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WENZHOU SMES' DIGITAL JOURNEY: LEVERAGING A FINANCIAL DATA PLATFORM FRAMEWORK FOR SUCCESS

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Abstract: In this paper, 337 literatures related to supply chain finance published in CSSCI and CSCD journals from 2007 to 2022 in CNKI database were selected as samples. CiteSpace, a scientific knowledge graph tool, was used to comprehensively analyze the frontier and research hotspots of supply chain finance by visualization analysis and content analysis. The results show that: from 2007 to 2022, the related research on supply chain finance in China presents a steady rising trend; Research hotspots include credit risk, small and medium-sized enterprises, inclusive finance, blockchain and commercial banks; The combination of supply chain finance and blockchain technology will be the forefront of research. With the advancement of technology, digitalization of supply chain finance and green supply chain finance will become the development trend in the future.

Keywords: Supply chain finance, CiteSpace, Progress and trends, Visual analysis, Knowledge graph.

1. Introduction

Supply chain finance is a brand new business field emerging with the development of supply chain. It combines the relevant knowledge of supply chain management and financial system, and provides a package of financial solutions[1]Since 2000, when Shenzhen Development Bank first experimented with trade finance business, the model and system of supply chain finance have been developing continuously in China. Supply chain finance has become an important area of economic development both globally and in China, showing great potential for growth. According to the report of the 20th National Congress of the Communist Party of China held on October 16, 2022, "With the theme of promoting high-quality development, we will strive to improve the resilience and security of industrial and supply chains." The stable development of the industrial chain and supply chain is of great significance to economic operation and a booster for high-quality economic development. The role of supply chain finance in supporting the industrial chain has been repeatedly emphasized in a number of Chinese policies. In September 2020, the People's Bank of China and eight other departments jointly issued the Opinions on Regulating the Development of Supply Chain Finance to Support the Stable Circulation, Optimization and Upgrading of the Supply Chain Industry Chain, which clarified that supply chain finance serves the integrity and stability of the

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supply chain industry chain, supports the optimization and upgrading of the supply chain industry chain and the national strategic layout. Against the backdrop of the changing international situation and rapid economic development at home, various parts of China have launched actions to stabilize, consolidate and strengthen the supply chain. Supply chain finance has played a positive role in maintaining chain stability, unblocking the upstream and downstream of the supply chain, and alleviating financing difficulties for small and medium-sized enterprises. In this paper, CiteSpace, a scientific knowledge graph tool, is used to make a visual analysis of the literature in related fields of supply chain finance, revealing the research hotspots and progress in this field from multiple perspectives, in order to provide theoretical reference and inspiration for further research in this field.

2.   Research Design

2.1 Research Methods

CiteSpace is a software developed under the background of data mining technology and information visualization. With the help of CiteSpace software and the comprehensive application of content analysis, bibliometric and visual analysis methods, this paper makes a visual analysis of the annual number of publications, core authors and the "knowledge graph" of key words in the field of supply chain finance, and displays the hot spots and research progress related to supply chain finance. This paper focuses on keyword cluster analysis and hot words breakout analysis to study the hot spots and research progress in each stage of supply chain finance.

2.2 Data Sources

The analysis samples in this paper are from CNKI database. In order to ensure the quality of the analysis samples, the source journals were set as "CSSCI source journals" and "CSCD source journals", the title of the literature search articles was set as "Supply chain finance", and the search time span was "2007-2022". A total of 337 valid data articles were obtained after screening. The relevant literature data were exported in Refworks format, modified into CiteSpace recognizable file names, and formatted for drawing the knowledge map.

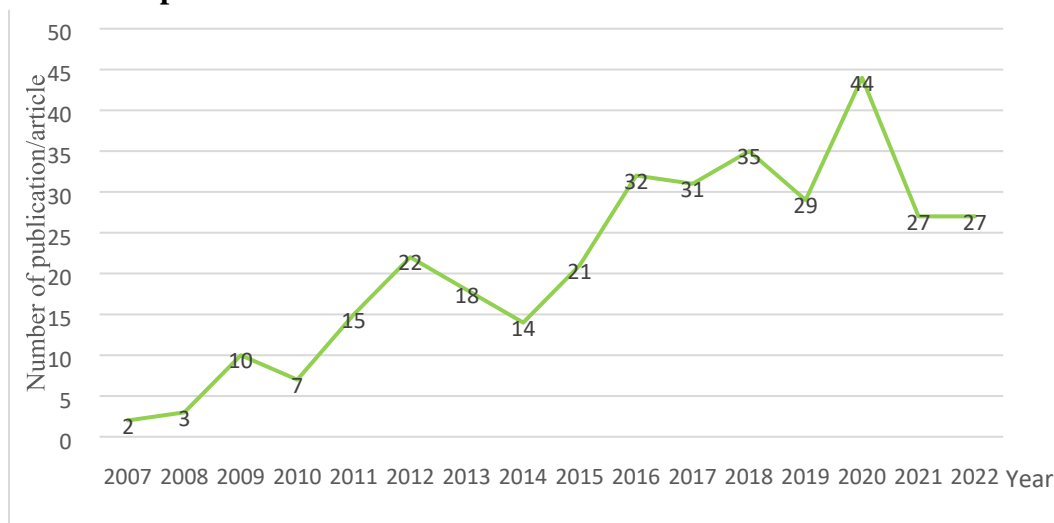**3. Research and judgment of China's supply chain finance 3.1 Analysis of the number of publications**

Figure 1 Trend analysis ofthe number of papers published in the field of supply chain finance in China from 2007 to 2022

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The number of literature output can reflect the research progress in this field to a certain extent. Based on this, Figure 1 shows the output time distribution of supply chain finance literature from 2007 to 2022. On the whole, the relevant research results in the field of supply chain finance show a steady upward trend. The theoretical research process can be specifically divided into four stages: embryonic period (2007-2010), preliminary exploration period (2011- 2015), rapid development period (2016-2019) and innovation breakthrough period (2020-present). In the embryonic stage, the number of core papers published was 22. Yang Lin, Xiong Xiong, Wan Hongdi and Hu Yuefei et al focused on the background, concept, risk assessment and financing of small and medium-sized enterprises of supply chain finance, etc . Later, more and more domestic scholars began to pay attention to relevant researches in the field of supply chain finance. In the exploratory period, 90 core literatures were published. Scholars studied the risks, financing models and agricultural supply chain finance of supply chain finance in combination with the development status of supply chain finance in China. In the period of rapid development, 127 core literatures were published. A number of scholars conducted empirical research on supply chain finance from different perspectives, pointed out its current situation and problems, and put forward suggestions for improvement. In the period of innovation breakthrough, 98 core literatures were published. Especially in 2020, after the outbreak of the epidemic, the research on supply chain finance increased rapidly, and scholars focused more on smart supply chain finance, providing theoretical support for solving the financing barriers of smes in the supply chain under the background of the epidemic.

3.2 Analysis of co-occurrence of authors

CiteSpace software is used to analyze the cooperative network of authors with "Author" as the node, and the author co-occurrence knowledge graph is obtained, as shown in Figure 2. The font size of the graph is positively correlated with the number of authors' publications, and the node connection is directly proportional to the closeness of the authors' cooperative relationship. Different colors in the graph distinguish different years.

Figure 2 Author co-occurrence knowledge graph

As can be seen from Figure 2, authors studying supply chain finance generally present the characteristics of small concentration and large dispersion. According to Price's law, the minimum number of papers published by core authors M=0.749 (Nmax) 1/2 (Nmax refers to the number of papers published by the authors with the most papers)[2], the author with the most papers on "supply chain finance" is Song Hua, with 25 papers published, and M=3.745 is calculated. That is, the author who has published more than or equal to 3 papers in the field of supply

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chain finance is the core author in this field. According to the visual analysis, a total of 344 nodes, 214 connections were obtained in this operation, and the network density was 0.0036, indicating that there is a certain scale of cooperation teams in this field, such as Song Hua and Yang Xuan, Chen Jinlong and Zhan Yongzhi, Xu Peng and Chen Xiaoxu, etc.

The high frequency authors and the highest citation frequency of supply chain finance research are shown in Table 1. According to the analysis results, Song Hua, professor of Business School of Renmin University of China, has published the most papers on the topic of supply chain finance, with a total of 25 papers. Song Hua, a professor of business School of Renmin University of China, proposed three dimensions of the object of description of supply chain finance in the literature with the highest cited frequency, namely structure, process and elements, and analyzed the ability requirements[3]of these dimensions at different stages from the perspective of subject vision. Followed by Xu Peng from the School of Management of Southwest University of Political Science and Law, the author conducted field research on the existing research results, refined the risk framework of online agricultural supply chain finance, and constructed a risk index evaluation system[4]. Then Lu Qiang from the Business School of Renmin University of China, whose most frequently cited literature conducted in-depth exploration and analysis[5]based on the innovation of supply chain finance in virtual industrial clusters.

Table 1 High-frequency authors and literatures with the highest citation frequency of supply chain finance research in China

Cited No.	Author	The most frequently cited literature	Frequency
1	Song Hua	The Evolution of Supply Chain Finance and Internet Supply Chain Finance: a theoretical framework	390
2	Xu Peng	Study on financial risk prevention of online agricultural products supply chain	59
3	Lu Qiang	Innovation of supply chain finance model based on virtual industrial cluster: a case study of Chuangjie Company	207
4	Yang Xuan	Risk sources and systematic management of supply chain finance: antegraded framework	159
5	Li Jian	Research on credit risk identification and early warning model of supply chain finance	165
6	Shi Jinzhao	Research on the evolution and risk management of online supply chain finance model based on third-party B2B platform	550
7	Chen Jinlong	Bilateral bargaining game model of third-party supply chain finance	52

4. China's supply chain finance research focus

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4.1 Keyword cluster analysis

Keywords are the highly condensed content of the full text, and the occurrence frequency of keywords represents the research hotspot in a certain period. Based on CiteSpace software, LLR algorithm was applied to obtain the keyword clustering network diagram of the research hotspots of supply chain finance (see Figure 3). The software uses two indexes: Q value (simulated value) and S value (average contour value) to evaluate the structural rationality and clarity of the clustering map. When Q value >0.3, the structure of the map is significant, when the average contour value S>0.5, the cluster map is reasonable, and if S is close to Figure 0.7, the structure of the map is very reasonable. The Q value of FIG. 3 is 0.847 and S value is 0.9251, which indicates that the clustering diagram is very good. FIG. 3 presents 7 clusters of "credit risk", "small and medium-sized enterprises", "inclusive finance", "blockchain", "commercial banks", "capital constraints" and "core enterprises". Further analysis can conclude the following three research hotspots.
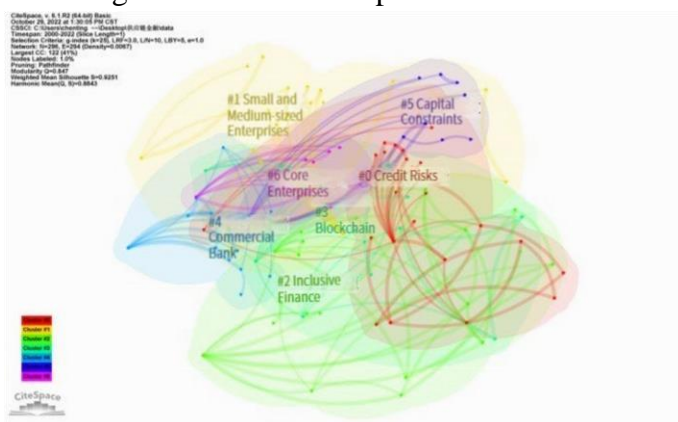
Figure 3 Knowledge map of supply chain finance keyword clustering

(1)   Research on supply chain finance risk management. Yang Lin proposed to strengthen the risk management of supply chain finance, emphasizing the focus on operational risks, the full review of legal risks, the adoption of risk diversification and risk mitigation measures and the exploration of risk measurement methods[6]. In terms of risk control, Jin Xiangshu, Li Jian et al., based on the benefit sharing - two-way option contract, constructed numerical examples and discussed the impact[7] of key parameters such as option strike price, benefit sharing ratio and bank pledge rate on risk control. In terms of credit risk, Xiong et al. put forward a credit risk evaluation system[8] related to subject and debt rating.

(2)   Related research on supply chain finance financing model. Supply chain finance is an important link of the whole chain financing of the supply chain. Its financing model can be roughly divided into accounts receivable, inventory pledge and prepayment financing. The accounts receivable financing mode of supply chain finance means that enterprises use the accounts receivable in the signed sales contract as the source of repayment, so as to obtain funds[9]. In the inventory pledge financing mode of supply chain finance, enterprises pledge inventory to banks to obtain financing, so as to provide financial services and products to help the core enterprises of the supply chain network and related small and medium-sized enterprises , and promote the resource allocation. [10]In the production and operation of the supply chain, the accounts payable caused by the purchase of raw materials and the inventory accumulation caused by the market influence will hinder the circulation of the assets of the supply chain activities . In this case, financial services[11]

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(3)   Innovative integration and development of supply chain finance and fintech (blockchain, Internet+, artificial intelligence and big data, etc.). On the basis of the decentralization of blockchain technology and other characteristics, Chen Xiaoling looked forward to the development prospects. [12]Gong Qiang and Ban Mingyuan compared digital supply chain finance with traditional supply chain finance, and completely analyzed the economic operation logic of digital supply chain finance, revealing that with the popularization of blockchain technology in the supply chain in the future, digital supply chain finance will become a more efficient and inclusive financial means to support economic development [13]

4.2 Keyword breakout analysis

Emergent keywords are keywords that receive greater attention in a short period of time. Keyword mutation analysis can measure the node activity in the keyword collinear network, and its emergent intensity and time can fully reflect the changes of relevant hot spots in the research field of supply chain finance in different periods and track their changing trends. CiteSpace software was used to draw the map of the top 11 keywords, and the emerging hot words from 2007 to 2022 were shown in Figure 4 according to the emerging intensity from high to low. From 2007 to 2014, the breakout words focused on small and medium-sized enterprises, financing mode, financing and risk control, etc. From 2016 to 2020, the research field in China mostly focused on supply chain finance credit risk, financing performance and risk management.

Top 11 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2007 – 2022
Small and medium-sized enterprises	2007	3.16	2008	2013	
Financing mode	2007	1.49	2008	2012	
Financing	2007	2.3	2009	2011	
Risk control	2007	1.54	2009	2014	
Credit risks	2007	1.53	2016	2017	
Financing performance	2007	3.1	2017	2018	
Risk management	2007	2.61	2018	2020	
Blockchain	2007	4.54	2019	2022	
Financial technology	2007	2.5	2019	2022	
Rural revitalization	2007	2.08	2019	2022	
Smart contract	2007	1.73	2020	2022	

Figure 4 Abrupt evolution map of keywords in the research field of supply chain finance in CNKI database during 2007-2022

Combined with Figure 4, it can be seen that from 2019, new keywords such as "blockchain", "fintech", "rural revitalization" and "smart contract" have appeared. Since 2021, a number of provinces across the country have issued the 14th Five-Year Plan, which mentions the supporting role of supply chain finance for agricultural development and rural revitalization. For example, Heilongjiang, Henan, Shandong and other major agricultural provinces have issued relevant documents to strengthen the development of agricultural supply chain finance. Supply chain finance cuts into the core enterprises of the industrial chain and penetrates into the upstream and downstream small and medium-sized enterprises of the industry, greatly expanding the scope of financial services and expanding the coverage of agricultural inclusive finance. It should be noted that among the above keywords, the emergence intensity of "blockchain" is as high as 4.54, reflecting the growing momentum of the integration and development of supply chain finance and technology in the new era. The blockchain, which is listed as one of the

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seven key industries of the digital economy in the "14th Five-Year Plan", with its smart contract, P2P network, consensus algorithm, asymmetric encryption and other new technologies, efficiently integrates physic al flow, data flow, information flow and capital flow, which can solve the problem of "storage" and "certificate" of information in supply chain finance. "Smart contract" is an open source distributed ledger using blockchain technology, which improves the recording efficiency of transaction data between buyers and sellers, and also ensures that these records are permanently preserved and verifiable. Transactions can also be automatically initiated by setting up "smart contract". The introduction of blockchain smart contracts is expected to improve the existing transaction mode of supply chain finance, enhance the communication between enterprises in the supply chain, reduce the transaction cost of the overall supply chain, and release greater value.

5. Conclusion

By using CiteSpace software and combining 337 valid data from 2007 to 2022, this paper makes a visual analysis of the annual number of published papers, core authors and research hotspots of keywords, and draws a "knowledge graph" to explore the academic research progress and hotspots in the field of supply chain finance. Conclusions can be drawn as follows: First, the number of published papers from 2007 to 2022 shows an overall fluctuating trend; Second, the cooperation among scholars in the field of supply chain finance has begun to take shape, but the degree of connection needs to be improved; Third, the topics related to credit risk, small and medium-sized enterprises, inclusive finance, blockchain and commercial banks are hot topics in the field of supply chain finance.

Supply chain finance is an interdisciplinary research topic, including supply chain management collaboration and financial services. At present, with the dual drive of market demand and policy orientation, the supply chain finance system has been continuously improved, and the research on supply chain finance has been constantly updated. Due to the changing global economic trend and the continuous development of China's financial model, Chinese scholars are paying more and more attention to the study ofmicro fields of supply chain finance, such as green supply chain finance, blockchain + supply chain finance, real economy, etc . It is foreseeable that with the deepening of research in the field of supply chain finance, digitalization of supply chain finance and green supply chain finance will become the development trend in the future.

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