Supply Chain Finance, Core Company Performance and Financing Difficulties of SMEs – Based on Central Holding Group's Industrial Ecosystem Practice

Yu, Zhuyun

UNIVERSITÉ DE GENÈVE

GENEVA FINANCE RESEARCH INSTITUTE

Supply Chain Finance, Core Company Performance and Financing Difficulties of SMEs

— Based on Central Holding Group's Industrial Ecosystem Practice

Dissertation Submitted to

The University of Geneva

in partial fulfillment of the requirementfor the professional degree of

Doctorate of Advanced Professional Studies in AppliedFinance, with Specialization in Wealth Management

by

Zhuyun Yu

(FCO N° 73938)

Dissertation Supervisor: Professor Olivier Scaillet,
University of Geneva

October, 2022

Disclaimer

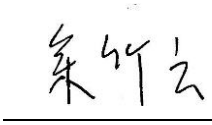
I declare that I have read the plagiarism information and prevention documents issued by the University of Geneva.

I certify that this work is the result of personal work and has been written independently. The work is the responsibility of the author, in no way does the work engage the responsibility of the University of Geneva, nor of the supervising Professors.

I declare that all sources of information used are cited in a complete and accurate manner, including sources on the Internet. Other individuals and groups that have contributed to the research work involved in this paper have been clearly identified in the paper.

I am aware that the fact of not citing a source or not quoting it correctly is plagiarism and that plagiarism is considered a serious fault within the University, punishable by penalties.

In view of the above, I declare on my honor that the present work is original.

Signature：  Date: 2022.10.18

Abstract

Small and medium-sized enterprises (SMEs) are crucial to the development of China's national economy. They significantly contribute to job creation, economic efficiency, industrial innovation and upgrading, economic transformation, and social stability. However, due to their low core competitiveness, high operational risks, and lack of collateral, SMEs commonly face difficulties in obtaining financial services, an inconsistency with their important strategic role in the development of the national economy. The issues of "difficult and expensive financing" have become major obstacles to the survival and growth of SMEs.

With the shift in international labor division and strong government support, various industries have actively responded to market demands by innovating and producing financial products. Consequently, supply chain finance has emerged as a new avenue to address the financing challenges faced by SMEs. Despite the advantages of the supply chain financing model for all participating parties and its significant development in China in recent years, supply chain finance is still in its early stages. It has not yet fully demonstrated its capacity to assist enterprises with financing. There remains considerable room for improvement and expansion in its practical application. In light of this, this paper aims to comprehensively review the concepts and characteristics of supply chain finance models, providing a rich theoretical and practical foundation for its continued development and implementation.

The research content is divided into four parts: First, a detailed review and analysis of the basic background, ideas, and three fundamental models of supply chain finance. Second, an examination of the benefits of supply chain finance in alleviating the financing challenges faced by SMEs. To support this view, this paper employs a sample of data from SMEs listed on the SME Board between 2013 and 2020, using a cash flow sensitivity model for a comprehensive empirical test. Third, an empirical analysis of the effectiveness of supply chain financial services in mutual empowerment, based on operational case studies of Zhonghuan Smart Logistics and Zhonghuan City. Fourth, based on an analysis of the current state of supply chain finance application in China, recommendations are made to address the primary issues identified, promoting the rapid development of the supply chain finance model in the domestic market and encouraging more enterprises to adopt this model.

Key words: Supply Chain Finance, SMEs, Financing Constraints, Blockchain Technology

Table of Contents

List of Figures

List of Tables

Chapter 1 Introduction

1.1. Research Background

Since the economic reform, China's economy has developed rapidly, and small and medium-sized enterprises (abbreviated as SMEs) have caught up and played an important role in boosting Chinese economy. In recent years, the number and scale of SMEs have expanded rapidly, contributing greatly to the national economy. With the growing scale of SMEs, their demand for capital is also increasing.

Statistics show that there are nearly 26 million small and medium-sized enterprises in China, accounting for 97% of the total number of enterprises. The value of products and services SMEs created reaches 59.9% of the total value of GDP, and its employment of labor force accounts for more than 80% of the total employment in cities and towns. Small and medium-sized enterprises are responsible for the important task of developing regional economy. However, the amount of financing obtained by small and medium-sized enterprises are severely restricted, which has become a huge bottleneck for the development of small and medium-sized enterprises in China. Domestic SMEs have relatively narrow financing channels, mainly internal financing, especially for enterprises with a single industry and a small scale. Among external financing, bank loans are the most important financing channel for SMEs, accounting for more than 80%. However, banks mainly provide short-term working capital and seldom provide long-term loans, so their ability to support small and medium-sized enterprises is very limited. According to statistics, the proportion of SMEs with relatively redundant funds is only 7%, and the SMEs with bank credit support only account for 10% of all SMEs. It can be seen that, SMEs are highly dependent on bank loans, but the chances of loan applications being rejected are high. Large enterprises and state-owned enterprises usually have easy access to low-interest unsecured loans from banks. Banks prefer to provide mortgage loans to small and medium-sized enterprises. However, small and medium-sized enterprises are small in scale, have little collateral, and have low credit levels, making it difficult to obtain loans from banks and fulfill its financial needs. SMEs have insufficient funds, lack of development motivation, so they reduce R&D investment accordingly, resulting in poor ability to resist risks, poor competitiveness, and thus reduced profitability, which further leads to funding gaps and forms a vicious circle. Therefore, solving the financing problem of SMEs is the key to ensure the speed and quality of their development.

Solving the financing dilemma of small and medium-sized enterprises is an important issue related to the high-quality economic development of small and medium-sized enterprises in China in the new era. The problem of 'difficult and expensive financing' has become a important bottleneck restricting the development of small and medium-sized enterprises. It is not only an important factor hindering the economic development of small and medium-sized enterprises in China for a long time, but also an unavoidable practical problem in the current stage of China's economic transition. In recent years, Chinese government departments have been committed to promoting the construction of a market system to solve the financing problems of private enterprises, and have made great efforts in establishing a multi-level capital market, developing financial technology, and standardizing and simplifying investment and financing procedures. Based on the financing needs of SMEs, supply chain finance has opened up a new market for SME financing, broadening SME financing channels, and enhancing the development space of SMEs. The officials are very concerned about the difficulty and expensive financing of small and medium-sized enterprises, and it also pays special attention to the development of supply chain finance. In recent years, with the support of national policies, the supply chain financial market has gone through stages of exploration, construction, practice and upgrading, and has achieved initial results in solving the financing problems of small and medium-sized enterprises. During the sudden outbreak of the epidemic in 2020, the supply chain financial platform has exerted its own advantages and characteristics, easing the financial constraints of small and medium-sized enterprises, and helping the industrialchain to resume work and production quickly.

1.2. Research Significance

As mentioned above, financing is a very important part of the growth and growth of small and medium-sized enterprises, and the difficulties in financing have also dragged down their progress. Under such circumstances, supply chain finance can judge the company's credit from different perspectives, so that banks should no longer focus on the company itself, but on the entire supply chain to obtain a more accurate and reliable judgment, providing SMEs with better credit qualifications to obtain loans smoothly. Obviously, in the face of the brand-new financial mechanism, both companies and banks still seem unfamiliar, revealing a lot of blind spots and weak points. Based on this, this paper would conduct a systematic and thorough analysis, aiming to bring some ideas and inspiration with academic and constructive significance.

1.2.1 Theoretical Significance

From a theoretical point of view, the significance of this paper is mainly reflected in the innovation of the research angle and the supplement of the results. There are many studies on the relation between supply chain finance and SMEs, but most of them only talk about the ways that supply chain finance affects the investment behavior and growth of enterprises from the perspective of the existence of financing constraints, and there is no systematic analysis of supply chain finance and how its various innovative technology cores can effectively improve the financing difficulties of SMEs, so this paper further explores the correlation among supply chain finances, blockchain and other innovative technologies and SME financing from the perspective of financing constraints, in order to enrich the research in this field.

1.2.2 Practical Significance

From a practical perspective, this paper demonstrates the value of supply chain finance financing for government agencies, small and medium-sized enterprises, financial institutions, and third-party logistics companies that provide professional services for mortgages and pledge. Through empirical analysis, whether supply chain finance has played an intermediary role in reducing the financing constraints of small and medium-sized enterprises is helpful to understand whether supply chain finance is suitable for reducing the financing constraints in China. First of all, from the perspective of the government and other relevant departments, government departments realize that supply chain finance can reduce the degree of financing constraints of small and medium-sized enterprises to a certain extent, which is conducive for the government to formulate industrial support policies for small and medium-sized enterprises according to the actual situation of the domestic market, government, bank and enterprise. The three parties should cooperate to improve the risk management and control mechanism of the financial market, thus making it easier for the government to implement fiscal policies. Secondly, from the perspective of financial institutions, banks can use the supply chain finance to summarize the successful experience of innovative financing forms and create more financial tools to expand. At the same time, operating income can effectively control risks, thereby effectively alleviating the financing constraints of SMEs, and better implementing the purpose of financial services for the economy.

1.3. Research Content

The chapter arrangement and main content of the article are as follows:

Chapter 1 Introduction. This paper will expound the important role of SMEs in China's national economic development, industrial transformation, labor force, and scientific and technological innovation. At the same time, it is pointed out that financing constraints are the main problem that restricts the development of SMEs. Due to the problems of 'short lifespan', small scale, no collateral in physical form, and poor reputation, small and medium-sized enterprises do not have healthy external financing channels. In order to revive the vitality of small and medium-sized enterprises, ease financing constraints, and stimulate scientific and technological innovation of enterprises, this paper conducts an empirical study on the relation between supply chain finance and financing constraints of small and medium-sized enterprises and summarizes the innovations and deficiencies of this paper.

Chapter 2 Literature review. Firstly, it introduces the research topic of this paper, as well as the financing constraint theory and cash flow sensitive model methods used in the research. By sorting out the paper, we focus on the shortcomings and improvements mentioned by previous scholars in the paper, and further explore the writing significance and innovation of this paper.

Chapter 3 The development status of supply chain finance. This chapter summarizes and reviews the definition and overview of supply chain finance, supply chain finance financing model, supply chain finance development history and situation, SME financing model, SME financing constraints, and the impact of supply chain finance on corporate financing constraints. At the same time, the emerging technology of blockchain and its application in supply chain finance will be explained.

Chapter 4 The theoretical basis and research assumptions of SME financing. This chapter first introduces the causes of financing difficulties for small and medium-sized enterprises, which leads to the significant role of supply chain finance and blockchain technology in solving financing pain points. With the help of the above theories, the research hypotheses of this paper are put forward respectively on the financing constraints of SMEs and the impact of supply chain finance on financing constraints.

Chapter 5 The method and empirical analysis part. This part mainly involves model and methodology introduction, sample selection, descriptive statistics of variables, correlation analysis, regression result analysis. Firstly, the variables and models used in the article are set and explained, and the selected data source is determined. We use measurement methods to test

the model, analyze the obtained results, respectively respond to the assumptions put forward in Chapter 4, and draw reliable and credible conclusions.

Chapter 6: The practice case of supply chain finance in Central Logistics Park. First, it introduces the industrial layout and main model of Central Logistics in supply chain finance, and then based on the operation case data of Central Smart Logistics, it empirically analyzes the advanced nature and effectiveness of its supply chain financial services in mutual empowerment.

Chapter 7 The research conclusions and recommendations. The article firstly explains the empirical conclusions and gives policy recommendations from the perspectives of core enterprises, small and medium-sized enterprises, financial institutions, and governments, and then puts forward prospects for the future development of supply chain finance.

1.4. Research Methods

1.4.1 Literature Analysis Method

By sorting out relevant literature on the subject, this paper clarifies the research context of financing constraints, determines the definition and measurement methods of supply chain finance, and summarizes the research results and shortcomings of previous scholars, so as to innovate the research content and research results of this paper.

1.4.2 Empirical Analysis Method

This paper builds a benchmark model by collecting microdata of listed companies on the SME board from 2013 to 2020 Cash flow sensitivity model, and then measure the degree of financing constraints of SMEs and add intermediate moderating variables in the follow-up research to empirically analyze the impact of the relationship between supply chain finance and financing constraints, and the impact of blockchain technology on supply chain finance and financing constraints. The influence of the relationship between the three, the nature of the enterprise and the growth of the enterprise have a moderating effect on supply chain finance and its alleviation of financing constraints. The data are processed by statistical methods, the empirical results are analyzed, and the conclusions of the full text are drawn.

1.5. Research Innovation

First of all, the sample selection in this paper is innovative and time sensitive. From the research point of view, the hypothetical problems proposed in this paper have the characteristics of layer-by-layer progression. There are many studies on the relation between supply chain finance and

small and medium-sized enterprises, but most of them talk about how supply chain finance affects the investment behavior and future growth ability of enterprises from the premise of financing constraints. From the perspective of financing constraints, this paper introduces a comprehensive discussion of supply chain finance, blockchain technology and enterprise operational efficiency. Also, the problem caused by the difficulty and expensive financing of small and medium-sized enterprises is that the operation efficiency of enterprises becomes low. Therefore, this paper further explores the relation between supply chain finance and enterprise operation efficiency from the perspective of financing constraints, which enriches the research in this field.

Chapter 2 Literature Review

2.1 Research on Supply Chain Finance

The Global Supply Chain Finance Forum firstly draw the definition of supply chain finance five years ago, defining it as a financing tool that relies on the overall credit of the supply chain and provides financial support to each participant in the supply chain at each transaction link. In recent years, supply chain finance has been widely used by well-known domestic and foreign companies, including Walmart, Boeing, Siemens and other large foreign procurement companies. The above companies have taken the initiative to establish supply chain finance platforms to increase the liquidity of their upstream small and medium-sized suppliers, while improving their own cash flow situation (Milne & Onorato, 2009; Rogers et al., 2016). Amazon also provides financial services, providing Amazon loaning services for some suppliers. As one of the largest e-commerce companies in China, Alibaba Group has provided supply chain financial services for upstream and downstream enterprises as early as 2014. As of June 2015, the accumulative loan amounted to 400 billion yuan. E-commerce retailers such as JD.com and Suning have also begun to provide supply chain financial services.

The academic research on supply chain finance was originally aimed at solving the problem of insufficient funds for SMEs (Berger & Udell, 2005). Regarding the exact mechanism of this new financing tool, scholars' views are mainly divided into two categories: the first is the finance orientation theory, which means supply chain finance is seen as an innovative financial product. From the perspective of financing problems, the importance of supply chain finance lies in the fact that financial institutions can design financial products of different durations and types for the capital demander, and broaden the traditional financing means (Gelsomino et al., 2016). Hu Yuefei (2009) conducted research on supply chain finance combined with the new credit loan model of trade self-payment and found that banks regard supply chain finance as a new risk control tools to better provide supply chain participants with funds and financial products. Jiang & Yao (2016) concluded that supply chain finance can provide financial services to upstream and downstream enterprises in the supply chain by utilizing the resources in the specific different stages in the chain. Through this new form of financial services, the risk of a mismatch between supply and demand in capital flows can be effectively reduced, and the efficiency of capital allocation can be improved to create value for the entire supply chain (Chen et al., 2012). The second mechanism is the supply chain orientated theory represented by Blackman et al. (2013). Hofmann (2005) mentioned in his paper that supply chain finance is a framework that

regulates the flow of funds between supply chain node enterprises and external financial service providers and jointly creates value for both sides. Therefore, the key purpose of supply chain finance is to effectively allocate cash flow in a maneuver that upstream and downstream business effectiveness can be greatly enhanced (Pfohl & Gomm, 2009). The above two viewpoints show that supply chain finance plays an important role in reconciling the relation between various market participants in the supply chain through different perspectives.

With the fast development of supply chain finance and the continuous advancement of related research, scholars have summarized the main financing framework of supply chain finance and classified them into three models, namely accounts receivable financing models, prepayment financing model and inventory financing models. The relative positions of SMEs and core enterprises in the supply chain under the three models are different (Yan & Xu, 2007). For the accounts receivable financing model, listed private companies are more likely to obtain accounts receivable financing (Jiang & Yao, 2016). For the prepayment financing model, it can effectively solve the problem of logistics lag (Basu & Nair, 2012). Yu (2011) proposed an agency supervision financing model to alleviate the financing constraints of SMEs in view of the practical problem of insufficient collateral for SMEs. Among these three models, accounts receivable financing has been highly valued by enterprises. So far, accounts receivable financing has received the most attention from business management practitioners. However, whether supply chain finance plays its own significant role, scholars in academia have given their own views. Regarding the practical application of accounts receivable financing, both business and academic circles have found that upstream small and medium-sized suppliers are not very proactive and willing to apply supply chain financial services. For enterprises with sufficient cash flow, the application of supply chain financial services will increase their own financing costs (Wuttke et al., 2019; Lekkakos & Serrano, 2016; Van der Vliet et al., 2015; etc.). At the same time, scholars have also begun to look for the influencing factors of supply chain finance. Among them, Wuttke et al. (2019) analyzed the influencing factors that affect the speed of small and medium-sized supplier enterprises adopting supply chain finance based on the transaction data of supply chain finance enterprises. Grueter & Wuttke (2017) studied how supplier companies can reduce financing costs by flexibly applying supply chain finance. Therefore, studying whether supply chain finance is helpful to the development of small and medium suppliers has certain guiding significance for the practice of enterprises.

At present, in the related research on supply chain finance, most foreign research analyzes the optimal decision-making problem of the financing tripartite through the game theory model from the perspective of optimal decision-making (Zhao & Duan, 2016), exchange rate risk issues (Yan et al., 2017; Zhang et al., 2015), and from commercial banking, studying cases to analyze how banks could make organizational adjustments, platform construction and other issues (Liebl et al., 2016). Domestically, most of them analyze from a financial perspective, the impact of supply chain finance on the financing constraints of SMEs (Yang et al., 2019; Zhang et al., 2019; Sha & Fu, 2019); corporate credit and financing risks (Hou et al., 2018; Guo, 2019; etc.). However, few scholars regard supply chain finance as the credit resource of enterprises and study the impact of supply chain finance on SMEs from the perspective of micro-enterprise development. Based on the analysis of the above scholars, it is concluded that one important role of supply chain finance is to ease the financing pressure of enterprises and provide new financing channels for SMEs.

2.2 Research on the Financing Difficulties of SMEs

Looking at the existing literature, many scholars have carried out rich research on the financing difficulties of SMEs. The research directions are roughly divided into two categories: 1. From macro and micro perspectives and environmental factors, conduct research on the existence and causes of the credit financing difficulties of SMEs. 2. Based on the assumption that there are indeed financing constraints for SMEs, discuss decision-making suggestions to alleviate the financing difficulties of SMEs. For the first direction, Stiglitz and Weiss were the first to study the causes of financing difficulties for SMEs. In their paper published in 1981, they put forward the theory of credit default behavior of SMEs and pointed out that the fundamental reason for the financing difficulties of SMEs is 'the information asymmetry'. When SMEs are exposed to market conditions with information asymmetry, the credit market will inevitably lead to moral hazard and adverse selection. Therefore, capital lenders will face a choice of self-interests and risks, which will make some SME enterprises, the capital demander of the enterprise, withdraws from the borrowing market to eliminate the excess capital demand, resulting in the inevitable equilibrium result of credit rationing. This conclusion of Stiglitz and Weiss pioneered research on information asymmetry and SME financing rationing, revealing that information asymmetry will directly lead to unbalanced credit rationing for SMEs, that is, when faced with an adverse selection and moral hazard, banks will choose credit rationing rather than raising loan interest rates to balance credit supply and demand. This will lead to SME's difficulty to obtain loans due to information asymmetry even if they can pay higher interest. When the financial sector (especially the banking sector) in an economy is more financially concentrated, it becomes

more difficult for SMEs to obtain financing. Lin & Li (2001) found that China's SMEs are mainly concentrated in relatively mature labor-intensive industries, limited by technology and market competition and unable to afford high financing costs in the direct financing market. At the same time, due to information asymmetry, SMEs will face adverse selection and moral hazard, which means they are considered to be more likely to damage the interests of funder during contract signing, negotiation and subsequent use of funds in the traditional financing market. The result is that large capital institutions are usually more willing to provide financing services to large enterprises than to SMEs with more robust capital needs but with smaller size. Hu (2000) pointed out that the financing constraints of SMEs are caused by comprehensive causes such as illegal financial statements, corporate ownership concepts, and insufficient mortgage guarantees. The Shanghai Research Group of the People's Bank of China (2001) also believes that the main obstacle to SME financing is that the society has not yet formed a credit service system suitable for the development of SMEs. The capital gap of SMEs is essentially due to the financial repression formed by the excessive capital demand and less financial supply of enterprises in the existing market environment. The information asymmetry between banks and SMEs will exacerbate such imbalances. Zhang (2002) believes that China's financial reform will bring greater pressure on relational credit services, which will make the financing difficulties of SMEs even more severe.

For the second direction, many scholars have put forward countermeasures and suggestions to solve the financing dilemma of SMEs. Luo (2004) proposed to solve the financing dilemma of SMEs based on the perspective of a reputation chain. He believes that SMEs need to establish a specific financial management system supervised by large enterprises, adjust, and optimize the financial information structure, and eventually form a hybrid of large enterprises and SMEs. Therefore, the SMEs will be finally liberated from the shackles of unfavorable financing. Zhang & Liang (2004) pointed out that the financing difficulties of SMEs in China are a complex combination of contradictions formed by the transition economy, market economy and macroeconomic factors, and it is necessary to propose a holistic solution for all aspects of the financial system. Jin (2007, 2009) proposed a Bridge-Tunnel Model and a Road Channel Model to adapt to the development of SMEs. Specifically, the Bridge-Tunnel mode refers to building a bridge between the credit market and the capital market, so that the credit application of small and medium-sized high-tech enterprises can improve the risk control of banks through the credit guarantee of the guaranteed company and the corresponding required commitment of the venture capital company. So as to successfully achieve loan financing. The Road Channel mode is to further integrate resources based on the bridge-tunnel model, and integrate various financial

and economic resources, including guarantees, trusts, investment banks, and various market participants (guarantee companies, SMEs, trust companies, banks) and the government. The main bodies must be organically connected to form an efficient and stable network, providing a more effective way for SMEs to finance. Bartoli et al. (2013) took Italian SMEs as the research object and found that relational and non-relational loans have complementary effects. Enterprises will generate a lot of 'soft information' in the process of lending, and the 'soft information' will help SMEs. Enterprises will gain certain relation advantages in the process of foreign financing negotiation. Zhang and Pan (2013) also proposed that relationship-based credit financing is one of the major ways for SMEs to obtain bank loans. Cowan et al. (2015) found that credit guarantees can increase the total amount of financing obtained by SMEs, but due to the existence of adverse selection, the probability of loan defaults of SMEs is correspondingly higher. Yao and Dong (2014) found that small and medium-sized banks can better provide financing services for SMEs, indicating that the improvement of financial structure and bank scale will help solve the financing difficulties of SMEs. Liu et al. (2017) showed that, compared with large state-owned banks, regional joint-stock banks, city commercial banks, and rural commercial banks and other local regional financial institutions have more advantages in supporting SME financing, and can access more unconventional information about local SMEs for more informed funding decisions. Xia and Jin (2011) discovered that supply chain finance can transform the traditional one-vs-one service from financial institutions to enterprises into one-vs-many, forming a more efficient capital network and achieving a win-win situation for all parties. Zhang and Liu (2012), Yao et al. (2017) found through empirical research that supply chain finance can reduce the information asymmetry in the credit market, which will further make up for the disadvantaged position of SMEs in information and credit and relieve SMEs constraints to a certain extent.

2.3 Research on Blockchain Technology

Blockchain is a credit system originated from virtual currency. It is a distributed accounting computing paradigm and a decentralized computing architecture. It has now been applied to many fields such as finance, technology, and government affairs. Conceptually, a blockchain is an information chain composed of blocks, where each block stores certain information and is linked to each other in the chronological order of its own

generation to form a directed chain. This chain is stored as a whole in all accessible servers. As long as there is one server in the area that can function, the information on the chain can be used intact, ensuring the security and reliability of the whole blockchain. In recent years, blockchain has gradually been valued and recognized by people, and has been widely

researched and applied in various industries. Yuan & Wang (2016) conducted a detailed research and analysis on the infrastructure and algorithm model of the blockchain, discussed the application value of the blockchain in smart contracts, and predicted that the blockchain technology will be the inevitable driving force for the social credit system reform. Zhang & Lun (2017) conducted a theoretical analysis of the feasibility of applying blockchain technology to supply chain finance and corporate financing and concluded that the combination of blockchain technology and supply chain finance will be an inevitable trend.

For the research work on the combination of blockchain and supply chain finance, foreign scholars mainly focus on how the blockchain can optimize the business procedures of supply chain finance and reduce the operating cost of supply chain finance. Chris (2016) believes that the beneficial effect of blockchain is that its information traceability can effectively solve the supply chain guarantee problem of downstream terminal buyers in the process of finding upstream supply chains and secondary suppliers. Omran et al. (2017) believes that blockchain can effectively alleviate the inefficiency of dynamic discounting and reverse factoring in supply chain finance and shows that the value-driven characteristics of blockchain can bring great benefits to the innovation and development of supply chain finance. Hofmann et al. (2018) believes that blockchain can bring substantial advantages to the upstream and downstream parties involved in supply chain financial transactions and can speed up the business flow process among enterprises, thereby significantly reducing SME financing constraint problems. Cong & He (2018) proposed that the smart contract technology of blockchain can realize the scientific management of cash flow in financing transactions and can promote the coordination and deployment of enterprise cooperation networks on the supply chain financial chain. Francisco & Swanson (2018) proposed that the blockchain has the characteristics of visibility and auditability, so it has a good effect on reducing credit audit costs and bank credit audit fees, thereby creating a more convenient way for supply chain finance cooperation.

Domestic scholars' research on blockchain focuses more on the role that blockchain can play in a specific link of supply chain finance. Song (2016b) analyzed blockchain technology from the perspective of an industrial supply chain in a different way and discovered that the use of blockchain technology can effectively solve the problem of docking and coordination of high-quality assets in supply chain finance and the payment and settlement of digital bills. Wu (2017) discussed and sorted out the relation between supply chain finance and blockchain under the influence of information asymmetry, as well as the synergistic impact of blockchain on supply chain finance. He revealed that due to its transparency and security, blockchain can effectively mitigate potential risks in supply chain finance. Ma et al. (2018) proposed to build a

supply chain finance service integration platform based on the blockchain alliance to enhance the reliability, transparency and traceability of the supply chain financial transaction process and minimize the transaction risk of financial credit as much as possible. Chen et al. (2018) proposed that blockchain can solve the problems of trust and information asymmetry in the supply chain, thereby reducing the risk of financial default and bad debts. Zhu, He & Guo (2018) analyzed and summarized the role of blockchain in supply chain empowerment, and pointed out that blockchain can strengthen the credibility of enterprises on the supply chain financial chain, reducing the information cost and moral hazard of credit transactions, and provide supply chain channels. To put in a nutshell, the combination of blockchain technology and supply chain finance worldwide is still a brand-new research field, and the research focuses of various scholars are different, but it is undeniable that there will be broad application potential for the coordination of supply chain finance and blockchain technology, which has also been technically verified to be feasible and effective.

2.4 Research on Alleviating Financing Constraints

Although SMEs play an important role in the economy and society, it is usually difficult for them to obtain unsecured loans from financial institutions due to their size and credit level. The emergence of supply chain finance can effectively alleviate this situation. Tang (2005) used the underlying logic of supply chain finance to reconstruct and study the financing model of SMEs and found the potential role of supply chain finance innovation in financing SMEs. Yang (2005) studied the specific transaction procedures and operation methodology of supply chain finance in the business model of commercial banks. Zhu (2007) discussed the functions, processes and decision-making mechanism of the supply chain finance's management system from the perspective of system architecture and analyzed through modeling methods the three aspects of financing, payment settlements and procurement in the supply chain finance system and the influential relation of each element. Zhu (2019) made a detailed analysis of how supply chain finance can alleviate the financing constraints of SMEs. First, he analyzed the history and development of supply chain finance, and then introduced three supply chain finance models and their respective characteristics. The four aspects of environment, object, mechanism and risk control compare traditional financing business and supply chain financial business, and from the perspective of three parties involved in the bank, enterprise and government supervision, it is demonstrated that supply chain finance can reduce costs, loan difficulty and improve the competitiveness of enterprises. Bao (2020) uses Game Theory to model and analyze how supply chain finance can alleviate the financing constraints of SMEs. The empirical results of the model show that supply chain finance has limited ability to solve the financing problems of SMEs. The

main reason is that the market positions of large enterprises and SMEs are very different. After obtaining short-term liquidity, the integration of cash flow will be further transferred to large enterprises, thereby reducing the enabling effect of supply chain finance. Therefore, Bao pointed out that in order to improve the financing effect of supply chain finance on SMEs, it is necessary to introduce high-quality, high- credit and large-scale intermediary guarantee institutions and strengthen the discount value of financial bills.

With the rise and development of econometrics and empirical financial methods, scholars have gradually begun to use more systematic and standard empirical models and frameworks to study financing constraints. At present, there are two main research ideas. The first idea is to construct an index to measure the financing constraints of SMEs. For example, Kaplan & Zingales (1997) constructed the KZ index, and Hadlock & Pierce (2010), based on the KZ index, reduced endogeneity issues with indices. Deng & Zeng (2014) conducted research on the data samples of A-share listed companies in China from 2001 to 2011 and used the WW index to test the positive correlation between financing constraints and capital returns of SMEs. Wang & Hu (2018) used the net cash flow from operating activities of enterprises to measure the level of financing constraints. The second idea is to indirectly indicate the degree of financing constraints by constructing a regression model and using the regression coefficients and their significance to indicate constraints. Based on the 'financing priority theory', the information asymmetry of SMEs will make their investment behaviors more inclined to use internal funds, revealing high investment-cash flow sensitivity. Therefore, Fazzari et al. (1998) established an investment-cash flow sensitivity model, that is, the higher the sensitivity of SMEs' investment expenditure and internal operating cash flow, the stronger the financing constraints. The cash flow sensitivity model scientifically reveals the information asymmetry and principal-agent problems. Fazzari used the investment and financing data of American SMEs to verify the rationality of this view. After that, many scholars, including scholars from other countries, also repeated experiments based on the corporate data of the corresponding countries and obtained similar results, which verified the rationality and robustness of the cash sensitivity model.

2.5 Literature Overview

To sum up, in the research field of supply chain finance and SME financing, scholars worldwide have conducted in-depth research, including the origin, development, business model and existing risks of supply chain finance, as well as the causes and solutions SMEs financing difficulties. However, most literature mainly focuses on qualitative analysis methods, and merely use quantitative methods for discussion. In view of this, on the basis of previous research, this paper will use the corporate cash-cash flow sensitivity model as a research framework to explore the impact of supply chain finance on SME financing from a combination of qualitative and quantitative perspectives, by establishing an empirical model to evaluate the implementation results. At the same time, some technological innovations of supply chain finance are also discussed.

Chapter 3 Current Situation of Supply Chain Finance Development

3.1 The Definition of Supply Chain Finance

'Supply chain finance' is an overall credit system relying on the supply chain. It establishes a low-cost, low-risk and high-efficiency system through effective coordination among logistics companies, banks, and customers. The financing framework, where each participant in the supply chain provides financial support, creates an extraordinary competitive advantage for the core enterprises and SMEs in the chain. Supply chain finance aims to ensure that all parties in the supply chain obtain their own development resources, and at the same time provide guarantees for the safe and rapid capital flow for enterprises, so that enterprises in the chain can form a solid community of interests and achieve a virtuous circle. It is the product of the combination of logistics, finance, and information technology. As an extension of a new type of logistics business model, supply chain finance digs out new profit possibility for traditional logistics and warehousing enterprises and promotes the transformation of traditional transportation and warehousing enterprises to modern digitized logistics companies. As a financial innovation product, supply chain finance can solve the contradiction between corporate financing loan constraints and bank lending difficulties and can effectively improve the overall social and economic logistics efficiency and commodity transaction efficiency. In the supply chain finance system, banks as financial intermediaries still undertake the responsibilities of capital providers and financial product providers.

3.2 Financing Modes of Supply Chain Finance

3.2.1 Accounts Receivable Pledge Mode

The accounts receivable mode refers to the scenario in which core enterprises and SMEs use the accounts receivable bills generated during commodity transactions as the pledged assets of banks to obtain bank credit funds during the process of commodity transactions. Generally speaking, the credit loan term provided by the bank is short-term, and its time duration is usually not longer than the maximum collection time limit of the accounts receivable used as a pledge by the bank. The accounts receivable model will comprehensively analyze the revenue and market share of products sold by upstream SMEs, the company resource strength of downstream core enterprises, and the stability of the entire product supply chain based on the transaction contracts generated in the process of enterprise cooperation. Under this framework, although the core enterprises in the downstream are responsible for providing accounts payable for the upstream

SMEs, the core enterprises themselves benefit from the large scale of assets, strong profitability, andlong-term stable cooperation with banks.

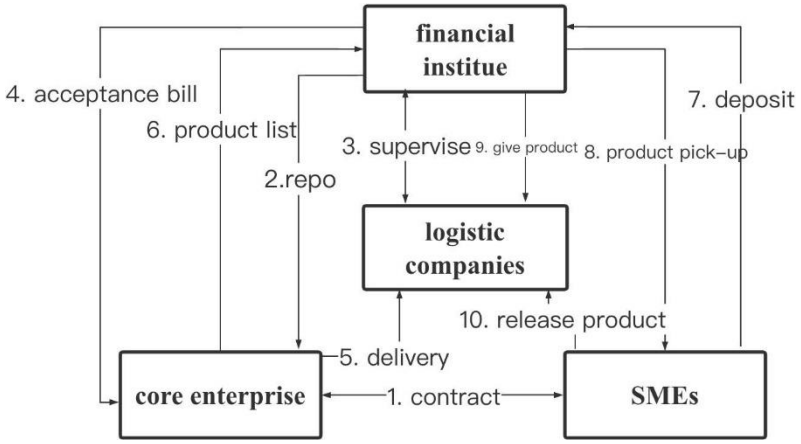


Figure 3.1. Accounts Receivable Pledge Mode

3.2.2 Inventory Pledge Financing Mode

The inventory pledge mode refers to a supply chain finance method in which SMEs in the downstream of the supply chain pledge the goods generated by the transaction to the bank to obtain bank loans. In this mode, SMEs use the commodities and inventories when trading goods as bank pledges to obtain bank credit funds. Under this framework, SMEs can apply for a pledge of commodities for sale to banks to speed up asset turnover, which in turn accelerates the cash flow turnover of SMEs. It can further solve the difficulties encountered in the turnover of short-term financing funds of SMEs to a certain extent while improving the asset turnover capacity of the enterprise. The schematic diagram of the process is shown in the following figure, in which processes (1)-(10) respectively represent the corresponding process sequence of the supply chain mode.

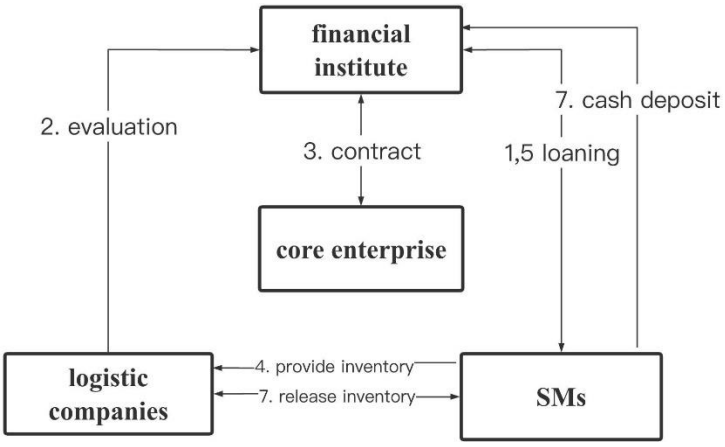


Figure 3.2. Inventory Pledge Financing Mode

3.2.3 Prepayment Financing Mode

Prepayment financing mode means that when a core enterprise conducts cooperative transactions with its downstream SMEs, if the amount of money payment and goods delivered is inconsistent, the SMEs can use the right of goods generated by the business transaction as a pledge. The transaction participants in this mode include sales agents, product suppliers, logistics regulators, and financial institutions, among which core enterprises can provide loan guarantees for SMEs, and SMEs use the relevant products and goods from the transaction. Bank mortgages, the bank provides corresponding credit authorization services, and according to the SMEs to be financed sell goods, the funds obtained will be transferred to the corresponding loan account to withdraw related goods. Core enterprises use their strong comprehensive strength to guarantee financing for SMEs. In the process of maintaining stable business transactions with SMEs, they not only ensure the sales of their own products, but also undertake the responsibility for the repurchase of goods. In the preparation stage for the bank to provide loans, SMEs need to provide necessary materials such as financial statements, bank statements in recent years, and transaction contracts with core enterprises, and at the same time, they need to ensure that part of the funds are pre-deposited into designated loan accounts in accordance with relevant regulations. In the later supervision stage when the bank provides credit services, the bank uses the cooperative logistics company to realize the closed management of the collection of the sales number of the SMEs' commodities, so as to release the SMEs' loan one by one and the money arrives, reducing the bank's possible default losses faced by lending to SMEs. It can be found that this type of financing framework not only helps SMEs in the downstream of the supply chain to obtain bank financing faster and more conveniently, but also helps core enterprises to expand their product sales and can also reduce the default losses of funds faced by banks in lending. The schematic flow chart of this mode is shown in the figure below, in which processes (1)-(10) respectively represent the corresponding process sequence of the supply chain mode.

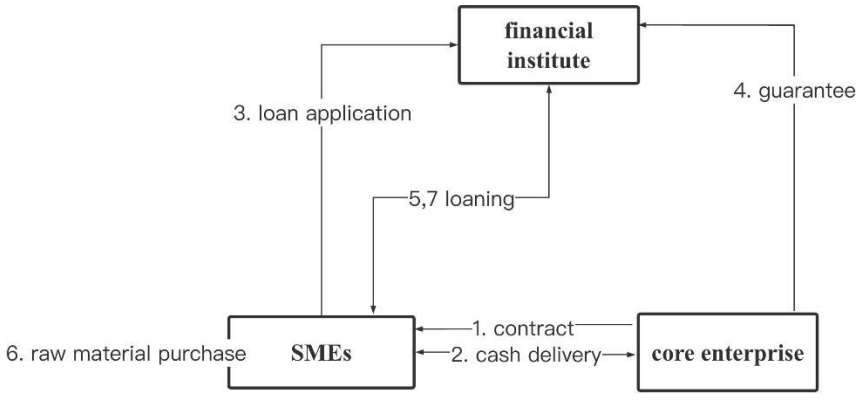


Figure 3.3. Accounts Receivable Pledge Mode

3.3 Supply Chain Finance Based on Blockchain Empowerment

As an emerging technology, blockchain is an effective method to broaden the financial capabilities of the supply chain and solve credit problems. This paper will list its typical technical methods for discussion below. Blockchain technology integrates the four key technologies of chain storage, consensus mechanism, smart contract, and cryptography, providing strong support for the establishment of a credible supply chain financial credit system. It can be seen that the supply chain finance credit platform built on the basis of blockchain technology can effectively solve the issues such as inauthentic and opaque enterprise data issue. Blockchain technology integrates the four core technologies of chain structure, consensus mechanism, smart contract and cryptography technology, which has played a strong technical support role for the reliable and efficient operation of supply chain finance. As mentioned above, in the field of academic research, foreign scholars focus on the research on the overall optimization of supply chain finance business processes by blockchain, while domestic scholars pay more attention to the research on the key role of blockchain in supply chain finance. The research in each direction has the same conclusion, which has proved the feasibility and effectiveness of the application of blockchain in supply chain finance.

Chapter 4 Theoretical Basis and Research Assumptions

4.1 Current Situation of SME Financing

At the present stage, current capital market for is not yet perfect for SMEs, which still hinders the pace of SMEs' debt-equity financing. Due to the high bar of the securities market, the imperfect venture capital system, the access barriers for corporate bond issuance and the narrow direct financing channels, it is difficult for SMEs to raise funds directly through the capital market. According to a survey conducted by the People's Bank of China in August 2010, 98.7% of China's SME financing supply came from bank loans, that is, direct financing only accounted for 1.3%. According to statistics, only about 10% of 3 million private enterprises receive bank credit support. In 2013, the short-term loans of individual and private enterprises accounted for only 14.4% of the total short-term loans of banks. Also, in 2011, bank loans in Zhejiang Province's private investment were only 20.1%.

The above statistics show that the contradiction of SME financing is that, on the one hand, bank loans are the main source of external financing for SMEs, while, on the other hand, banks tend to reject SME loan requests. According to data from the Shanghai Branch of the People's Bank of China, as of September 2015, for 300 SMEs in Zhejiang and Fujian within the jurisdiction, their bank loans accounted for 62% of the external financing of enterprises, and the specific proportion varies. In the same period, among 178 SMEs in 3 provinces and 5 cities in Jiangxi, Hubei and Hunan, state-owned enterprises SMEs, bank borrowings reach 93% of total borrowings. It can be seen that SMEs are too dependent on bank loans, but their application for loans is also more likely to be rejected.

4.2 Causes of Financing Difficulties for SMEs

4.2.1 Information Asymmetry

For many SMEs, first of all, they generally have the problem of family shareholder structure. A considerable number of managers have not received systematic management training, lacked corresponding management experience, and had no experience in enterprise management. Secondly, due to the involvement of industry competition, the information disclosure of SMEs is not transparent enough, many of the financial statements provided have not been audited, and even bad behaviors occur such as fee evasion and credit default. At the same time, the credit evaluation system of financial institutions has higher requirements for the company scale, raising the financing bar for SMEs. Most banks have not issued targeted credit preferential

policies for SMEs, and the credit risk control system and process of banks are mostly in accordance with the standards of large enterprises, and the operation framework of SMEs are quite different from those of large enterprises. Also, the lack of credit records of a legit credit evaluation of SMEs have led to the refusal of banks' risk control systems. Therefore, the current targeted customers of financial institutions such as banks are mainly large enterprise customers with relatively transparentinformation. They are much more cautious with SMEs.

4.2.2 High Transaction Costs

Brown (1998) believes that when the transaction activity contains irrational participants, additional transaction costs will appear, and transaction participants will make a series of irrational behaviors due to the influence of the environment and their own factors. Due to the possibility of opportunism in transaction subjects, in order to meet their own interests, they will take different ways to break their commitments. Therefore, transaction activities are more challenging, and transaction costs will also increase significantly. Due to their small scale, SMEs have weaker bargaining ability than large enterprises in the process of business negotiation and are prone to the problem of taking up funds for too long and causing their capital flow to break. Compared with large enterprises, SMEs have obvious disadvantages in terms of investment in product research and equipment renewal, resulting in insufficient competitiveness, and they are easily eliminated by fierce market competition. The financial needs of large enterprises are relatively more abundant, so banks are more willing to cooperate with large enterprises or groups to obtain more intermediary business income and realize greater profits.

4.2.3 Lack of Assets Available for Mortgage Security

At present, the fixed assets owned by most SMEs are too small to apply for bank loan mortgages. With the gradual deepening of China's financial reform, financial institutions have gradually changed their previous credit management framework, which focused on loan business expansion, to a framework targeted to controlling loan security and low bad debt rates. Except for state-owned enterprises and a few large and medium-sized enterprises, financial institutions basically do not issue external credit loans. In addition, the main loan review and lending models of banks basically need to be secured by fixed assets, rather than simply measured by customer creditworthiness. Most SMEs are in the early stage of business, with fewer fixed assets such as equipment and factories, lack of real estate assets that can be used as mortgages, and a lack of third-party enterprises or institutions that provide real and effective guarantees for them. Therefore, considering all the above reasons, the problem of SMEs' difficulty in obtaining loans will become more and more serious.

4.3 The Impact of Supply Chain Finance on Corporate Financing Constraints

4.3.1 Solve the Problem of Information Asymmetry

Once SMEs put together a supply chain, they will have stable upstream and downstream enterprises to carry out trade activities with them, which reduces the risk of SMEs being harmed by external business environment, creates a good operating environment for them, and improves their competition capabilities to minimize the operational risk. Enterprises in the supply chain define the development direction of their own industries through serial development of a certain product. The overall size and risk of the industry become predictable when integrated into the concept of the life cycle of the industry, and thus the credit risk to SMEs becomes predictable. Through negotiation, various enterprises are closely connected with each other, thus ensuring the smooth flow of information, enabling complete enterprise information to be obtained by banks, and to a certain extent alleviating information inconsistencies between banks and enterprises.

4.3.2 Absorb Loans from Financial Institutions

From a practical point of view, supply chain finance is to provide services related to the financial business of upstream and downstream SMEs with a stable cooperative relation with a certain enterprise in the supply chain as the core. From the perspective of the macro environment, commercial banks can lower the thresholds and standards for credit loans because they can get help from core companies, no longer pay attention to in-depth study of the company's financial situation and focus on each loan business. When commercial banks provide credit loans to SMEs, they should pay attention to the ongoing loan business, and each time they complete a single loan business, they need to re-evaluate the credit rating of the SMEs, so as to lay the foundation for the development of future credit business and finally realize the loan target of risk management. For SMEs that meet the credit standards of loan business, the loan business will be carried out according to the original link.

4.3.3 Reducing the Default Risk of SMEs

In the past, in the process of credit supply, it was difficult for SMEs to obtain external credit supply because the credit risk of was too high, and banks had to endure possible losses when they provided credit for them. Since core enterprises have stable cooperative relations with their upstream and downstream SMEs, they can accumulate various business information of SMEs, and core enterprises have also made corresponding repayment guarantees for SMEs to repay their loans in the end. Therefore, the level of credit risk is greatly reduced. Even if the SMEs don’t pay in the future, with the repayment guarantee, the large-scale enterprises will pay off the corresponding loans for the SMEs first, and the banks will naturally have no default risk losses.

Therefore, large-scale enterprises that make repayment guarantees should understand the credit status and operating conditions of the guaranteed SMEs beforehand, so as to reduce the possible default of SMEs.

4.4 Enabling Role of Blockchain Technology in Supply Chain Finance

The blockchain technology has designed a rigorous and detailed data structure (such as smart contracts, private keys, etc.), and the decentralized consensus mechanism ensures that the data traceable and cannot be altered. According to the inherent governance advantages of the blockchain, it can build a series of credit protection systems to promote the optimization of credit evaluation, credit sharing and credit supervision processes for SMEs.

4.5 Research Hypothesis

As mentioned above, China's SMEs can be improved in various aspects, such as operation, profitability and development potential. Corporate financing constraints are often affected by many aspects, including external factors and internal factors. The internal factors mainly include the company's reputation level, operation level, and asset scale. However, the objective of supply chain finance is to connect upstream, downstream companies, banks and logistics, maximizing the reputation advantages of core companies to bring benefits to SME financing. The important content of this paper is to judge and measure the financing constraints faced by SMEs. Therefore, it is necessary to determine how to measure the financing constraints of SMEs. Through analysis of the relevant literature, we discovered that Almeida et al. (2004) demonstrated a certain relation between cash holding changes of listed companies and cash flow, that is, the sensitivity of cash holding with cash flow changes. He claimed that companies with positive cash-cash flow sensitivity are subject to a relatively severe financing constraint. Lian et al. (2008) improved the measurement of previous research on financing constraints and proved that the sensitivity model can reflect more accurately the financing constraints faced by SMEs. The model has been verified as a powerful tool to investigate the financing constraint hypothesis, so this paper put forward the following hypothesis:

H1: SMEs in China have the problem of financing constraints, that is, SMEs will show positive cash-cash flow sensitivity when other conditions remain unchanged.

H2: Supply chain finance can effectively alleviate the financing difficulties of SMEs.

H3: Supply chain finance can effectively alleviate the financing difficulties of SMEs, and the use of blockchain technology can promote the role of supply chain finance in alleviating financing difficulties.

H4: Supply chain finance has a positive impact on the operational performance of core companies.

Chapter 5 Methodology and Empirical Results

5.1 Methodology

Researchers Fazzari, Hubbard & Petersen. (1988) used investment-cash flow sensitivity (referred to as FHP below) to evaluate the financing constraints of SMEs. Through in-depth research and analysis, it is concluded that the size of the financing constraint of an enterprise will affect its investment-cash sensitivity, that is, the higher the constraint, the stronger the sensitivity. Since then, more and more scholars have used this method in their research to demonstrate the results of FHP from different perspectives through different samples. However, Kaplan and Zingales (1997) conducted research and analysis on this issue from a theoretical perspective through the single-period investment model, and tested the FHP conclusion, but obtained different research results. In addition, scholars Erikson & Whited (2000) and Gomes (2001) both put forward the investment-cash sensitivity. Around this issue, Almeida, Campello, and Weisbach (2004) jointly conducted research, and proposed a new method to evaluate corporate financing constraints, namely cash-cash flow sensitivity model, and pointed out the existence of financing constraints. At present, researchers worldwide mainly use the investment-cash flow sensitivity model and the cash-cash flow sensitivity model to conduct empirical tests when studying financing constraints. Therefore, the empirical part of this study will draw on and follow Almeida's cash-cash flow sensitivity research framework for further analysis.

5.2 Data Variable Selection

5.2.1 Explained Variables

5.2.1.1 Cash Holdings

As stated above, this study will apply cash-cash flow sensitivity model proposed by Almeida in 2004 to verify whether the introduction of supply chain-related variables can improve the financing difficulties of SMEs. Almeida's theory believes that SMEs with financing difficulties will pay more attention to the current and future investment expenditures, and the investment expenditures of SMEs are directly linked to their cash holdings. Therefore, companies usually make a complete capital budget and eventually determine the optimal cash holdings. However, enterprises without financing constraints won't face such trade-off, so SMEs with sufficient financing will not change their cash holdings due to investment spending behavior. In this paper, the changes in cash and cash equivalents held by enterprises are used as explained variables, expressed as $\Delta CASH_{i,t}$.

The formula for calculating the cash holdings of SMEs is:

$$\Delta CASH_{i,t} = \frac{\text{Increase in cash}_t}{\text{Total assets}}$$

As mentioned above, if a company faces external capital financing constraints, in order to ensure future cash reserves and capital flow needs, it usually deducts part of the capital from the current operating cash flow. When not facing financing shortfalls, a company can keep a small amount of cash. Therefore, it is reasonable to refer to the use of cash holdings indicators as explained variable.

5.2.1.2 Enterprise Operation Efficiency

The measurement of operational efficiency adopts the annual inventory turnover rate, namely inventory/operating cost, which measures the speed of inventory turnover of the enterprise. The calculation formula is shown as follows:

$$O_{i,t} = \frac{Inventory_t}{Operating\ Cost}$$

5.2.2 Explanatory Variables

5.2.2.1 Supply Chain Finance

In terms of meaning, supply chain finance is the organic integration of enterprise logistics, data information flow and financing funds. Therefore, the definition and quantification of supply chain finance index variables need to include the above three elements. From a microscopic point of view, under the SME's corporate financial operation report system, this paper hasn't found a direct indicator to reflect the development of SMEs' supply chain finance. From a macro perspective, there is currently no public data that can measure the development level of supply chain finance in China. Zhang and Liu (2012) selected statistical data such as short-term loans and bills of exchange at the national level as proxy variables for the development level of supply chain finance. However, the scale of the national level indicator is too large, and short-term loans and drafts are not entirely composed of supply chain finance, so it is not representative and reasonable to use this indicator to measure supply chain finance. At the same time, they explained variables and control variables in this paper all use the micro-level data of SMEs, and the use of macro national indicators as the variables of supply chain finance lacks consistency and is not suitable for the specific situation of the development of supply chain finance of each enterprise.

Therefore, this study selects the short-term loans and bills payable of SMEs at micro level as the variables to construct the development level of supply chain finance. From the actual operation of domestic enterprises, there are mainly three types of supply chain finance models, namely inventory pledge, accounts receivable financing and prepayment financing. Among them, the inventory pledge and accounts receivable financing are usually in the form of mortgage loans, and the amount is a short-term loan entry in the financial statements of SMEs. The prepayment financing is usually in the form of bank acceptance bills or commercial acceptance bills, which are bills payable in the financial statements of SMEs. Considering the main business of China's supply chain finance, the use of bills payable and short-term loans to measure the development level of enterprise supply chain finance is more in line with the practice of China's economics. Therefore, this paper uses the ratio of the sum of short-term borrowings and bills payable to the total assets at the end of the current period to define and quantify supply chain finance. The supply chain financial variable is expressed as $\Delta SCF_{i,t}$, the formula is:

$$\Delta SCF_{i,t} = \frac{short-term\ notes_t + bills\ payable_t}{Total\ assets_t}$$

5.2.2.2 Corporate Cash Flow ($CF_{i,t}$)

Another important explanatory variable is the company's cash flow, which measures the operating cash flow entry in the cash flow statement of the company's financial statements. This paper uses the total assets at the end of the period to standardize the data of each enterprise. The purpose is to offset the bias of the variable scale caused by different enterprises' sizes, and to facilitate mutual comparison between different enterprises. According to the priority financing theory, the cash flow of the enterprise can reflect the status of the business activities of the enterprise. For SMEs with external financing constraints, in order to meet the needs of investment expenditure funds, the method of internal financing will be prioritized to ensure that the cash generated by certain operating activities is retained within the enterprise, thereby increasing the cash holdings of the enterprise. Under the empirical theoretical framework of this paper, the regression coefficient of the company's operating cash flow reflects the sensitivity of the company's cash holdings to its operating cash flow. The larger the absolute value of the regression coefficient, the stronger the dependence of the company's cash holdings on the cash flow, that is, the stronger the financing constraints of the company, and the more serious the financing problem. Its calculation formula is:

$$CF_{i,t} = \frac{Net\ operating\ cash\ flow_t}{Total\ asset_t}$$

5.2.2.3 Blockchain Application Variables

This paper checks whether the company incorporates blockchain technology into its technical system. Considering that there may be omissions in the information in the Wind and CSMAR databases, this paper also searches the official news and media reports of SMEs through Baidu. According to statistics, a total of nearly 120 listed SMEs have used blockchain technology. In addition, considering that some enterprises don't explicitly display the application of blockchain, this paper also pays special attention to the proprietary vocabulary of blockchain-related technologies, such as distributed accounting technology, consensus mechanism, encryption algorithms, etc. The blockchain variable is set to 1 if blockchain technology is used in the current year and later, otherwise it is set to 0. The calculation formula is:

$$BLC_{i,t} = \begin{cases} 1, & use\ block\ chain \\ 0, & not\ use\ block\ chain \end{cases}$$

5.2.3 Control Variables

5.2.3.1 Enterprise Growth

The enterprise growth variable is used to quantify and measure the growth rate of the enterprise. This paper uses the change rate of this year's operating income relative to last year's operating income as the calculation method. The calculation formula is as follows:

$$GROW_{i,t} = \frac{income_t - income_{t-1}}{income_{t-1}}$$

Generally speaking, the greater the growth of a company, the greater its financing needs. Therefore, if the company faces the problem of obtaining financing from external funding, the growth of the company will make the company's cash holdings larger. Therefore, it is expected that in the empirical results of this paper, the regression coefficient of enterprise growth $GROW_{i,t}$ should be positive, that is, the growth of SMEs facing external financing constraints and the cash holdings of enterprises should share a co-movement.

5.2.3.2 Enterprise Scale

For SMEs, the size of the enterprise is mainly determined by its total assets, so this paper uses the logarithm of the total assets at the end of the period to measure the enterprise size of SMEs. The calculation formula is:

$$SIZE_{i,t} = log(total\ asset\ at\ year\ end)$$

Generally speaking, the larger the business scale of the enterprise, the greater the demand for financing. Therefore, if SMEs face the problem of obtaining financing from external funding, the increase in the size of the enterprise will make the cash holdings of the enterprise increase simultaneously. Therefore, it is expected that in the regression coefficient of the enterprise size variable $SIZE_{i,t}$ should be positive, that is, the enterprise size and cash holdings of SMEs facing external financing constraints have a trend of simultaneous growth.

5.2.3.3 Changes in Non-Cash Operating Capital $\Delta NWC_{i,t}$

By definition, non-cash operating capital is the difference between current assets and current liabilities after deducting cash and cash equivalents. The change in non-cash working capital calculated in this paper is measured by the rate of change of the difference between the current non-cash working capital and the previous non-cash working capital. The specific calculation formula is:

$$\Delta NWC_{i,t} = \frac{non - cash\ operating\ capital_t - non - cash\ operating\ capital_{t-1}}{non - cash\ operating\ capital_{t-1}}$$

When the change of non-cash working capital is positive, it means that the cash holdings of the company are in a state of outflows. Therefore, it is expected that in the subsequent empirical results of the model, the regression coefficient of the change of non-cash working capital $\Delta NWC_{i,t}$ should be positive, that is, SMEs facing external financing constraints will non-cash working capital and the business's cash holdings should have opposite trends.

5.3 Empirical Model Construction

This paper adopts the cash-cash flow sensitivity model as the theoretical framework to study the five assumptions raised in Chapter 4. Aiming at Hypothesis H1, that is, Chinese SMEs have a certain degree of financing constraints, this paper will use the following basic model 1 as an empirical verification analysis:

$$\Delta CASH_{i,t} = \alpha_0 + \alpha_1 CF_{i,t} + \alpha_2 Control_{i,t} + d_t + f_i + \varepsilon_{i,t}$$

where $\Delta CASH_{i,t}$ represents the change in cash holdings of company i in period t, $CF_{i,t}$ represents the control variable, and is used to eliminate the influence of other variables. $CF_{i,t}$ is the cash flow of firm i in period t. d_t and f_i dummy variables represent time effects and individual effects. The coefficient α_1 will determine whether the supply chain finance has a statistically significant effect on the financing constraints of SMEs. When α_1 is significantly less than 0, it indicates that the enterprise has significant financing constraints.

Aiming at Hypothesis 2, i.e., supply chain finance can effectively alleviate the financing difficulties of SMEs, based on Model 1, this paper introduces the cross variables $CF_{i,t} \times SCF_{i,t}$ of corporate cash flow and supply chain financial variables, and constructs the following model:

$$\Delta CASH_{i,t} = \alpha_0 + \alpha_1 CF_{i,t} + \alpha_2 SCF_{i,t} + \alpha_3 CF_{i,t} \times SCF_{i,t} + \alpha_4 Control_{i,t} + d_t + f_i + \varepsilon_{i,t}$$

where the cross term $CF_{i,t} \times SCF_{i,t}$ coefficient α_2 will determine whether the supply chain finance has a statistically significant effect on the financing constraints of SMEs. When α_2 is significantly less than 0, it indicates whether the introduction of supply chain finance can effectively alleviate the financing constraints of enterprises. H3 is based on H2, tackling that the introduction of blockchain technology can further promote the research of supply chain finance to alleviate the financing constraints of SMEs, this paper introduces explanatory variables $BLC_{i,t}$, which represent the application degree of blockchain, and constructs another cross term $\alpha_4 CF_{i,t} \times SCF_{i,t} \times BLC_{i,t}$ with following model:

$$\Delta CASH_{i,t} = \alpha_0 + \alpha_1 CF_{i,t} + \alpha_2 SCF_{i,t} + \alpha_3 CF_{i,t} \times SCF_{i,t} + \alpha_4 BLC_{i,t} + \alpha_3 CF_{i,t} \times SCF_{i,t} + \alpha_4 CF_{i,t} \times SCF_{i,t} \times BLC_{i,t} + \alpha_5 Control_{i,t} + d_t + f_i + \varepsilon_{i,t}$$

The cross term $CF_{i,t} \times SCF_{i,t} \times BLC_{i,t}$ coefficient α_4 represents the effect of the use of blockchain on supply chain finance alleviating financing constraints. When α_4 is significantly negative, it indicates that the use of blockchain technology has a positive effect, i.e., the higher the degree of development of blockchain technology, the more it can alleviate the financing constraints of enterprises.

Aiming at H4, that is, supply chain finance has a significant positive impact on the operational performance of core enterprises, this paper uses the operational efficiency of the enterprise as the explained variable, defined as $O_{i,t}$. We construct the following model:

$$\Delta O_{i,t} = \beta_0 + \beta_1 SCF_{i,t} + \beta_2 Control_{i,t} + d_t + f_i + \varepsilon_{i,t}$$

The coefficient β_1 of $SCF_{i,t}$ will determine whether supply chain finance has a statistically significant effect on the operational efficiency of SMEs. When β_1 is significantly greater than 0, it indicates that the introduction of supply chain finance has a significant positive effect on the operation efficiency of the enterprise. The higher the development degree of supply chain finance, the more it can improve the operation efficiency of the enterprise.

5.4 Sample Selection and Processing

This paper constructs research data sample based on the corporate financial data of the SMEs sector of listed companies from 2013 to 2020. The data are from the CSMAR Guotai Junan Financial Database and the Wind Database (Wind). In the process of constructing research samples, it is found that there are many abnormal and invalid data in the SME sector. In order to ensure the consistency and robustness of the research results, this paper excluded data samples according to the following criteria:

(1) Exclude SME stock data including ST

(2) Exclude data on stocks that have been listed for less than three years

(3) Exclude small and medium-sized listed companies with incomplete financial data

At the same time, in order to prevent the influence of outliers on the regression results, we also perform 1% abbreviation of variables, that is, the variable values that exceed the 99% quantile are replaced by value at the 99% quantile.

5.5 Analysis of Empirical Results

5.5.1 Descriptive Statistics

Table 5.2 Descriptive Statistics

Variable	Sample	Average	Maximum	Minimum	Medium	Std.
$\Delta CASH_{i,t}$	5219	0.018	0.462	-0.316	0.0024	0.110
$CF_{i,t}$	5219	0.045	0.284	-0.147	0.052	0.066
$SCF_{i,t}$	5219	0.138	0.582	0.000	0.121	0.116
$BLC_{i,t}$	5219	0.105	1.000	0.000	0.000	0.302
$SIZE_{i,t}$	5219	15.45	17.57	12.36	15.24	0.013
$GROW_{i,t}$	5219	0.168	1.389	-0.523	0.152	0.291
$\Delta NWC_{i,t}$	5219	0.004	0.283	-0.195	0.004	0.053
$EXPEN_{i,t}$	5219	0.061	0.255	-0.013	0.040	0.022
$\Delta O_{i,t}$	5219	0.213	6.229	0.931	0.198	1.770

According to Table 5-2, there are 5129 data samples. Among them, the average of corporate cash holdings $\Delta CASH_{i,t}$ is 0.018, the maximum value and the minimum value are 0.462 and -0.316 respectively. The maximum and minimum values of the core explanatory variables $CF_{i,t}$ are 0.284 and -0.147, and the standard deviation is 0.066. The difference in data distribution is also obvious, indicating that although SMEs are SMEs, there is a certain degree of fluctuation in the amount of cash held by different companies. The supply chain development level of the core explanatory variables $SCF_{i,t}$ also has a certain degree of difference in the data distribution. For supply chain finance variable $SCF_{i,t}$, the minimum and maximum are 0 and 0.582, indicating that for different SMEs, they use apply supply chain finance differently. The average $BLC_{i,t}$ is 0.107, and the median value is 0, indicating about 10.5% of enterprises use blockchain technology, but most enterprises don't, which is reasonable since blockchain technology requires a certain amount of capital investment, and most SMEs have little investment in such technology. The average company size is 15.45, with maximum 17.57 and minimum 12.36. The non-cash operating capital and capital expenditure of enterprises also varies, meaning operating conditions of enterprises quite differ. The maximum value of enterprise operation efficiency is 6.229, and the minimum value is 0.931, showing that there is a bigdifference in the operation efficiency in enterprise samples.

5.5.2 Correlation Analysis

Table 5.3 Correlation Analysis

	$\Delta CASH_{i,t}$	$CF_{i,t}$	$SCF_{i,t}$	$BLC_{i,t}$	$SIZE_{i,t}$	$GROW_{i,t}$	$\Delta NWC_{i,t}$	$EXPEN_{i,t}$	$\Delta O_{i,t}$
$\Delta CASH_{i,t}$	1								
$CF_{i,t}$	0.423	1							
$SCF_{i,t}$	-0.091	-0.052	1						
$BLC_{i,t}$	-0.004	0.097	-0.025	1					
$SIZE_{i,t}$	0.103	-0.008	0.104	0.042	1				
$GROW_{i,t}$	0.122	0.014	0.025	0.132	0.019	1			
$\Delta NWC_{i,t}$	-0.059	-0.035	-0.097	0.023	0.032	0.052	1		
$EXPEN_{i,t}$	-0.038	-0.019	0.052	0.081	0.152	-0.039	-0.125	1	
$\Delta O_{i,t}$	0.024	0.052	-0.004	0.043	0.108	0.121	0.082	0.042	1

As shown above, the correlation between $\Delta CASH_{i,t}$ and $SCF_{i,t}$ is less than 0, which is in line with our expectations, it implies that supply chain finance has a positive role in alleviating financing constraints. In terms of control variables, the correlation between changes in non-cash capital and company size is positive, implying that the larger the company size, the larger the change in cash holdings, which is in line with the businesspractice.

5.5.3 Empirical Results

Table 5.4 Model 1-3 Results

Variable	Model 1	Model 2	Model 3
$CF_{i,t}$	0.525***	0.487***	0.522***
	（2.85）	（2.24）	（2.73）
$SCF_{i,t}$		-0.036***	-0.039***
		（-1.74）	（-1.74）
$CF_{i,t} \times SCF_{i,t}$		-0.374***	-0.276***
		（-2.41）	（-2.78）
$BLC_{i,t}$			-0.063***
			（-1.14）
$CF_{i,t} \times SCF_{i,t} \times BLC_{i,t}$			-0.173***
			（-1.67）
$SIZE_{i,t}$	0.150***	0.093***	0.112***
	（1.48）	（1.37）	（1.01）
$GROW_{i,t}$	0.058***	0.053***	0.044**
	（4.02）	（4.01）	（2.95）
$\Delta NWC_{i,t}$	-0.211***	-0.209***	-0.204***
	（-1.24）	（-1.22）	（-1.20）
$EXPEN_{i,t}$	-0.021**	-0.022**	-0.021**
	（-1.57）	（-1.49）	（-1.46）
Constants	-0.75	-0.44	-0.62
	（-0.53）	（-0.52）	（-0.56）
Time effect	controlled	controlled	controlled
R2	0.35	0.36	0.35

Note: T-value in Parentheses, *,**,**indicate 1%, 5%, 10% significance

As shown in the regression results above, the regression coefficient of $CF_{i,t}$ is 0.525, significant at the 1% significant level, indicating that the sample companies do have cash-cashflow sensitivity. The results of model 1 verify the hypothesis 1, that is, the SMEs selected by the sample do have significant financing constraints.

From the regression results of model 2, the regression coefficient of $CF_{i,t}$ is 0.487, significant at 1% level, which also verifies hypothesis 1. The coefficient of $SCF_{i,t}$ is -0.036 and the of cross term $CF_{i,t} \times SCF_{i,t}$ is -0.374, significant at 1% level, showing that with development of supply chain finance for SMEs, the dependence of corporate cash holdings on operating cash flow is weakened, and the investment expenditure no longer relies solely on internal operating cash flow, but can be achieved through external channels with supply chain finance to obtain cash income and increase cash holdings. The results of model 2 verify our hypothesis 2, that is, the introduction of supply chain finance can effectively alleviate the financing constraints of SMEs. It can be seen from model 3 that the coefficient of $CF_{i,t}$ is 0.522, and the $CF_{i,t} \times$

$SCF_{i,t} \times BLC_{i,t}$ coefficient is -0.173, significant at 1% level. It concludes blockchain technology can promote and boost supply chain finance's performance in alleviating financial constraints.

As for control variables, coefficients of the enterprise size from models 1 to 4 are significantly greater than 0, which implies that the enterprise size is positively correlated with the company's cash holdings. The coefficient for growth factor $GROW_{i,t}$ is positive, indicating that there is a positive correlation between corporate growth and cash holdings. Non-cash operating capital and capital expenditure both share negative relation with cash holdings, indicating that for SMEs, the increase in non-cash working capital and capital expenditure will increase corporate cash holdings. To summarize, empirical results of Models 1-3 verify our Hypotheses 1-3. SMEs do have significant financing difficulties. The introduction of supply chain finance can effectively alleviate financing constraint problems, and the effective application of blockchain technology is conducive to improving supply chain finance in alleviating financing constraints of SMEs.

Table 5.5 Model 4 Results

Variables	Model 4（$\Delta O_{i,t}$）
$SCF_{i,t}$	0.168***
	（0.456）
$SIZE_{i,t}$	-0.680**
	（0.203）
$GROW_{i,t}$	0.218***
	（0.155）
$EXPEN_{i,t}$	0.034***
	（0.029）
Constant	0.181
R2	0.31

Note: T-value in Parentheses, *,**,**indicate 1%, 5%, 10% significance

As indicated in Table 5-4, it can be seen that the coefficient of the supply chain finance variable is 0.168, which is significant at 1%, indicating that supply chain finance has a significant positive effect on the improvement of the operational efficiency of enterprises. When the supply chain finance application increases by 1 unit, the operational efficiency of the enterprise will increase by 0.168 units. Hypothesis 4 is verified and we can conclude that the introduction of supply chain finance will significantly improve the operational efficiency of core enterprises. The regression coefficient of the firm size variable is -0.68, which is significant at 5%. It shows that there is a negative relation between enterprise size and operation efficiency. When the enterprise scale is larger, the operation efficiency of the enterprise begins to decline.

Chapter 6 Supply Chain Financial Solutions of Central Holding Group's Logistics Park

6.1 Introduction to Central Holding Group's Logistics Park

Central Holding Group's Logistics Park (short as Central Logistics Park) is an integrated business center that provides logistics industry chain services. It focuses on fourth-party logistics platform services and logistics base construction, integrating logistics financial services and software system development for enterprises in the park. This chapter will focus on its mature experience in the coupling of SME financing and supply chain finance and use real operation data to demonstrate how Central Holding Group could improve its commercial ecosystem with empirical methods.

Central Holding Group adds a smart logistics module on the basis of the traditional and adopts the smart digital logistics park mode for overall management and operation. In order to improve the sustainability and market competitiveness of small and medium-sized logistics companies and solve the situation that small and medium-sized, logistics enterprises are difficult to obtain financing, expensive financing, and unable to obtain financing without collateral, Central Holding Group cooperates with large financial institutions and its own core enterprises as a case of financing small and medium-sized logistics enterprises. Central Holding Group will package the enterprises in the park as a whole and carry out the business of financial institutions. With the core enterprises in Zhonghuan as the guaranteed platform, apply to banks and financial institutions for low interest rates, credit, and closed-loop risk control of the business chain to effectively solve the difficulty of small business loans. Financing is expensive.

6.2 SME Operation in Central Logistics Park

From 2020 to 2022, the cash inflows and net cash holdings of companies in logistics park have increased significantly. The main reason is that the companies in the park have used the financing methods of supply chain finance around 2020 to optimize their financial statements to a certain extent.

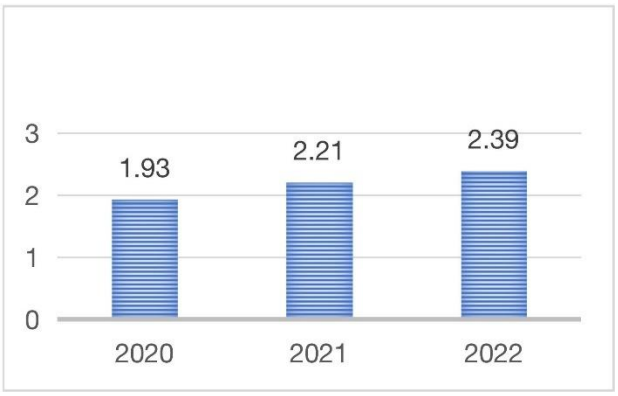


Figure 6.1 Average Cash Inflows from Park Operating Activities (100 million ¥)

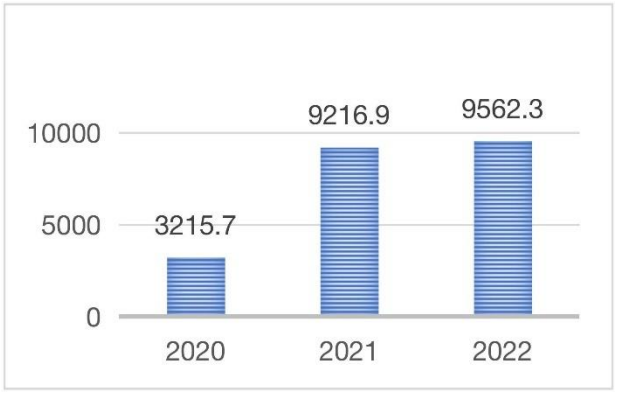


Figure 6.2 Average Net Cash Flow from Park Operating Activities (10 million ¥)

6.3 Empirical Analysis

In order to study the effectiveness of supply chain finance in Central Logistics Park, we obtained operational data in the park, which covers financial and operational data of several SMEs from 2020 to 2022. Based on this, this chapter uses the following difference-in-difference empirical model DID for analysis:

$$\Delta CASH_{i,t} = \beta_0 + \beta_1 Treat_t \times Time_t + \beta_2 SCF_{i,t} + \beta_3 Control_{i,t} + u_{i,t} + \theta_t + \varepsilon_{i,t}$$

Among them, *Time* represents the time dummy variable before and after the supply chain financial measures, which is 1 before the measure and 0 after the measure. $Treat_t$, as group dummy variables, is 1 for companies with supply chain finance 0 otherwise. The regression coefficient of can measure the effect of supply chain finance on alleviating the financing difficulties of SMEs. If it is significantly greater than 0, it means that supply chain finance can effectively alleviate the financing difficulties of enterprises. The control variables in this paper are enterprise scale factor and enterprise growth factors.

Table 6.1 Difference in Difference Results

Variables	Regression
$Treat_t \times Time_t$	-0.685**
	（0.375）
$SCF_{i,t}$	-0.102**
	（-0.352）
$SIZE_{i,t}$	-0.0890***
	（0.010）
$GROW_{i,t}$	-0.0192***
	（0.005）
$\Delta NWC_{i,t}$	4.297**
	（0.167）
$EXPEN_{i,t}$	-0.297*
	（-0.855）
R-square	0.203
Company fixed effect	Control
Year fixed effect	Control

Note: T-value in Parentheses, *,**,**indicate 1%, 5%, 10% significance

The results show that the cross term of time and group dummy variables is -0.685, which is negative at 5% significance, indicating whether the intervention of supply chain finance can bring significant improvement to the financing constraints of SMEs in the Central Logistics Park. At the same time, the supply chain finance variable is significantly negative at 5% significance, indicating that the use of supply chain finance can effectively alleviate the dependence of SMEs on their own internal cash holdings in the financing process, which is consistent with the results of Hypothesis 2 and Model 2. The regression coefficient results of the remaining control variables are basically consistent with the model regression results in the previous section.

To sum up, supply chain finance solution adopted by the Central Logistics Park has enhanced the business competitiveness of its downstream SMEs, conformed to the trend of innovation, transformation, and development in the industry, and expanded new profit growth points. For intermediaries such as cooperative banks, it also brings benefits. For SMEs in logistics, freight, and other fields, it reduces the business risks in the process of due diligence assessment of enterprises by financial institutions like banks, improving the possibility of financing, easing financing constraints, and eventually achieving the goal of reducing financing costs. For Central Logistics Group, its downstream SMEs rely on the credit financing of its large real estate logistics groups, which increases the financing dependence of SME suppliers. At the same time, it also increases the stickiness of logistics and freight forwarding suppliers and SMEs to the supply chain of Central Logistics Group. On the other hand, it ensures the stability of the enterprise's business order and enhances the control of Central Group over the entire chain.

Chapter 7 Conclusions and Recommendations

7.1 Conclusion

With the rapid development of China's economy, SMEs have become an imperative role of the entire economic system, which has greatly promoted innovation and labor force employment. However, due to the influence of the market environment, the difficulties of SMEs have increased, and the problems of high financing costs have gradually been exposed. The supply chain finance has developed rapidly after 2006 and has become a very critical way to expand financing channels for SMEs. Therefore, this paper chooses to study whether the supply chain finance can alleviate financing constraints. We build a basic cash-cash flow sensitivity model to measure the degree of financing constraints imposed by SMEs. By regressing the panel data of listed companies on the SME board from 2013 to 2020, our results show that SMEs have significant positive cash flow sensitivity, which verifies the Hypothesis 1 of this paper, consistent with most research conclusions and actual situations. The models 2-4 in this paper are used to study the role of supply chain finance and blockchain technology in alleviating the financing constraints of SMEs. On the basis of the model 1, the supply chain finance and blockchain variables are integrated to verify 2-4 are verified respectively.

Firstly, through empirical analysis, it is discovered that there are significant cash sensitivity in China's SMEs, showing that there's indeed a certain degree of financing constraints. Secondly, the development of supply chain finance can alleviate the financing constraints of SMEs to a certain level. Empirical results show that supply chain finance can reduce cash sensitivity and further reduces information asymmetry and transaction costs in the financing market with a unique financial model, providing external financing for upstream and downstream SMEs in the chain. Thirdly, the application of blockchain technology in SMEs has a positive effect on the alleviation of financing constraints of SMEs. Through our research, this paper finds that for SMEs empowered by blockchain technology, the supply chain financial model can perform significantly better at alleviating corporate financing constraints. The intuition is that blockchain technology could promote SMEs to acquire financing by reducing information asymmetry between banks and enterprises. The stability of the relation between enterprises created by blockchain in the supply chain can help provides ingenuous trade information among different node enterprises, and transmits a safe and guaranteed signal, which helps improve the credit evaluation of the whole supply chain and individual companies, thereby increasing the credit opportunities of SMEs. Fourthly, the application of supply chain finance can significantly

improve the operational efficiency of core enterprises and achieve mutual benefit and win-win situation for upstream and downstream enterprises. Fifthly, through empirical case analysis of the supply chain finance practice of Central Logistics Park, we verify that the effectiveness and advancement of Central Holding Group's practice in actual business activities.

7.2 Policy Recommendations

The empowerment of information technology promotes the development of supply chain finance. The combination of blockchain technology and the financial industry escalate and provide new momentum the development of supply chain finance for the new era. Blockchain technology can ensure the authenticity, accuracy, and integrity of the transaction information for the whole supply chain. Therefore, in the process of effectively allocating financial resources, it is necessary not only to take traditional supply chain finance as the cornerstone, but also to grasp the trend cutting edge science and technology.

Many SMEs have been hit hard by the COVID-19 pandemic, which stands for a special challenge for industrial and supply chain system, experiencing both crisis and new opportunities. The revitalization of industry also precisely reflects the strong vitality of China's industrial system. While at present, most SMEs in China are still at the bottom of the food chain, relying heavily on the import of core technologies and key materials, and have more challenges than other enterprises in the industrial chain. Problems such as the allocation of material reserves and the excessively long industrial chain have been exposed. In the post-epidemic period, economic recovery is the main theme, where we should address the exposed problems, plug loopholes, and make up for shortcomings in a timely manner. In nowadays market competition environment, SMEs have always been the driving force for growth and stable employment. With the gradual opening of China's financial market and the relaxation of financial policies, the financing environment of SMEs has not greatly changed with the financial system reform and financial industry structure. It is because financing problems of SMEs are universal and unique, and we should look at it from all aspects, and may not completely handle the financing pressure of SMEs with traditional financial tools. Enterprise development, especially non-state-owned enterprises, should make use of supply chain finance to get rid of the financing dilemma caused by their own general credit problem and insufficient collateral. When analyzing the financing of SMEs, it is necessary to explore all financing possibility of SMEs in a deeper level. We should take into consideration SMEs' unique situation in the contradiction of efficiency, fairness, market mechanism and policy support, solving the financing problems of SMEs from the very source and promoting a virtuous and sustainable development.

For SMEs, when faced with serious external financing constraints, they should combine their own supply chain advantages to learn from each other's strengths and weaknesses, applying chain financial strength to alleviate their own financing constraints, broaden financing channels, and break through the limitations of traditional credit models. For financial institutions, they should actively participate in supply chain finance by transferring financial resources, bond with various entities in the supply chain, and rely on the overall credit mechanism of the supply chain to expand the credit market for SMEs and improve their own profit levels. For the government, it should give SMEs preferential policies such as targeted and short-term loan facilities and allow dynamic financial resources to actively flow to SMEs. At the same time, the legislative department should speed up the legislation on supply chain finance activities, improve and standardize the existing supply chain finance practice through laws and regulations, fill the legal loopholes that may exist in supply chain finance, and ensure the healthy and sustainable developmentfor SMEs and supply chain finance.

References

Almeida, H., Campello, M. & Weisbach, M.S. (2004). The Cash Flow Sensitivity of Cash [J]. *The Journal of Finance*, 59: 1777-1804.

Atkinson, W. (2008). Supply Chain Finance – The Next Big Opportunity [J]. *Supply Chain Management Review*, 3: 57-60.

Bao. C. (2020). On the Mitigating Effect of Supply Chain Finance on SMEs' Financing [J]. *East China Economic Management*, 12: 91-98 (in Chinese).

Bartoli, F., Ferri G., Murro, P., & Rotondi, Z. (2013). SME Financing and the Choice of Lending Technology in Italy: Complementarity or Substitutability? [J] *Journal of Banking in Finance*, 37(12): 5476-5485.

Basu, P., & Nair, S. K. (2012). Supply Chain Finance Enabled Early Pay: Unlocking Trapped Value in B2B Logistics [J]. *International Journal of Logistics Systems and Management*, 12(3): 334-353.

Berger, A. N., & Udell, G.F. (1998). The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle [J]. *Journal of Banking & Finance*, 22(6-8): 613-673.

Berger, A.N., & Udell, G.F. (2005). A More Complete Conceptual Framework for SME Finance [J]. *World Bank Policy Research, Working Paper*.

Blackman, I.D., Holland, C.P., & Westcott, T. (2013). Motorola's Global Financial Supply Chain Strategy [J]. *Supply Chain Management*, 18(2): 132.

Bo, L. (2009). Hidden Financial Concerns in the Growth of Enterprises: A Survey Report on the Financing Situation of SMEs [J]. *Import and Export Managers*, 1, 40-41 (in Chinese).

Bougheas, S., Commendatore, P., & Kubin, I. (2018). Special Issue: Macro and Micro Perspectives on Location, Innovation, Trade, Migration and Regional Growth [J]. *Review of International Economics*, 26(3): 507-507.

Busch, J. (2007). LIVE Dispatch: Ariba and Orbian Partner to Take on the Banks. *Spend Matters*, May 23.

Brown, W. Jr (1998) Transaction Costs, Corporate Hierarchies, and the Theory of Franchising, *Journal of Economic Behavior & Organization*, 36(3): 319-329.

Chen, C., Lu, H., & Sougiannis, T. (2008). Managerial Empire Building, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs [J]. *Working paper*, 40(31): 212-225.

Chen, C. (2011). *Corporate Type, and the Asymmetric Behavior of Selling, General, and Administrative Cost* [D]. VU University Amsterdam. Dissertation.

Chen, H., & Fan, Y. (2015). The Influence of Margin Trading System on China's Stock Market Volatility: An Analysis of Policy Evaluation Method Based on Panel Data [J]. *Journal of Financial Research*, 6: 159-172 (in Chinese)

Chen, H., Han, G., & Wu, K. (2015). Do Financing Constraints Inhibit the Improvement of Technical Efficiency? An Empirical Study Based on Manufacturing Micro Data [J].

Financial Research, 10: 148-162 (in Chinese).

Chen, L., Sun, W. & Li, H. (2018). Research on Risk Prevention of Supply Chain Finance Based on Blockchain Technology [J]. *Hebei Enterprises*, 2: 32-33 (in Chinese).

Chen, Y., Chai, Y., Li, X., et al. (2012). A Novel Transaction Financing Model towards Electronic Commerce [C] ESTC. 2012 4th *Electronic System-Integration Technology Conference*. Amsterdam.

Chris, G. (2016). *Increasing Supply Chain Assurance via the Blockchain* [D] Doctoral Dissertation. Carnegie Mellon University.

Coase, R.H. (1937). The Nature of the Firm [J]. *Economica*, 4(16): 386-405.

Coase, R.H. (1960). The Problem of Social Cost [J]. *Journal of Law and Economics*, 3: 1-44.

Cong, L.W., & He, Z. (2018). Blockchain Disruption and Smart Contracts [J]. *National Bureau of Economic Research Working Paper*, 24399.

Cowan, K., Drexler, A., & Yañez, A. (2015). The Effect of Credit Guarantees on Credit Availability and Delinquency Rates. *Journal of Banking & Finance* ,59: 98–110.

Demica. (2014). *Research Report: A Study on the Growth of Supply Chain Finance, as Evidenced by SCF Dedicated Job Titles at Top European Banks* [R]. Demica, London.

Deng, K., & Zeng, H. (2014). Financing Constraints of Chinese Enterprises: Characteristic Phenomenon and Cause Test [J]. *Economic Research*, 49(2): 47-60 (in Chinese).

Erickson, T., & Whitted, T.M. (2000) Measurement Error and the Relationship between Investment and *Q* [J]. *Journal of Political Economy*, 108: 1027-1057.

Fazzari, S.M., Hubbard, R.G., & Petersen, B. (1988). Financing Constraints and Corporate Investment [J]. *Brooking Papers on Economic Activity*, 19(1): 141-206.

Francisco, K. and Swanson, R.D. (2018). The Supply Chain Has No Clothes: Technology Adoption of Blockchain for Supply Chain Transparency [J]. *Transparency*, 2(2): 1-13.

Gelsomino L. M., Mangiaracina R., Perego A., Tumino A. (2016). Supply Chain Finance: A Literature Review [J]. *International Journal of Physical Distribution & Logistics Management*, 46: 348–366.

Gelsomino, L.M., De Boer, R., Steeman, M., & Perego, A. (2019). An Optimization Strategy for Concurrent Supply Chain Finance Schemes [J]. *Journal of Purchasing and Supply Management*, 25(2): 185-196.

Geng, L. (2020). *Research on the Impact of Supply Chain Finance on R&D Investment of Small and Medium Enterprises* [D]. Master Dissertation. Anhui University of Finance and Economics (in Chinese).

Gomes, J.F. (2001). Financing Investment [J]. *The American Economic Review*, 91(5): 1263-1285.

Grueter R., & Wuttke D.A. (2017) Option Matters: Valuing Reverse Factoring [J]. *International Journal of Production Research*, 55: 6608–6623.

Gu, Q. (2016). Research on the Effect of Supply Chain Finance on Alleviating Financing Constraints—Empirical Evidence from Small and Medium-Sized Technological Enterprises [J]. *Collected Essays of Finance and Economics*, 5: 28-34 (in Chinese).

Guo, X (2019). A Preliminary Study on Supply Chain Financial Risk Control [J]. *Business News*, (17): 29-31 (in Chinese).

Hadlock, C.J., & Pierce, J.R. (2010). New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index [J]. *The Review of Financial Studies*, 23(5): 1909-1940.

Herath, G. (2015). Supply-chain Finance: The Emergence of a New Competitive Landscape [J]. *McKinsey on Payments*, 8(22): 10-16.

Hofmann, E. (2005). Supply Chain Finance: Some Conceptual Insight [A]. Lasch, R./ Janker, C.G. (Eds.), *Logistik Management. – Innovative Logistikkonzepte*. Weisbaden: Deutscher Universitätsverlag: 203-214.

Hofmann, E. (2009). Inventory Financing in Supply Chains: A Logistics Service Provider Approach [J]. *International Journal of Physical Distribution & Logistics Management*, 39(9): 716-740.

Hofman, E., Strewe, U. M., & Bosia, N. (2019). *Supply Chain Finance and Blockchain Technology: The Case of Reverse Securitisation* [M]. Springer.

Hou, W., Xiang, D., Wu C., & Chen, Y. (2018). Financial Risk Evaluation of Internet Supply Chain Based on Partial Variable Comprehensive Evaluation Method [J]. *Business Economics Research*, 24: 146-148 (in Chinese).

Hu, X. (2000). *SME Financing* [M]. Beijing: Economic Management Press (in Chinese).

Hu, Y. (2009). Supply Chain Finance and Small and Medium-sized Commercial Banks' Competitive Strategy. *The Chinese Banker*, 2: 44-46 (in Chinese)

Jensen, M. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. [J] *The American Economic Review*, 76(2): 323-329.

Jiang, W., & Yao, W. (2016). The Enforcement of the Property Law and Supply Chain Finance: Empirical Evidence from Bank Loans Pledged by Accounts Receivable [J]. *Economic Research Journal*, 1: 141-154 (in Chinese).

Jin X., (2007) *Bridge-Tunnel Model* [M]. Hangzhou: Zhejiang University Press.

Jin X., (2009) *From Bridge- Tunnel Model to Road Model* [M]. Hangzhou: Zhejiang University Press.

Kaplan, S.N., & Zingales, L. (1997). Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints? [J]. *The Quarterly Journal of Economics*, 112(1): 169-215.

Klapper, L. (2006). The Role of Factoring for Financing Small and Medium Enterprises [J]. *Journal of Banking & Finance*, 30(11): 3111-3130.

Lekkakos. S. D., & Serrano, A. (2016). Supply Chain Finance for Small and Medium Sized Enterprises: The Case of Reverse Factoring [J] *International Journal of Physical*

Distribution & Logistics Management, 46(4).

Li, B., Li, T., & Geng, C. (2016). Supply Chain Finance and SMEs Financing Constraints: A Case Study of Small and Medium-Sized Listed Companies in the Manufacturing Industry [J]. *East China Economic Management*, 30(11): 174-179 (in Chinese).

Li, C., Wen, X., Song, M., & Yang, W. (2020). FinTech and Corporate Innovation: Evidence from New Third Board Listed Companies [J]. *China Industrial Economics*, 1: 81-98 (in Chinese).

Li, C.X., Tian, L., & Zhang, W. (2014). Cash-Cash Flow Sensitivity: Financing Constraint or Income Uncertainty? [J]. *Economic Review*, 2: 115-126 (in Chinese).

Li, G. (2010). Application Research of Supply Chain Finance in Commercial Bank SMEs Credit [J]. *Special Economic Zone Economy*, 1: 295-297 (in Chinese).

Li, L., & Huang, X. (2002). Application of Principal Agent Theory in Cost Control [J]. J*ournal of Northeastern University*, 10: 937-939 (in Chinese).

Li, Q. (2013). Research on the Financing Problems of SMEs Based on Financial Growth Cycle Theory [J]. *Science and Technology Management Research*, 33(10): 243-250 (in Chinese).

Li, Y. (2005). Research on Principal-Agent Theory and Supply Chain Incentive Mechanism [J]. *Logistics Science and Technology*, 1: 45-47 (in Chinese).

Li, Y., He, Z., Feng, G., & Wang, J. (2007). The Development and Countermeasures of My Country's Inventory Pledge Financing Business [J]. *Statistics and Decision Making*, 18: 115-117 (in Chinese).

Li, Z. (2010). The Application of Credit Default Swap in Domestic Small and Medium-sized Enterprise Loans [J]. *Friends of Accounting Journal*, 1: 54-55 (in Chinese).

Li, Z., & Wang, S. (2011). Monetary Policy, Information Disclosure Quality and Firm Debt Financing [J]. *Accounting Research*, 10: 56-62 (in Chinese).

Lian, Y., Su, Z. & Ding, Z. (2008). Can Cash Flow Sensitivity of Cash be Used to Test the Financial Constraints Hypothesis? [J] *Statistical Research*, 25(10): 92-99 (in Chinese).

Liang, B. (2005). Investigation Report on the Development and Financing Situation of Small and Medium Enterprises in Our Country [J]. *Financial Research*, 5: 120-138 (in Chinese).

Libecap, G.D. (1986). Property Rights in Economic History: Implications for Research [J]. *Explorations in Economic History*, 23(3): 227-252.

Liebl, J., Hartmann, E., & Feisel, E. (2016). Reverse Factoring in the Supply Chain: Objectives, Antecedents and Implementation Barriers [J]. *International Journal of Physical Distribution & Logistics Management*, 46(4): 393-413.

Lin, Y., & Li, Y. (2001). Promoting the Growth of SMEs through the Development of Small- and Medium-Sized Financial Institutions [J]. *Economic Research Journal*, 1: 10-18 + 53 (in Chinese).

Liu, B., Yuan, Q., & Shang, H. (2015). Financing Constraints, Discrimination and Firm Size Distribution: An Analysis Based on the Data of Chinese Industrial Firms [J]. *Finance and*

Trade Economics, 3: 72-87 (in Chinese).

Liu, Chang., Liu Chong, & Ma, G. (2017). Small and Medium Banks and SMEs Loans [J]. *Economic Research Journal*, 8: 65-77 (in Chinese).

Luo, Z. (2004). *Research on Financing Problems of Small and Medium-Sized Enterprises* [M]. Beijing: Economic Science Press (in Chinese).

Ma, X., Du, M., Yu, W. & Wang, Y. (2018) Blockchain Based Supply-Chain Finance Service Platform [J]. *Big Data Research*, 1: 13-21.

Milne, A., & Onorato, M. (2009): Risk-Adjusted Measures of Value Creation in Financial Institutions. *Bank of Finland Research Discussion Paper*, 25: 1-40.

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The Determinants and Implications of Corporate Cash Holdings [J]. *Journal of Financial Economics*, 52(1): 3- 46.

Orman, Y., Henke, M., Heines, R., & Hofman, E. (2017). Blockchain-Driven Supply Chain Finance: Towards a Conceptual Framework from a Buyer Perspective. *IPSERA Working Paper*¸ 29.

Pfohl, H.C., & Gomm, M. (2009). Supply Chain Finance: Optimizing Financial Flows in Supply Chains [J]. *Logistics Research*, 1: 149-161.

Riddick, L.A., & Whited, T.M. (2009). The Corporate Propensity to Save [J]. *Journal of Finance*, 64(4): 1729-1766.

Rogers, D., Leuschner, R., & Choi, T. Y. (2016). The Rise of FinTech in Supply Chains [J]. *Harvard Business Review*, June 22.

Sha, N., & Fu, Y. (2019). Mitigation on Constraints of Supply Chain Financing Oon Jewelry Companies Based on Listed Light Manufacturing Companies [J]. *Resources and Industry*, 21(5): 94-100 (in Chinese).

Shan, H. (2005). Credit Crisis and Financing Barriers of Small and Medium Enterprises [J]. *Statistics and Decision Making*, 7: 132-133 (in Chinese).

Shan, M. (2019). Research on the Financial Model of Green Supply Chain under the Participation of Multiple Parties [J]. *Environment and Sustainable Development*, 44(3): 64-67 (in Chinese).

Song, H. (2016a). *Supply Chain Finance* [M]. Second Edition. Beijing: China Renmin University Press (in Chinese).

Song, H. (2016b). Innovation and Trend of Supply Chain Finance Based on Industrial Ecology [J]. *China business and Market*, 12: 85-91 (in Chinese).

State Council General Office. (2018). Guiding Opinions on Actively Promoting Supply Chain Innovation and Application [A]. China Warehouse & Storage Association (Ed.), *Blue Book of China's Warehousing Industry (2018)*: 6.

Stiglitz, J.E., % Weiss, A. (1981): Credit Rationing in Markets with Imperfect Information [J] *The American Economic Review*, 71(3): 393-410.

Takafumi, S. (2016). Financial Cash Flows and Research and Development Investment [J].

Pacific-Basin Finance Journal, (39): 1-15.

Tang, S. (2005). Logistics Finance - A Booster for the Development of Small and Medium Enterprises [J]. *Jiangsu Commercial Forum*, 12: 50-52 (in Chinese).

Van der Vliet, K., Reindorp, M., & Fransoo, J.C. (2015). Improving Service Levels through Reverse Factoring [J]. *Europeam Journal of Operational Research*, 242: 843-853.

Wang, L., & Hu, Y. (2018). Supply Chain Finance and Corporate Financing Constraints——An Adjusting Role Analysis Based on the Combination of Industry and Finance and Strategic Commitment [J]. *China Business and Market*, 6: 122.128 (in Chinese).

Wu, J. (2017). Application of Blockchain Technology in Supply Chain Financing: A Perspective Based on Information Asymmetry [J]. *Logistics Technology*, 11: 121-124.

Wuttke D.A., Rosenzweig, D.E., & Heese, H.S. (2019). An Empirical Analysis of Supply Chain Finance Adoption [J]. *Journal of Operations Management*, 65(3): 242-261.

Xia, T., & Jin, X. (2011). The Advantage of Supply-Chain Finance in Solving SMEs Financing [J]. *Commercial Research*, 6: 128-133 (in Chinese).

Yan, J., & Xu, X. (2007). Analysis of Financing Models of SMEs based on Supply Chain Finance [J] *Shanghai Finance*, 2: 14-16 (in Chinese).

Yan, N., Liu, C., Liu, Y., & Sun, B. (2017). Effects of Risk Aversion and Decision Preference on Equilibriums in Supply Chain Finance Incorporating Bank Credit with Credit Guarantee [J] *Applied Stochastic Models in Business and Industry*, 33(6): 602-625.

Yang, S. (2005). Supply Chain Financing Services from the Perspective of Commercial Banks' Business Model [J]. *Logistics Technology*, 10: 179-182 (in Chinese).

Yang, Y., Zhu, Q, & Yang, T. (2019). Internal Control, Supply Chain Finance and Financing Constraints of Small and Medium Enterprises: Empirical Evidence from GEM Listed Companies [J]. *Wuhan Finance*, 9: 66-73.

Yao, W., Xia, J., & Sun, T. (2017). Research on Financing Constraints and their Mitigation for Technology-Based SMEs from the Perspective of Supply Chain Finance [J] *Technological Progress and Countermeasures*, 4: 105-110 (in Chinese).

Yao, Y. & Dong, G. (2014). The Development of Small and Medium-Sized Banks and the Financing Constraints of SMEs: Empirical Research from the Perspective of Optimal Financial Structure Theory in New Structural Economics [J]. *Journal of Finance and Economics*, 1: 105-115 (in Chinese).

Yu, J. (2011). Using Supply Chain Finance to Ease the Financing Difficulties of SMEs [J]. *Economic Review Journal*, 3: 99-102 (in Chinese).

Yuan, Y., & Wang, F. (2016). Blockchain: The State of the Art and Future Trends [J]. *Acta Automatica Sinica*, 4: 481-494 (in Chinese).

Zhang, J. (2002). Relationship Lending to Small Business and the Bank Organizational Structure [J]. *Economic Research Journal*, 6: 32-37 + 54 (in Chinese).

Zhang, J., & Liang, D. (2004). Analysis of Influencing Factors of Loan Constraints for Small and Medium-Sized Enterprises in China [J]-*Journal of Jinan University (Humanities and Social*

Sciences Edition), 2004, 26(1): 40-44 (in Chinese).

Zhang, J., & Lun, Z. (2017). Research on the Combination of Blockchain Technology and Supply Chain Finance [J]. *Co-Operative Economy & Science*, 21: 58-59 (in Chinese).

Zhang, J., Long, Y. & Ai, R. (2019). The Role of Supply Chain Finance in Easing the Financing Constraints of Enterprises Integrating Industry and Finance - Based on the Perspective of Inter-Enterprise Related Transactions [J]. *Business Economics Research*, 18: 166-169 (in Chinese).

Zhang, W., & Liu, K. (2012). Can the Development of Supply Chain Finance Reduce the Financing Constraints of SMEs? An Empirical Analysis Based on Small- and Medium-Sized Listed Companies [J]. *Economic Science*, 3: 108-118 (in Chinese).

Zhang, X., & Pan, L. (2013). Banking Structure and Relationship Lending to Small Business [J] *Journal of Financial Research*, 6: 133-145 (in Chinese).

Zhang, L., Hu, H., & Zhang, D. (2015). A Credit Risk Assessment Model Based on SVM for SMEs in Supply Chain Finance [J]. *Financial Innovation*, 1(14): 1-21.

Zhao, J., & Duan, Y. (2016). The Coordination Mechanism of Supply Chain Finance Based on Tripartite Game Theory [J]. *Journal of Shanghai Jiaotong University (Science)*, 21: 370-373

Zhu, L. (2019). Research on Supply Chain Finance Easing Financing Constraints of Small and Medium-Sized Enterprises [J]. *West Leather*, 41(15): 129-130 (in Chinese).

Zhu, W. (2007). *Financial Supply Chain Analysis and Decision-Making* [D]. Doctoral Dissertation. Fudan University, Faculty of Management and Engineering (in Chinese).

Zhu, X., He, Q, & Guo, S. (2018). On the Role of Blockchain Technology in Supply Chain Finance [J]. *China Business and Market*, 3: 111-119 (in Chinese).

Resume of the Author

Zhu Yun Yu, born in 1973 in Quzhou, Zhejiang Province, is a prominent entrepreneur and business leader. He is the Founder and Chairman of Central Holding Group, and Vice-President of the Quzhou's Overseas Chinese Association.

Zhu holds a master's degree from Cheung Kong Graduate School of Business and is completing is doctoral degree at the University of Geneva, in partnership with Tsinghua University's PBC School of Finance.

After a first career in the military, Zhu transitioned to the business sector in 1996. In 2004, he established Central Holding Group in Anhui, which has since grown significantly since. The company reached a milestone on December 3, 2019, with its listing on the Main Board of the Hong Kong Stock Exchange (stock code: 01735).

Zhu's influence extends beyond his business endeavors. Zhu holds various significant positions, including Executive Vice-President of the China Federation of Overseas Chinese Entrepreneurs, Director of the China Guangcai Business Promotion Association, Director of the China Youth Volunteer Association, Executive director of the China Mergers and Acquisitions Association, Member of the China Youth Federation, and Vice-President of Anhui Entrepreneurs Association.

His contributions have earned him numerous accolades, such as the National Moral Model Nomination, Anhui Province Moral Model, China's Good Samaritan, and Person of the Year among Chinese Descendants. Zhu's leadership and commitment to social responsibility continue to inspire and impact the business community and beyond.