

Research on the Impact of Financial Derivatives on Companies in the Energy Industry

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Abstract. In recent years, the development of the new energy industry has attracted more and more attention from countries focusing on coping with the energy crisis and economic upward development so that financial derivatives as a financial instrument need to be further explored for their value to companies. This paper selects a case study on the risk resilience, market competitiveness, financial management level and business expansion of China's leading energy company Baolihua New Energy before and after the systematic intervention of financial derivatives, aiming to explore how the intervention of financial derivatives affects the development of new energy enterprises in many aspects. Through a single-case study approach, the findings show that with the help of derivatives such as futures, both the purchase of raw materials and the packaging and sale of outputs are more efficient and more certain. The intervention of financial derivatives can help energy companies reduce price risk and play an important role in capital chain, market share and territorial expansion further. Meanwhile, this paper points out that derivatives could put forward an effective way for new energy enterprises to develop positively in financial derivatives in order to adapt to the development of the times.

1 Introduction

Energy, both in the country's own development process and in trade between countries, occupies a central position. A stable energy supply in various countries is the cornerstone of industrial operation, and even related to the steady development of the economy and social harmony and stability. In terms of international trade, energy trading affects the economic lifeline of various countries and affects the geopolitical landscape. In this process, the advantages of financial derivatives are fully revealed. Options flexibly respond to price fluctuations, futures lock in prices in advance to avoid future uncertainties, and foreign exchange currency derivatives help cross-border energy transactions eliminate exchange rate risks. They safeguard energy trading and improve market efficiency by enhancing risk management capabilities and expanding financial market. However, for most countries like China, the energy derivatives market is still not active and liquid enough, but with the active development of the economy, the process of the energy sector has not reached a level that can be matched, which can actually be improved by derivative.

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According to the 'Report on the Work of the Government' and 'New Energy Vehicle Industry Development Plan (2021-2035)' issued by the State Council of China, the development of new energy vehicles, as China's strategic measure to cope with climate change and promote green, means that China will start with new energy vehicles in the next ten years to carry out scientific and technological revolution and industrial transformation, which will greatly promote the optimization of energy consumption structure[1,2]. The accelerated integration of the automotive and energy sectors is putting pressure on the rapid development of the new energy industry to be able to cooperate in a timely manner. The recent increase in the use of new energy in countries like China, which is pursuing rapid development, has made the development of the energy industry imminent, while there are still some companies that use less or even reject financial derivatives in this situation. For example, LONGi Green Energy Technology Co Ltd., a leading enterprise in the industry, even if it has successfully grown with the help of derivatives, still has shortcomings such as underutilization of futures [3]. As Butt et al. explained, the use of derivatives can sometimes have a negative value to the value of the company due to poor corporate governance structure, when the purpose is mixed with speculation [4]. This paper focuses on the necessity of the rapid development of financial derivatives auxiliary energy enterprises and the further development strategies of energy enterprises. Guangdong Baolihua New Energy Stock Co., Ltd., a leading privately-owned company in China's new energy industry, was selected as the research object, and the study was conducted through a single case study and qualitative comparative analysis (QCA). It mainly adopts a single-case analysis method, which can deeply understand and explain the performance and internal mechanism of a specific phenomenon in a single case, and at the same time explore unique experiences and problems, which in turn reveals its growth path and key success factors in a specific market environment. Based on the authoritative CSMAR, Bloomberg and other data websites, as well as the relevant data searched on the official website of Baolihua New Energy, the paper analyzes the chart and examines the question of whether the intervention of financial derivatives can accelerate the development of energy companies.

The research has certain theoretical and practical significance. Firstly, through in-depth case analysis, this paper can further explore the effect of financial derivatives in reducing the risk coefficient and expanding the volume of commodity trading in non-financial enterprises, so as to achieve the effect of actively promoting corporate value. It is possible to analyze the specific effects that some energy companies have successfully achieved with the help of derivatives and speculate on the reasons why it is difficult to use financial derivatives. Meanwhile, through the existing cases of new energy companies successfully using derivatives to achieve expansion, theoretical suggestions for enterprises in the energy industry to use this method to break through the bottleneck are made. Secondly, in view of the broad prospects for the development of the financial derivatives market, with the gradual standardization of the derivatives market in various countries and the establishment of more systematic and complete international trading channels, the derivatives market in different industries will be gradually opened, and this paper will provide some reference suggestions for the adoption of derivatives in industries other than the energy industry. Finally, enterprises generally only achieve the purpose of hedging or speculation through derivatives, this paper analyzes the performance of Baolihua New Energy before and after the adoption of foreign exchange derivatives and proposes that financial derivatives have the ability to help companies occupy a larger market share and further make profits, which puts forward new ideas for the expansion of derivatives functions.

2 Theoretical analysis and literature review

A financial derivative is a financial instrument whose source of value depends on changes in the price of the underlying asset. Financial derivatives use the principles of hedging, arbitrage and speculation, so that investors can carry out better risk management and even speculate on profits based on the judgment of market trends [5]. For the entire financial market, the development of derivatives has also greatly improved market efficiency, expanded market share, and encouraged the creation of more financial products to meet different market needs, which is matched with the demand of energy industry [6].

The energy industry, especially for the electrical sector, as an industry that needs to purchase a large number of raw materials such as coal and natural gas, whose prices fluctuate greatly due to various factors such as international politics and economic conditions, has been greatly promoted by financial derivatives [7]. Under such a political policy situation, all walks of life have responded positively. Serving the real economy is the meaning of financial existence, which is also the fundamental principle of all financial risks [8]. Tan also claimed that in the face of the new situation of the futures industry following the development of the national new energy policy, the measures of Yingda Futures to actively build a derivatives service provider in the energy industry are worth learning [8].

As Yamada and Matsumoto have proposed to promote the development of the energy industry, weather derivatives can effectively help energy companies mitigate the impact of cash flow fluctuations, and insurance companies have formed corresponding regulatory measures [9]. In addition, carbon offset derivatives trading has also entered the financial mainstream as a new type of derivatives created to help curb global carbon emissions[10]. These unique financial derivatives play a complementary role in the production, sales and risks management of energy companies to varying degrees. On the production side, due to the entry of derivatives such as futures, which allow the trading process to be more standardized, the company will have a relatively stable cash flow to support the procurement of raw materials and facilities [9]. In terms of sales, downstream products in the power industry chain, such as batteries, as described by Hu, Armada and Sánchez, have the opportunity to cooperate with battery companies to carry out energy arbitrage through Battery Energy Storage Systems, as in the UK electricity market [11]. Additionally, as one of the most important functions of derivatives, financial derivatives provide a global strategy for energy companies to ensure long-term risk hedging to a relatively stable state [12]. However, as Grima and Thalassinos emphasized, the role of derivatives is due to the different internal controls of the company, which makes this paper specific to the research on whether the energy industry that tends to hedge derivatives, can move towards positive development as a whole [13].

3 Case study: Baolihua New Energy

This paper chooses Guangdong Baolihua New Energy Stock Co., Ltd. as the main body of research to conduct an in-depth analysis and discusses the comparison of its development before and after the intervention of thermal coal futures, and the reasons why it has achieved a certain degree of loss reduction and risk reduction under the turbulence of the original business scope, mainly based on the following three considerations. Firstly, as a private power company, Baolihua New Energy uses idle own funds to invest in futures, which excludes the possibility that external factors such as government grants may affect the company's performance like state-owned enterprises. Secondly, for A-share companies such as Baolihua New Energy, their information disclosure is more comprehensive and standardized, and the real-time recognition of their stock prices in the market can reflect the correctness of their decisions. Lastly, the company's current main financial derivatives project is thermal coal futures contracts, which can be easily speculated on the impact of derivatives.

In addition, this paper uses the double case analysis method to briefly compare the application of financial derivatives between Baolihua New Energy and NRG Energy, a private leading energy company in the United States with a more complete system. It helps identify commonalities, differences, and underlying patterns, offering in-depth insights and facilitating theory building and hypothesis testing.

3.1 The background of the company

Baolihua New Energy is an enterprise with new energy power generation and financial investment as the core, which is supplemented by diversified businesses such as power generation by-products and sales of raw materials, showing good market competitiveness and growth potential. Its power business accounted for 96.37% of the 2023 annual report and has significant advantages in many fields such as ultra-supercritical power generation and green power. Despite a slight decline in total operating income in the first quarter of 2024, net profit increased significantly year-on-year, fully demonstrating the company's profitability.

However, on August 6, 2024, Baolihua New Energy issued an announcement, revealing that its performance in the first half of the year fell sharply, mainly due to the impact of high coal prices. Given that the financial derivatives hedging campaign was officially launched in 2022, this provides the company with an opportunity to mitigate risks and even take the opportunity to break out of the encirclement. Besides, with the continuous growth of electricity demand and the deepening of green and low-carbon transformation, the company is expected to seize new growth opportunities through technological innovation and market expansion.

3.2 Analysis of the impact of financial derivatives on Baolihua New Energy

3.2.1 The futures for thermal coal

(1) Risk resilience

Increased market competition, fluctuations in raw material prices and policy changes may pose potential threats to energy companies' operations. Not only Baolihua New Energy, but also the coal power companies that have announced their performance in the first half of 2024 show that the entire industry is facing huge operating pressure. Taking the core listed companies under the five major power generation groups as an example, such as Datang Power Generation, Huadian International and Guodian Power, their performance has shown varying degrees of decline. It can be seen that in the energy industry, in addition to high revenues during market stability, certainty also plays a very important role in market fluctuations.

Under the situation, Baolihua New Energy's and the entire industry's the combined leverage of financial leverage and operating leverage are shown in Figure 1. When the industry environment is stable in 2022, Baolihua New Energy initially used financial derivatives to improve the efficiency of the use of funds, and then increase leverage to shield a certain degree of taxation and enhance shareholder control. In the case of significant price fluctuations in 2023 and 2024, with the assistance of derivatives, Baolihua New Energy can appropriately adjust to lower leverage to have a greater buffer of funds, so as to face market fluctuations and operational risks more easily. Moreover, although the introduction of financial derivatives, especially futures, will increase the associated trading risks, such as market liquidity risk, operational risk and basis risk, the certainty it brings to enterprises is more valuable.

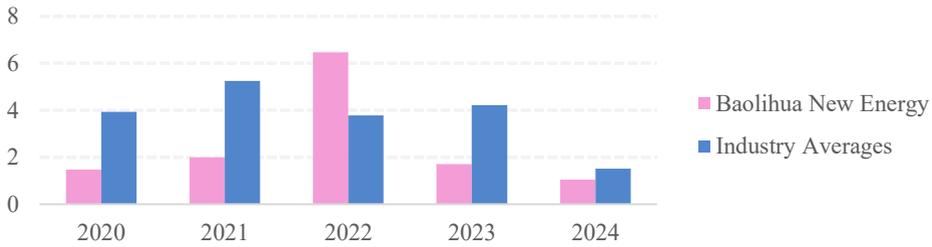


Fig 1. Comprehensive leverage analysis

(2) Financial management level

The profitable company's financial performance should be that cash flow is gradually rising and for private enterprises, more of its own funds are needed to further increase the company's value. Baolihua New Energy uses thermal coal futures hedging to improve its financial management level, because it can effectively lock in the cost of thermal coal procurement, reduce the impact of price fluctuations on costs, stabilize profits, and improve cost control capabilities. Through hedging, the uncertainty caused by price risk is reduced and the financial situation is more stable, which is conducive to the improvement of the efficiency of capital use and the optimization of financial leverage.

Figure 2 shows the change trend of the company's cash flow indicators from 2020 to 2024, and it can be seen that the cash content of Baolihua New Energy's operating income has shown a steady upward trend, indicating that thermal coal futures hedging has stabilized the cash flow of operating activities. Stable cash flow makes sales receipts more secure. In addition, hedging reduces the uncertainty of cash outflows caused by fluctuating thermal coal prices, allowing enterprises to plan funds more accurately and have more cash for investment, thereby increasing the ratio of cash to investment and enhancing the investment capacity and development potential of enterprises.

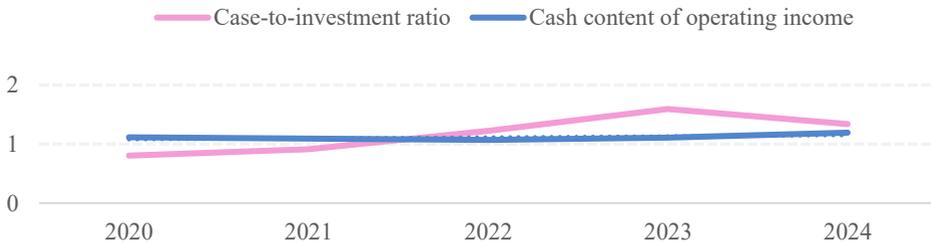


Fig 2. Financial management analysis

(3) Market competitiveness

The coal source of Baolihua New Energy is mainly imported Indonesian coal and the proportion of long-term coal is low so that fluctuation of coal prices has a great impact on its cost. By participating in thermal coal futures hedging, the company can lock in the stable cost of coal purchase price in a certain period of time, making performance more predictable. The company's participation in the futures market for risk management shows that it has a strong awareness and ability of risk management and control. This positive signal that make investors more confident in the company's management level and future development, attract investors to buy or hold the company's shares, thereby having a positive impact on the stock price and enhancing the company's image and valuation in the capital market. This increased investor confidence reduces large stock price fluctuations due to performance uncertainty and helps stock prices to operate stably within a reasonable range or even climb over a period of time, as shown in Figure 3 for a period of post-2022

stock price gains. In 2024, due to the overall market being affected by the economic situation, the share price of Baolihua New Energy will also show a downward trend. However, based on the stock price calculation from 2022 to 2024, the stock price volatility has gradually decreased since the intervention of financial derivatives in 2022, indicating that derivatives have helped energy companies stabilize the situation to a certain extent in the face of economic instability. The outstanding price-to-earnings ratio in 2022 also shows that this approach is a great encouragement for investors, as shown in Figure 4.

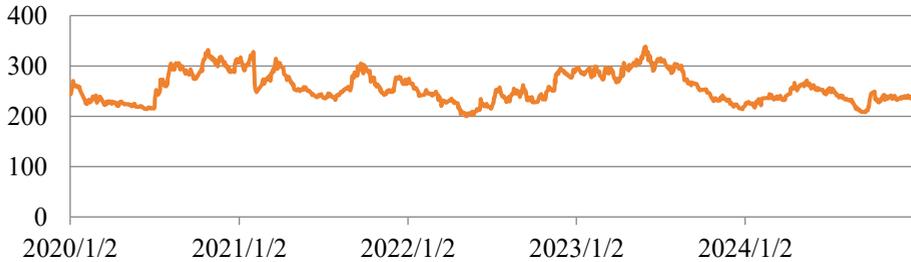


Fig 3. Average closing price from 2020 to 2024



Fig 4. Market performance analysis

In terms of market share, stabilizing the supply and cost of raw materials through futures hedging can ensure the stability and sustainability of the company's power production. For large industrial customers who have high requirements for the stability of power supply, the stable power supply of Baolihua New Energy is more attractive, which will help the company expand such high-quality customer groups and increase its market share in the power market. In addition, participating in the futures market and effectively using futures tools for risk management and business decision-making will enhance the influence of Baolihua New Energy in the power industry. It has more say in cooperating with upstream and downstream enterprises and participating in the formulation of industry standards, which is conducive to the company's business cooperation, expanding new business areas and indirectly increasing market share, as shown in Figure 5.

(4) Business expansion

In 2022, Baolihua New Energy entered the first year of full production power generation as a Haifeng project, in addition to the comprehensive utilization base of resources of Meixian Heshuyuan Power Plant, the company began to focus on building Lufeng Jiahuwan Clean Energy Base, which induced the development strategy of "based on the main business of energy and power, expanding the field of financial investment and building a green rise pattern". After that, in 2023, the annual utilization hours of the company's thermal power units will reach 5955 hours, an increase of 620 hours year-on-year; The power generation capacity was 20.664 billion kWh, a year-on-year increase of 11.62%. After a year of construction, the expansion project of units 3 and 4 of Lufeng Jiahuwan Power Plant ($2 \times 1000\text{MW}$) continued to advance and the construction in progress in the first three quarters

increased by 116.82% year-on-year due to the increase in project investment.

In terms of financial business, the power industry has both opportunities and pressures in the next two years. The national economy has continued to recover and made steady progress, and the electricity consumption of the whole society has increased year by year. Benefiting from the overall decline in coal prices, cost pressures on coal-fired power plants have eased. However, because of affects from the improvement of water supply and the growth of new energy power generation, the growth rate of thermal power output has declined, and the profitability of thermal power enterprises has improved but the growth space is limited. In the face of this complex business situation, the company continued to optimize its internal management mechanism to improve quality, control costs and increase efficiency by reducing risks with the help of thermal coal futures projects. During the reporting period, the company achieved operating income of 3.713 billion yuan and net profit attributable to shareholders of listed companies of 366 million yuan, achieving the goal of steady development.

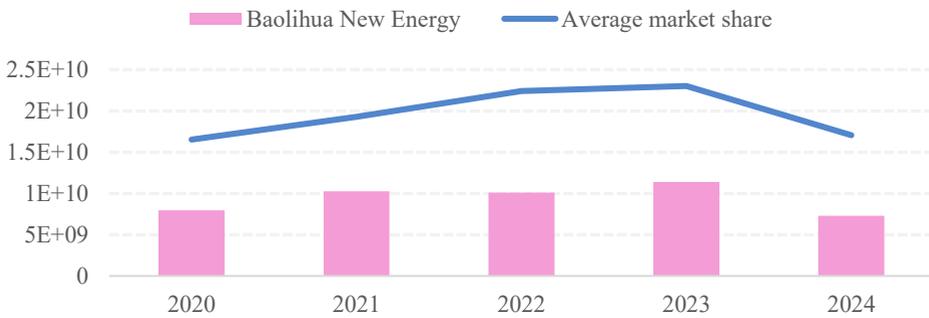


Fig 5. Market share analysis

3.2.2 Comparison with NRG Energy

In the United States, a country where derivatives are more complete and fast-paced, the notional principal of derivatives at the end of 2022 was \$191 trillion, accounting for 27% of the global derivatives market, of which OTC derivatives accounted for 95% of all derivatives and 29% of the global scale. Since the application of derivatives is in the process of gradual improvement around the world, the application of derivatives in the United States is worthy of China as a reference for the future expansion of the derivatives market. As a private enterprise with market power in the U.S. energy sector, NRG Energy is also exposed to risks such as electricity price fluctuations, fuel cost fluctuations, interest rate and exchange rate changes, which can be a benchmark company for Baolihua New Energy in China.

First of all, NRG Energy will make full use of various futures, options and other financial derivatives to hedge energy price fluctuations and weather risks in energy trading. In addition to the existing thermal coal futures hedging, forward foreign exchange settlement and sales and foreign exchange swap business, Baolihua New Energy can also further research and use new energy-related futures and options products, such as power futures, carbon emission futures or options. If the market launches weather derivatives related to the efficiency of new energy generation in the future, it can also actively participate. Through the method, the company can hedge various risks in power production, sales and international business more comprehensively, which means that it is able to reduce the impact of market price fluctuations, weather changes and other factors on performance, enhancing the company's ability to resist risks and performance stability.

Secondly, NRG Energy has a complete risk management system in the process of

participating in financial derivatives trading, including risk assessment, risk limit setting, risk monitoring and other links. Baolihua New Energy can learn from its experience and establish a more refined and professional financial derivatives risk management process by introducing advanced risk assessment models and monitoring systems. The market risk, credit risk and operational risk of financial derivatives trading can be monitored and evaluated in real time.

Finally, NRG Energy actively cooperates with various financial institutions and other energy companies in the financial derivatives market to expand its business scope and market share. Although Baolihua New Energy has implemented the dual-core business strategy of integrating the main new energy power into new energy investment, compared with NRG Energy, it still needs to further strengthen cooperation with domestic and foreign financial institutions to jointly develop innovative financial derivatives products suitable for the company's business needs so as to achieve risk sharing and benefit sharing. In addition, with the help of the resources and professional advantages of the partners, the company will enhance its influence in the financial derivatives market and obtain more market information or trading opportunities.

4 Conclusion

This paper studies the impact of financial derivatives on the four areas of risk control, financial management, market value and business development of companies in the energy industry so as to explore the assistance of derivatives for the development of energy enterprises and the ability of enterprises to gradually improve their ability to further develop from various aspects such as sales strategy, capital and market. Additionally, this paper compares two private energy companies in China and the United States horizontally, which puts forward new ideas for the expansion of China's new energy industry.

The primary reason for the success of Baolihua New Energy in expanding its market share in 2022 through financial derivatives is that derivatives can effectively reduce the risk to the energy industry when the price volatility range of the fuel market is too large. Based on this, the company can follow the policy development trend and gradually focus on new energy trading and corresponding risk reduction derivatives, such as NRG Energy's mature weather derivatives. In the power industry, because changes in temperature lead to seasonal changes in electricity demand, utilities can use weather derivatives to hedge against fluctuations in electricity demand and revenue uncertainty caused by temperature anomalies. Secondly, for the aspect of capital chain, because the derivatives mainly used by Baolihua New Energy are futures and forwards signed with fixed companies, the company can have a considerable part of the cash flow of predictable time under the unstable general environment, showing the increase in the level of capital management. Partnering with financial institutions to expand market share or even proactively create derivatives projects can be the next step in the effort. This will not only share the risk with a trustworthy company, but also increase the market's trust in the company. What's more, with the fact that futures can be sold in large quantities, energy companies could expand their market share and gradually increase production. In the case of sufficient production, in line with the government's policy on the development of new energy vehicles in China, which can be combined with foreign exchange derivatives export in foreign countries to achieve multi-line development.

The research fills the gap in the robustness of financial derivatives for hedging, rather than speculation for energy companies, and guides people to go beyond their role in reducing the risk of price fluctuations. It will be helpful to explore the unique auxiliary role of derivatives in the energy industry and the functional expansion of derivatives in various industries. Due to the availability of data, it is difficult to obtain the number of futures at the

specific time of the company in the study of risk management, so the analysis method based on theoretical analysis is chosen. In the future, on the basis of a complete database, the function of financial derivatives on energy companies to reduce risks can be quantified in case that the number of derivatives used can be controlled in more detail.

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