, calculation and control technology to monitor the operating status of the power system in real time, accurately control the distribution and scheduling of the store, and improve the stability and reliability of the power grid.

Digital technology provides a large number of data collection and analysis means for energy production, which can carry out real-time monitoring and analysis of the operating state of the energy system and provide more accurate data support. At the same time, it can optimize the overall

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efficiency of the energy system, improve the efficiency of energy utilization and reduce the waste of energy.

Virtual reality technology can help energy engineers better understand and design energy systems. Through this technology, engineers can simulate and demonstrate the energy system, better understand the operating principle and effect of the system, and then optimize and improve [7].

2.4. Treats

2.4.1. Intense Market Competition

For fossil fuels, as the mainstream fuel that people have always relied on, the market is mature, with several monopolies. Chevron is an established and well-known energy company that relies on fossil fuels as its primary business and is not too exposed to market changes, so it does not have to pay much attention to customer choices.

In contrast, the new energy industry, as the energy industry that has emerged in recent years, the industry competition is huge. BYD, for example, whose main business is new energy vehicles. Competition in the new energy vehicle industry is huge, and BYD is facing strong competitors such as Tesla. And many old car brands famous for oil cars such as Porsche, Mercedes-Benz, BMW, etc., have also entered the market of new energy vehicles. In such a large market density, BYD needs to always pay attention to the will and trend of consumers, and improve and publicize their products in a timely manner [6].

2.4.2. Geopolitical Risk

The geographical problems of energy exploitation mainly include the unbalanced distribution of energy supply and demand, fluctuations in international energy prices and environmental problems.

Uneven geographical distribution is a prominent problem. China's main coal mining areas are located in mountains, deserts and other regions, while the main energy consumption areas are concentrated around the more prosperous cities. This uneven geographical distribution results in high transportation costs and low efficiency.

Fluctuations in international energy prices also pose a threat to energy security. The new reserves of international oil and gas exploration continue to decline, resulting in rising oil and gas prices, which has a major impact on the economy.

Environmental problems are an important aspect in the process of energy exploitation. Large-scale energy exploitation activities, especially the exploitation of fossil energy, have caused serious impacts on the natural environment. For example, land subsidence, water pollution and greenhouse gas emissions caused by coal mining exacerbate environmental problems such as global warming. When extracting fossil fuels in the desert, the huge temperature difference between day and night and the dust can greatly impair the durability and maneuverability of the equipment. So geography is also a big threat to the energy market.

3. Company Analysis

3.1. CATL

A Chinese company and a global leader in the development and production of lithium-ion batteries, primarily for electric vehicles (EVs) and energy storage systems. Founded in 2011, CATL has rapidly grown to dominate the global battery market, holding a significant share of the EVs battery supply chain. It collaborates with major automakers like Tesla, BMW, and Ford, and is heavily invested in research and development to improve battery performance, energy density, and safety. The

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headquarters are located in the Ningde City in Fujian province. It has six R&D centers, mostly in China but one in Germany. It also has been built up 13 production bases which across from China to Europe (Germany & Hungary).

The first strategy of CATL is renewable energy generation which means using the energy storage systems to indirectly support renewable energy. The second is energy transition, especially utilizing EV batteries to replace mobile fossil energy and develop a sustainable battery value chain. The third is technology innovations such as road passenger transport, urban delivery, construction, vessel and so on.

3.1.1. Quantitative Analysis

This paper calculated the operating performance, payout and liquidity of CATL. Then reaching the following conclusion from Table 1.

(1) CATL is generating 82 cents of sales for every dollar of fixed assets it owns, which means that it has a relatively lower efficiency in utilizing fixed assets.
(2) CATL has only 52.45% retention ratio manifests that it not only invest in growth and expansion, but also take shareholders' profits into consideration.
(3) CATL has limited liquid resources and could face short-term liquidity challenges if immediate cash outflows exceed inflows. But this is common, where a large portion of assets may be tied up in inventory or machinery rather than cash.

The balanced dividend payout and retention ratios indicate that CATL carefully manages both shareholder returns and future growth, especially with climate change concerns and the need for frequent product updates. The cash ratio suggests potential short-term liquidity risks, common in the industry due to reliance on inventory and machinery rather than cash, but the current ratio shows CATL has a generally stable liquidity position. In terms of environmental indicators, it compared the 2022 data with the 2023 data. It found that total GHG emissions fell by 34.99 percent. Zero-carbon electricity usage increased by 38.83%.

Table 1: CATL returns and values from 2019 Sep. to 2014 Sep. [8].

CAPM		Market Value of Equity	817.96B in CNY	Return and Risk	CATL
Rf	2.14%	EPS	12.27	Arithmetic Return	3.38%
Rm-Rf	6.00%	P/E Ratio	15.16	Geometric Return	2.62%
Beta	0.88			Variance	0.0169
Expected return	7.42%			Standard Deviation	0.1299

3.1.2. Qualitative Analysis

CATL faces several climate risks, including natural, reputational, and temperature-related risks, which could affect its financial stability in the short term. Natural disasters like floods and hurricanes may damage its machinery and property and disrupt the supply chain. The company also needs to keep its products updated with climate change solutions to meet stakeholders' expectations and protect its reputation. As a leader in battery manufacturing and the EV supply chain, CATL is sensitive to temperature changes. High heat can lower battery efficiency and lifespan, while cold temperatures reduce capacity, making temperature control critical during production and use [9].

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3.2. BYD

BYD Company Limited, a Chinese multinational corporation based in Shenzhen, Guangdong, was founded in 1995 with a focus on battery manufacturing. Over time, it has expanded into various sectors, including electric vehicles (EVs), renewable energy, and electronics. Today, BYD is one of the world's largest producers of EVs and batteries, offering a diverse range of products, from cars and buses to solar panels and energy storage systems. BYD's growth strategy is driven by a commitment to green technology and innovation. The company is dedicated to environmental protection and sustainable development, prioritizing technological research and digitalization. Actively expanding into global markets, BYD emphasizes corporate social responsibility and has made notable contributions to the worldwide energy transition and sustainability efforts. The first strategy of BYD is to vigorously develop technology and use technology to drive development. Second, in line with international development initiatives, it will pursue green and sustainable development. Secondly, it should pay attention to independent innovation and have a global vision. The last is to shoulder social responsibility and corporate vision.

3.2.1. Quantitative Analysis

From 2022 to 2023, the global usage of non-gasoline vehicles, particularly electric vehicles (EVs), increased significantly, while gasoline-powered cars saw a notable decline in market share. EVs accounted for around 14% of new car sales globally in 2022, rising to 18% in 2023 (see Table 2). This growth was driven by supportive government policies, rising fuel prices, and the growing demand for cleaner transportation. Between 2022 and 2023, BYD experienced a substantial increase in its electric vehicle (EV) sales, cementing its position as a leader in the global market.

Table 2: BYD returns and values from 2019 Sep. to 2014 Sep. [8].

CAPM		Market Value of Equity	692.735B in CNY	Return and Risk	BYD
Rf	2.14%	EPS	11.22	Arithmetic Return	3.96%
Rm-Rf	6.00%	P/E Ratio	22.4	Geometric Return	2.97%
Beta	0.54			Variance	0.0219
Expected return	5.38%			Standard Deviation	0.1481

The fact that BYD's actual return rate is lower than the expected return rate suggests that the company may be facing profitability challenges or less favorable market conditions than anticipated. This could affect its future financial performance and returns to shareholders. Additionally, the high standard deviation reflects significant volatility in BYD's stock price, indicating greater investment risk. The company may need to implement strategies to mitigate this risk or stabilize returns. However, BYD's strong market value and earnings per share (EPS) highlight its significant market position and profitability. Despite higher market risks and suboptimal returns, investor optimism remains high, with expectations that BYD will continue to play a leading role in green technology and the electric vehicle (EV) market. In light of the growing demand for EVs and the increasing adoption of these vehicles, BYD's trading volume remains strong, further reinforcing its leadership position in this rapidly expanding sector. While BYD faces challenges, it is well-positioned to capitalize on the ongoing shift toward electric transportation and sustainable technology.

3.2.2. Qualitative Analysis

BYD faces many problems under the impact of climate change. The first is natural disaster. Extreme weather conditions and supply chain disruptions due to climate anomalies could affect disruptions

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due to climate anomalies could affect BYD's earnings, potentially impacting dividends. If production is interrupted or product performance is affected by weather conditions, this may reduce revenue. In addition, the second challenge is temperature sensitivity. The electric vehicle and battery industries are sensitive to temperature extremes, as batteries perform poorly in very cold or hot climates.

The third is the Impact on investor. For investors, severe weather and climate-related disruptions can impact BYD's earnings and dividends. Production delays and reduced product performance due to weather can lower revenue. Investors are keen to see how BYD adapts to climate change and its role in the growing green technology market. As climate regulations tighten and demand for electrification rises, BYD's strong position in electric vehicles and batteries could lead to significant returns.

In response to these problems, the group proposed a number of solutions. BYD is addressing these issues with innovations such as its latest lithium iron phosphate (LFP) batteries, which have increased energy density by 10% and reduced production costs by 15%. These batteries also offer better thermal stability, environmental benefits, and a longer lifespan, reflecting BYD's commitment to sustainability and innovation [10].

3.3. CVX

Chevron Corporation is a major global energy company based in California, operating in over 180 countries. It produces crude oil, natural gas, transportation fuels, lubricants, petrochemicals, and additives. Chevron invests in technology to advance the industry and aims to reduce its carbon footprint while supporting both traditional and low-carbon energy sectors. In 2023, global gas demand rose by 0.02%, and crude oil consumption exceeded 100 million barrels per day for the first time since 2020, indicating strong oil demand. Fossil fuels account for 81.5% of global energy use, highlighting ongoing reliance on these sources and a supportive environment for Chevron. The growing interest in new energy sources also offers future opportunities for the company.

3.3.1. CVX Quantitative Analysis

Firstly, using the Capital Asset Pricing Model (CAPM), it estimated Chevron's expected return. However, the actual return was lower, suggesting that Chevron's stock might be overvalued, which could affect its future financial performance and shareholder returns. Secondly, Chevron's stock shows high volatility, as evidenced by its large standard deviation. This indicates significant investment risk, and the company will need to work on reducing this risk and stabilizing its earnings. Additionally, Chevron's low price-to-earnings (P/E) ratio, along with its high earnings per share (EPS) and market value, reflects its strong position and profitability in the energy sector. The 2023 annual report reveals that Chevron has a significant amount of natural gas production in Asia, which benefits from lower costs and higher profitability. It also highlights Chevron's increased focus on clean energy investments. Overall, these factors demonstrate Chevron's leading role in the energy industry while also pointing out the challenges and risks associated with its investments.

Table 3: CVX returns and values from 2019 Sep. to 2014 Sep. [8].

CAPM		Market Value of Equity	251.452B in CNY	Return and Risk	Chevron
Rf	3.71%	EPS	10.1	Arithmetic Return	1.07%
Rm-Rf	5.50%	P/E Ratio	13.72	Geometric Return	0.65%
Beta	1.08			Variance	0.0089
Expected return	9.65%			Standard Deviation	0.0943

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3.3.2. CVX Qualitative Analysis

Chevron's growth in the energy market is influenced by several key factors. Economic volatility continues to challenge the company as fossil fuel prices have stabilized but production costs and financial crises have risen, creating instability. Geopolitical tensions, including ongoing conflicts in Asia, Europe, and the Middle East, further complicate oil development. Additionally, climate change poses a significant issue, with the energy sector contributing heavily to pollution and facing potential future legal risks. As global focus shifts toward clean energy, the IEA projects that renewable energy will constitute nearly 50% of the power mix by 2030, while fossil fuels will decrease by about 7%. This transition will be crucial for Chevron's future strategy and adaptation in the energy market.

4. Conclusion

To summarize the main industries of the three companies: CATL specializes in batteries, electric vehicles, and energy storage; BYD focuses on batteries and new energy vehicles; and Chevron (CVX) is centered on oil and gas. Chevron competes with CATL and BYD as its traditional fossil fuels are being replaced by the new energy solutions provided by these companies. CATL supplies batteries to BYD, showing a collaborative supply relationship even as they compete. Chevron, as a dominant player in oil and gas, faces less pressure from consumer choices compared to BYD and CATL, which need to adapt to changing market demands. In terms of climate impact, Chevron's 2023 report shows it suffers less financial loss from climate issues compared to CATL and BYD, which are affected by temperature fluctuations due to their reliance on battery technology. Looking forward, global warming is expected to significantly challenge the fossil fuel industry, while new energy sources from companies like CATL and BYD are likely to offer better prospects.

The covariance analysis of the returns for Chevron, CATL, and BYD reveals that Chevron exhibits a slightly negative correlation with both CATL and BYD. This suggests that as the global renewable energy market expands, Chevron may experience relatively lower returns, whereas CATL and BYD are likely to see increased returns. It's important to consider that higher returns often come with higher volatility. CATL and BYD offer higher returns than Chevron primarily because they are better aligned with the global energy transition, though they are also more sensitive to market competition and regulatory changes. In contrast, Chevron, operating within the traditional energy sector, benefits from greater stability and lower volatility due to its mature market and its connection to global oil prices, making it less affected by the fluctuations that impact CATL and BYD. The portfolio optimizer analysis indicates that the current portfolio lacks valuable diversification. Since CATL, BYD, and Chevron are exposed to similar risks—such as fluctuations in EV demand and supply chain disruptions—their performance can be similarly influenced by global energy demand, geopolitical tensions, and climate-related regulations. This overlap limits the benefits of diversification. To improve portfolio stability and returns, it is recommended to include investments across a broader range of industries to mitigate risks and enhance overall performance.

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