The Advantages of Supply Chain Finance and Blockchain Technology are Combined and Empowered——Based on Scientometric Analysis

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Abstract. In the process of technology promoting the transformation towards digitalization, both blockchain technology and supply chain finance emerge as hot topics. Blockchain technology, characterized by decentralization, immutability, transparency, security, and programmability, addresses the risk considerations inherent in supply chain finance operations. The challenge lies in the clutter of data and information, making it difficult to establish a foundation of trust between enterprises, thus hindering the maximization of benefits. This paper employs scientometric analysis to explore the literature on related keywords such as "blockchain" and "supply chain finance" in the Web of Science (WoS) database. Utilizing the Bibliometrics tool, correlations are established and visualized to elucidate the development trends and hotspots in the integration of supply chain finance with blockchain technology. The aim is to provide theoretical significance for stakeholders in the field, including researchers and corporate decision-makers. Additionally, it seeks to offer an architectural framework for designing a more digital and efficient supply chain financial system, thereby promoting the processes of informatization, digitization, and intelligence.

Keywords: Blockchain technology; Supply chain finance; Scientometric Analysis

1 Introduction

The growing interest and research in supply chain finance across various academic disciplines worldwide reflect the importance and complexity of this evolving field[1]. The future of research in supply chain finance looks promising, with a focus on providing enhanced support and guidance for practical applications. This will undoubtedly benefit core enterprises and drive innovation in the field[2]. This approach effectively mitigates risk for small and medium-sized enterprises by integrating capital flow, logistics, and information flow within the supply chain. It ensures a more stable and controllable financial environment for all involved parties[3]. Supply chain finance plays a crucial role in reducing risk, improving efficiency, and driving financial innovation. Based on the data retrieved by WoS, the research fields of blockchain in foreign countries are diverse, including medical care, digital currency, and artificial intelligence, while supply chain finance research spans corporate finance and quantum chemistry. This paper provides a comprehensive review of the integration of blockchain technology in supply chain finance, highlighting its diverse applications across various industries including corporate

finance, logistics[4], quantum chemistry, digital currency, drug industry, anti-drug efforts[5], intellectual property[6], , and food supply chains [7]. The advancement of supply chain finance is crucial in the current era of globalization and digitalization. It plays a key role in stabilizing industrial and supply chains, addressing financing challenges for small businesses, and driving economic growth[8]. The evolving landscape of supply chain finance, marked by digitalization and intelligence, multi-level financial support, and global cooperation, is driving governments worldwide to implement supportive policies. This shift presents both opportunities and challenges, influencing various aspects of enterprise operations. Effective debt management hinges on accelerating fund turnover. Blockchain is a decentralized distributed ledger that is stored in a block-chain, tamper-proof, secure and trustworthy manner, which combines distributed storage, peer-to-peer transmission, consensus mechanism, cryptography and other technologies to record transactions and information through the ever-growing blockchain of data blocks to ensure the security and transparency of data，it provides automated solutions for global supply chain finance practices[9]. Blockchain technology offers significant advantages for supply chain finance due to its inherent characteristics of decentralization, immutability, transparency, security, and programmability. This makes it a powerful tool for enhancing efficiency and trust in supply chain transactions[10]. Smart contracts play a pivotal role in enhancing the efficiency, security, and transparency of capital circulation within the supply chain ecosystem, enabling seamless payment, settlement, and capital supervision. Their adoption fosters collaborative information management, driving operational effectiveness[11]. This paper highlights the potential benefits of combining blockchain technology with supply chain finance, including improved transparency, reduced risks, and optimized financing processes. The research indicates promising development prospects for this innovative approach.

2 Data and Methodology

This paper uses scientific metrics to conduct research. This paper uses scientific metrics to conduct research. The scientometric analysis is a valuable research method that utilizes statistical and mathematical techniques to analyze scientific literature and scholarly communication. By examining bibliometric data, researchers can identify patterns, trends, and relationships within the scientific community. The methods involved in scientometric analysis include data collection, data cleaning, descriptive analysis, network analysis, temporal analysis, correlation, regression analysis, text mining, NLP, advanced statistical techniques, validation, and interpretation.

The study employed a systematic approach to retrieve literature on the intersection of blockchain technology and supply chain finance. Utilizing the comprehensive multidisciplinary core journal citation index database, Web of Science, a query design was meticulously crafted with expert input. The search criteria focused on the keywords "Blockchain" and ("supply chain finance" or "SCF" or "supply chain financing"), spanning the years 1985 to 2023, resulting in 120 relevant articles on December 28, 2023. Descriptive analysis revealed a total citation count of 1791, with an average citation frequency of 14.93 per article and an h-index of 22.

In the subsequent phase, data was imported into VOSviewer and Bibliometric software for visualization, encompassing network analysis, temporal trends, and correlation mapping. Data cleaning procedures were undertaken, including the consolidation of similar keywords such as

author keywords. The final stage involved validation and interpretation of the generated visualizations. Challenges encountered in the study primarily stemmed from the intricacies of query design, data cleansing, and the subsequent validation and interpretation processes.
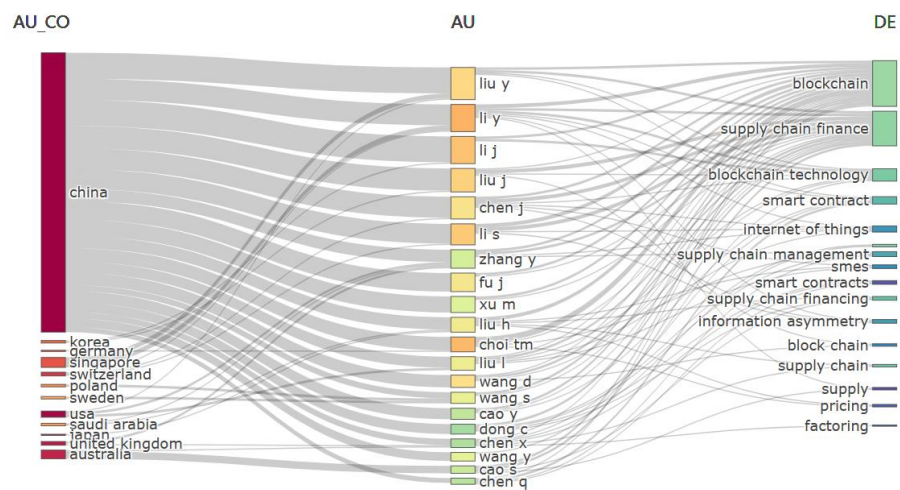
3 Chart Analysis

Fig.1. Three-Fields Plot.

The three-field map (Three-Fields Plot) can build a comprehensive correlation network between different indicators to analyze the relationship between different bibliometric indicators. Using the Three-FieldsPlot method in bibliometrix, "nationality" is selected on the left, the middle field is "author" and "key words" is selected on the right field, and a large number of relevant literature and research papers are collected and organized to draw the network relationship of nationality-author-subject words in Chinese and English literature. By observing the characteristics of this graph, we find that there are obvious crossover areas between blockchain and supply chain finance, and the areas between the overlapping areas may expand with the development of the Internet. Secondly, the number of more keywords are: smart contract, supply chain financing information asymmetry, small and medium-sized enterprises, etc. Block chain and supply chain finance these two areas are involved in the processing and analysis of large amounts of data, both cross use can improve data sharing and transparency, implement intelligent contract automation, avoid human error and fraud, strengthen the credit mechanism, improve financing convenience, etc., bring more business opportunities to small and medium-sized enterprises, promote the development of small and medium-sized enterprises. As can be shown in the figure, China has the highest yield of related scientific papers and has relatively in-depth research in this field. South Korea, Japan, Australia, the Americas and Europe have similar yields of related scientific papers and have differences in nationality for keyword topics. Academic research institutions and scholars with these regions have relatively low interest in

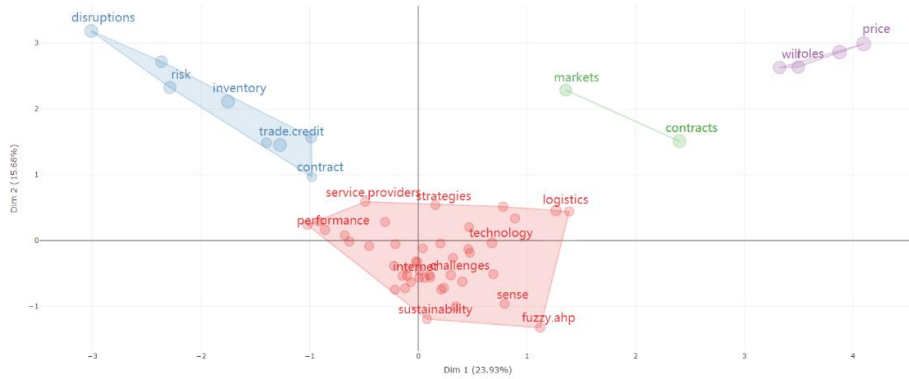this field or the possibility of blockchain model combined with supply chain finance in this country.

Fig.2. Factor analysis chart.

Further clustering the themes through keyword retrieval and factor analysis to obtain the data structure map, whose importance is determined by the size of the cluster map. The data points realize good category differentiation, and the keywords within the cluster have similarity, which effectively identifies the internal structure in the data. Can be seen from the figure 2, the red group range is relatively large, data has multiple clear categories, mainly by performance, strategy, sustainability, logistics, fuzzy analysis level process, service providers theme group external form, and technology, the Internet, the challenge for the group center theme, Dim value near the origin of the center, focus on the Internet and challenge theme. It was followed by the Blue Group, the Green Group and the Purple Group. Blue Group consists of contract, trade credit, interruption, risk, inventory topics. Green and Purple groups are of low importance, including market, contract and confidence, role, the relationship between the two keywords in the group is biased, and show the relative marginal position on the chart. In order to improve the integration of supply chain finance and blockchain technology, we can combine relevant factors and design relevant models, so as to improve the applicability and effect of the model.
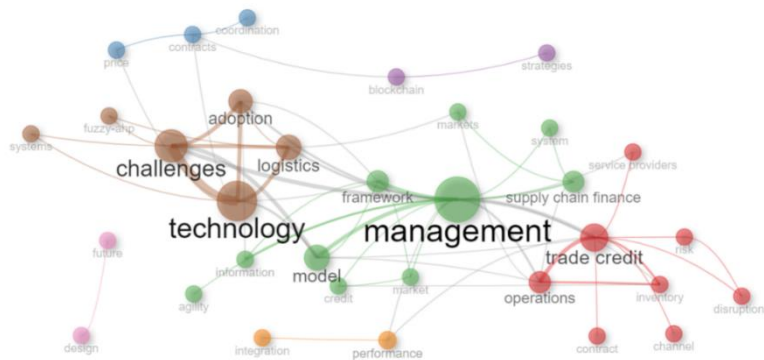

Fig.3. Keyword co-occurrence network diagram.

In order to clarify the degree of correlation between themes or keywords, this paper constructs the keyword co-occurrence network. Under the setting of a certain threshold, the co-occurrence network of keywords can reflect the closeness between keywords. Generally speaking, the more frequently keywords appear or the more simultaneously in the literature or research field, the more it can reflect the connection degree and importance between keywords. The figure shows a total of 7 clusters, with strong centrality of brown and green clusters, with technology and management as the core keywords respectively, reflecting the great importance of these two themes in the field. Diverging from the central keywords, the construction elements of brown cluster are more balanced, including application, challenge and so on. However, the importance of the green cluster is less balanced, including the framework, model, supply chain financing and so on. The red cluster takes transaction credit and practical operation as the main association center, and the correlation is second only to the brown cluster. However, the blue, purple and orange clusters are smaller. The pink group composed of the layout and the future keywords deviates from the center topic, with the lowest close correlation. The core themes and key concepts in the research field are clearly presented in figure 3. A series of high frequency keyword node highlights the research hotspot and focus, the close connection between them reveals the internal connection between these topics and mutual influence, these findings for us to understand the research status and development trend of the field provides a strong support, also identify some potential research blank and provide new ideas and breakthrough point. These information for us to understand the field of knowledge flow and evolution law provides important clues, the figure using data visualization to reflect some keywords high correlation, can narrow the scope of reference, improve the relevance and readability of the article, make the article easier to find the key information, and according to the framework of the network structure.

4 Summary

This paper presents a comprehensive statistical analysis of supply chain finance research utilizing blockchain technology. The study highlights the increasing interest in blockchain and supply chain finance, particularly in China. The research identifies key themes and directions for further exploration, such as smart contracts and sustainability. The findings provide valuable insights for future research and contribute to the advancement of digital transformation in the field.

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