

Application and Risk Analysis of Blockchain Technology in Supply Chain Finance: A Case Study of New Energy Vehicle Companies

Xuetai Li

*School of Business, Macau University of Science and Technology, Macau, China
1220019059@student.must.edu.mo*

Abstract. With the gradual development of the new energy vehicle (NEV) industry, the market share and scale of enterprises continue to expand. However, supply chain and finance management have become more difficult as a result of the intricate industrial chain structure. While supply chain finance can provide financing support, the accuracy and timeliness of information transmission are difficult to guarantee. Because of its distinct security qualities, blockchain technology is becoming more and more popular in the financial industry as a significant information technology. This paper focuses on the application of blockchain technology in the supply chain finance of the new energy vehicle industry. It explores how integrating blockchain technology can improve the efficiency and reliability of supply chain finance to address information transmission issues in the NEV industry and promote the stable development of the industrial chain. The study finds that blockchain technology, with its unique security and information technology attributes, is highly compatible with the trend of intelligence and informatization in the NEV industry. By introducing blockchain technology, secure, convenient, and timely sharing of information between enterprises can be achieved, effectively integrating supply chain finance, improving its operational efficiency and reliability, and bringing numerous benefits to enterprises in the industrial chain, thus assisting the sustainable development of the NEV industry.

Keywords: Blockchain technology, Supply chain finance, New energy vehicle industry, Application, Risk

1. Introduction

With the development of technology and industry, new energy vehicles (NEVs) have become an important driving force for the low-carbon development of the automobile industry. The NEV industry in China has also made significant progress. In the past decade, China has become the world's largest producer and consumer market for new energy vehicles. From 2015 to 2024, the production of NEVs in China increased from 401,300 vehicles to 12.888 million vehicles, with a compound annual growth rate (CAGR) of 47.03%. Its global market share grew from 30% to 70% [1].

The production of upstream raw materials (like graphite and lithium iron phosphate), midstream components (like motors, batteries, and chips), and downstream vehicles (like BYD) comprise the NEV supply chain. While some NEV firms distribute through dealers, others sell straight to consumers. While other component manufacturers are frequently small and medium-sized businesses, core component makers are usually major corporations with substantial negotiating strength [2].

The development of SMEs has long been constrained by financing difficulties and high financing costs. This is partly due to the lack of information disclosure obligations and regulations compared to listed companies, making it difficult for banks to offer credit services. Additionally, fierce competition in the NEV industry, such as the large-scale price war at the beginning of 2023, with several companies participating and vehicle prices dropping by more than 170,000 yuan per unit, has disrupted the cash flow of upstream and downstream enterprises [3]. In 2024, the average profit margin of China's NEV industry was 4.3%, lower than the 6% in downstream industries and 5% in upstream supplies [4]. Half of the companies in the power battery sector experienced losses, leading to imbalances in the supply chain's funds, with upstream enterprises often delaying payments and downstream enterprises having to prepay funds [3]. In 2024, the average payment period for car companies was 170 to 200 days, significantly longer than overseas car companies like Toyota and Mercedes-Benz. Although some car companies attempted to shorten the payment period to 60 days, the results were not significant [5]. Enterprises in weaker parts of the supply chain, due to insufficient fixed assets, find it difficult to obtain financial support [6]. Therefore, there is an urgent need to adopt new financial technologies to provide solutions for SMEs and improve supply chain efficiency.

This paper focuses on the application of blockchain technology in the supply chain finance of the NEV industry, discussing how it can enhance the operational efficiency and reliability of supply chain finance, resolve information transmission challenges in the industrial chain, and promote the stable development of the supply chain.

2. Theoretical overview

2.1. Supply chain finance

Supply chain finance is a financial service model based on the supply chain, where core enterprises lead the way in realizing the deep integration of finance and the real economy. In the supply chain finance system, the core enterprise undertakes the task of providing financing guarantees for other enterprises in the supply chain, using assets such as orders and accounts receivable as collateral to provide financing, thereby reducing financing costs and risks. The main supply chain financing models include accounts receivable financing, inventory financing, and prepaid financing [7].

Accounts receivable financing, also known as accounts receivable pledge financing, refers to a model where a battery system manufacturer pledges its accounts receivable from automobile manufacturers to banks or other institutions as collateral to obtain financing from banks or other financial institutions [8]. Businesses in sectors with lengthy payment cycles can effectively handle cash flow and capital turnover problems in this way. The amount of accounts receivable will not be lost as long as the business can retrieve the receivables within the allotted period since they are utilized as security rather than being transferred directly.

Inventory financing refers to enterprises pledging their own inventory goods or raw materials as collateral to apply for loans from banks. Similarly, the prepaid financing model uses prepaid accounts receivable as collateral, such as order payments, to obtain financing support from financial

institutions. This model effectively alleviates the capital turnover pressure of downstream enterprises in the supply chain and meets their financing needs [9].

However, traditional supply chain finance models face problems such as information opacity, difficulty in sharing information, and the inability to ensure the authenticity of information. SMEs lack standardized information disclosure, making it difficult for financial institutions to extend credit and causing financing difficulties. Additionally, the large volume of data generated in supply chain operations relies on manual review in traditional systems, which is time-consuming and labor-intensive, resulting in long loan processing cycles. Information distortion or tampering may occur when transferring data across different levels of the supply chain, making it difficult for core enterprises' guarantees to be effectively implemented.

2.2. Blockchain technology

Blockchain technology is a new information infrastructure built on distributed ledgers, cryptographic algorithms, and consensus mechanisms. It is characterized by decentralization, immutability, and openness. Blockchain consists of nodes that form the chain, where each node is equal and jointly records and edits the same ledger, unlike traditional databases where a single server or organization performs permission authentication, data storage, and distribution.

The decentralized nature of blockchain ensures the security of data. When uploading data, the nodes package the information into a new block, encrypt it using algorithms such as SHA256, and write the discrete function result of the previous block at the beginning to determine the order. Using the characteristics of hash algorithms, such as one-wayness and fixed length, nodes can verify the correctness of the previous block's content by comparing the current block's header with the predecessor hash, thus maintaining the chain structure. Using features like immutability, blockchain provides a fast and verifiable information exchange channel for the nodes, making it the cornerstone of mutual trust between enterprises and facilitating various activities. Blockchain may be classified as public chains, consortium chains, and private chains according to how open it is, each of which has a unique consensus method [10]. Public chains, which are usually used in anonymous environments like Bitcoin, have no entrance barriers and employ consensus procedures like proof of work (PoW), which uses a lot of energy and processing capacity. In the supply chain finance blockchain environment, most nodes are known manufacturers within the supply chain, so consortium chains, which have certain entry thresholds and identity restrictions, are often used.

3. Application of blockchain technology in supply chain finance

3.1. Solving the problem of information opacity

Information opacity is a key issue that has long hindered SME financing in traditional supply chain finance. SMEs often lack the information disclosure obligations and standards required of listed companies, making it difficult for financial institutions to obtain their true financial data and operational status, which in turn makes it challenging to accurately assess risk and provide financing support. Blockchain technology records all transaction information on a distributed ledger, ensuring transparency and immutability. Each node maintains the same copy of the ledger, and any update to transaction information is instantly synchronized across all nodes. Once recorded, the information cannot be tampered with. This enables SMEs to provide credible financial data and operational status, allowing financial institutions to more accurately assess risk based on transparent and reliable information, making them more willing to provide financing support. For instance, through

blockchain technology, SMEs can share their orders, accounts receivable, and other information with financial institutions in real time, enabling financial institutions to quickly verify the authenticity of this information and accelerate the financing process, thereby reducing financing costs.

3.2. Enhancing information sharing efficiency

Blockchain technology not only improves the transparency of information but also significantly enhances the efficiency of information sharing. In traditional supply chain finance, information sharing mainly relies on manual review, which is cumbersome and time-consuming. Blockchain technology enables real-time information sharing and rapid verification through smart contracts and automation mechanisms, greatly reducing the manual review steps and shortening the financing cycle. For example, BYD's "DiLian" platform uses blockchain technology to integrate supply chain finance, enabling secure and rapid information sharing between enterprises. The platform employs smart contracts and automation mechanisms to automatically execute contract terms, significantly shortening the time from contract creation to loan approval, improving financing efficiency. However, this platform also faces risks. If BYD's sales or credit experience a significant fluctuation, it could trigger a chain reaction among the enterprises on the platform. Similarly, SAIC's SAICSec platform also uses blockchain technology to optimize supply chain finance processes, improving financing efficiency through smart contracts and automation mechanisms. But the platform also faces the risk of core enterprises using decentralized technology to create centralized systems, forcing SMEs to accept longer payment terms and harsher conditions, further squeezing profit margins. This indicates that although blockchain technology can enhance information sharing efficiency, finding a balance between decentralization and centralization remains a key challenge.

3.3. Ensuring information authenticity

The immutability of blockchain technology is one of its major advantages in supply chain finance. In traditional supply chain finance, information is easily distorted or tampered with during transmission between different levels of the supply chain, reducing financial institutions' trust in SMEs and increasing financing difficulties. Blockchain technology ensures that information remains authentic and complete as it is transmitted across the supply chain through distributed ledgers and cryptographic algorithms. Each block is encrypted through hash algorithms, and each block contains the hash value of the previous block, forming an immutable chain structure. This mechanism ensures that once information is recorded, it cannot be modified, thereby ensuring its authenticity. The credit of core enterprises is effectively transmitted, enhancing financial institutions' trust in SMEs. For example, core enterprises can use blockchain platforms to share their credit ratings, order information, and other data with financial institutions and SMEs, allowing them to use this credible information for financing and transactions. This not only improves financing efficiency but also reduces the risk for financial institutions, promoting healthy development in supply chain finance.

4. Risk analysis and challenges

When applying blockchain technology in supply chain finance for NEVs, several risks and challenges must be addressed. Core enterprise credit risk is a major issue. The creditworthiness of core enterprises is crucial for the stability of the entire supply chain. If the sales or credit rating of a core enterprise experiences significant fluctuations, financial institutions may tighten credit limits,

impacting SMEs that rely on the credit guarantees of core enterprises. These SMEs typically finance through accounts receivable or orders from core enterprises. If the core enterprise fails to pay on time, SMEs' cash flow will be severely impacted, potentially causing a break in the funding chain, preventing normal operations.

Centralization risk cannot be overlooked. Although blockchain technology is decentralized, some core enterprises may use their dominant position in the industry chain to create centralized systems, holding excessive power and intervening in platform operation rules and data-sharing mechanisms. This could force SMEs to accept longer payment terms and harsher transaction conditions, further compressing profit margins, thus violating the initial intent of blockchain technology and intensifying unfair competition between upstream and downstream enterprises in the industrial chain.

Another significant limitation is legislative and regulatory risk. There is now market misunderstanding and compliance issues as a result of the undeveloped legislation and policies around the deployment of blockchain technology in supply chain financing, which is still in the exploration stage. The lack of a clear regulatory framework could result in non-compliant actions by enterprises, such as data falsification or illegal financing, undermining industry development. The lag in regulatory policies may also limit the potential of blockchain technology to improve the efficiency and security of supply chain finance.

In conclusion, while blockchain technology holds great potential in NEV supply chain finance, it is essential to remain cautious of core enterprise credit risk, centralization risk, and regulatory policy risk. To ensure sustainable development of the industry, improvements should be made in regulatory policies, strengthened supervision, and promotion of decentralized governance.

5. Conclusion

Blockchain technology and supply chain finance have good compatibility and development potential. The integration of these two systems will have a promising future in the NEV industry. However, regulations and policies need to be developed to govern its application and mitigate potential risks, ensuring a healthy competitive environment.

Nevertheless, this paper has some limitations. Firstly, the research is mainly based on existing literature and cases, lacking in-depth empirical analysis of the actual application of blockchain technology. Future studies can conduct field research and data collection to quantitatively assess the actual application of blockchain in NEV supply chain finance and accurately measure its benefits and risks. Secondly, the discussion on the legal and regulatory framework for blockchain applications in supply chain finance is relatively limited. Given the rapid development and complexity of blockchain technology, future research could delve deeper into the impact of laws and regulations in different countries and regions on blockchain applications and propose more targeted policy recommendations.

References

- [1] China Association of Automobile Manufacturers (CAAM). (2025). Statistics. Retrieved from <http://www.caam.org.cn/tjsj>
- [2] Liu, S. (2023). Research on the Operation Mode and Effect of "Blockchain + Supply Chain Finance" <https://doi.org/10.27040/d.cnki.ggzdu.2023.001695>
- [3] Huang, Y., Deng, Z.. (2025). The Formation Mechanism and Governance Recommendations for "Involutionary". <https://doi.org/10.19851/j.cnki.CN11-1010/F.2025.06.173>.

- [4] Competition in China's New-Energy Vehicle Industry. (2025). Behind the "breakout" of auto sales: 2024 industry profit margin is only 4.3%. Retrieved from http://dianzibao.cb.com.cn/html/2025-04/21/content_335450.htm?div=-1
- [5] General Office of the State Council of the People's Republic of China. (2025). Regulations on the Payment of Funds for SMEs. Retrieved from https://english.www.gov.cn/archive/statecouncilgazette/202504/10/content_WS67f6fd9ac6d0868f4e8f18ca.html
- [6] Tong, S. (2023). Research on Blockchain in Supply Chain Finance. Retrieved from <https://doi.org/10.14013/j.cnki.scxdh.2025.12.025>.
- [7] Zhu, X., He, Q., Guo, S. (2017). On the Role of Blockchain Technology in Supply Chain Finance. Retrieved from <https://doi.org/10.14089/j.cnki.cn11-3664/f.2018.03.013>.
- [8] Lu, H., Dong, G. (2016). Discussion on the Financing Mode of China's NEV Supply Chain. Retrieved from <https://doi.org/10.13910/j.cnki.shjr.2016.08.013>.
- [9] Xu, L. (2022). Research on credit risk of S Group, a new energy vehicle enterprise, from the perspective of Supply Chain Finance. Retrieved from <https://doi.org/10.27040/d.cnki.ggzdu.2023.001695>
- [10] Li, J. (2023). Survey of blockchain: principle, progress and application Retrieved from doi: 10.11959/j.issn.1000-436x.2020027