

东北财经大学本科毕业论文

数字普惠金融对辽宁省中小企业融资效率的影响
研究

Research on the Impact of Digital Financial
Inclusion on the Financing Efficiency of Small and
Medium-Sized Enterprises in Liaoning Province

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摘要

中小型企业对中国的经济发展起着举足轻重的作用，它能够为剩余劳动力就业岗位选择，提高 GDP，缩小城乡之间的贫富悬殊。在 2008 年的次贷危机，2011 年的三角债，2019 年的新冠疫情这些全球性的突发事件中，首当其冲为中小企业造成了负面的冲击，中小企业一直面临融资难、融资贵的困境，对中小企业的可持续发展造成了很大的影响。随着数字普惠金融的提出，将数字技术应用到金融领域，使中小企业获得更多的资金，拓宽了融资渠道，减少了对银行和其他金融机构的贷款成本，获得更好的融资效果。

本课题通过对我国中小企业融资现状、数字普惠金融发展和对中小企业融资运用等相关的文献梳理，发现数字普惠金融能够促进经济发展，同时揭示了目前中国中小企业融资效率低的现状。在此基础上，阐明数字普惠金融对辽宁省中小企业融资效率的作用机理，揭示数字普惠金融可以拓宽融资渠道，降低信息不对称，从而提升中小企业融资效率，并据此提出两个假设。

本研究以在辽宁省新三板挂牌的 70 个上市公司的财务数据为样本，运用 DEAP2.1 构建 DEA 评价模型，对中小企业融资效率进行评估。以评估后的融资效率作为 Tobit 模型的被解释的变量，得出数字普惠金融的综合指数对辽宁省中小企业的融资效率有显著提升作用，而次级指标则相反。最后，对本文研究的结论进行整理和归纳，并从政府、金融机构和中小企业的视角出发，给出相应的政策建议，以期从实际的视角来提升辽宁省的中小企业的融资效能，从而实现其健康、平稳地发展。

关键词：数字普惠金融 辽宁省中小企业 新三板 融资效率 DEA-Tobit 模型

ABSTRACT

In China, SMEs play a pivotal role in the economy, providing a substantial number of jobs for surplus labor, expanding GDP, and reducing the disparity between the rich and the poor in urban and rural areas. During global emergencies such as the sub-prime crisis in 2008, the triangle debt in 2011, and Covid-19 in 2019, SMEs were the first to be negatively impacted. They have been facing difficulties in financing and expensive financing, which has dramatically affected their sustainable development. Along with the introduction of digital financial inclusion, the application of digital technology to the financial sector has enabled SMEs to access more funds, broaden their financing channels, reduce the cost of loans to banks and other financial institutions, and obtain better financing results.

By combing through the literature on the current situation of SME financing in China, the development of digital financial inclusion, and its application to SME financing, this topic finds that digital financial inclusion can promote economic development while revealing the low current efficiency of SME financing in China. On this basis, the mechanism of the effect of digital financial inclusion on the financing efficiency of SMEs in Liaoning Province is elucidated, revealing that digital financial inclusion can broaden financing channels and reduce information asymmetry, thereby enhancing the financing efficiency of SMEs, and two hypotheses are proposed accordingly.

This study adopts the financial data of 70 listed companies on NEEQ of Liaoning Province as a sample, and uses DEAP 2.1 to construct a DEA evaluation model to assess the financing efficiency of SMEs. Using the assessed financing efficiency as the variable explained in the Tobit model, it is concluded that the comprehensive digital financial inclusion index has a significant enhancing effect on the financing efficiency of SMEs in Liaoning Province, while the sub-indicators are opposite. Finally, the findings of this paper are collated and summarised, and corresponding policy recommendations are given from the perspectives of the government, financial institutions and SMEs, with a view to improving the financing effectiveness of SMEs in Liaoning Province from a practical perspective, so as to achieve their healthy and smooth development.

Keywords : digital financial inclusion; SMEs in Liaoning Province; financial efficiency; DEA-Tobit model

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List of Abbreviations

SMEs: Small and Medium Enterprises

NEEQ: National Equities Exchange and Quotations

TE: Technical Efficiency

PTE: Pure Technical Efficiency

SE: Scale Efficiency

ST: Special Treatment

ST*: Special Treatment for Three Consecutive Years of Business Losses

ROE: Return on Equity

OLS: Ordinary Least Square

DFII: Digital Financial Inclusion Index

CB: Coverage Breadth

UD: Usage Depth

DL: Digitisation Level

Y: Yes

N: No

Research on the Impact of digital financial inclusion on the Financing Efficiency of Small and Medium-Sized Enterprises in Liaoning Province

Part 1 Introduction

1.1 Research Background

Currently, China is in the period of the 14th Five-Year Plan, which plainly stipulates that the "SMEs Finance Promotion Project" should be implemented thoroughly to upgrade the availability of finance. The reason is that SMEs are an important force for national economic and social development, and their advances are not only conducive to alleviating domestic employment pressure, but can also stimulate domestic demand, promote consumption, boost employment and bring a great quantity of technological innovation to a country.

According to statistics from the Ministry of Industry and Information Technology, by the end of 2021, SMEs had contributed more than 50% of China's fiscal tax revenue, more than 60% of its GDP, more than 70% of its technological innovation and more than 80% of its urban labour employment. These figures reveal that against the backdrop of challenging economic situations and the rise of trade protectionism around the world, the smooth and sustainable development of SMEs acts a significant role in the stability of the macro-economy and the healthy development of the national economy. However, as Chinese SMEs continue to grow, the problems of complicated and costly financing are becoming progressively prominent. The "Macmillan Gap"^① caused by unresolved financing requirements has constrained the growth of Chinese SMEs. If this problem is appropriately addressed, it will allow the sustainable development of China's economy to continue.

In conformity with the measurement indexes established by China Statistical Yearbook 2022, the economic development level of Liaoning province is in the middle and lower among 31 provinces in China. Although Liaoning Province has twice put forward the requirement of

^①Macmillan Gap: a huge capital allocation gap of modern SMEs because of the general shortage of financial resources, especially long-term financing, due to the insufficient supply of financial resources.

"Revitalising the Northeast", the economy is still facing strong downward pressure and numerous problems in economic development. It is imperative to promote supply-side reform further and realise the conversion from "factor investment-driven" to "innovation-driven." The support of the financial system is indispensable to the comprehensive revitalisation of Liaoning Province during the 14th Five-Year Plan period. By 2021, SMEs in Liaoning accounted for 99% of the province's enterprises, generating 60% of the province's GDP in terms of goods and services and providing more than 70% of the jobs. Otherwise, the current loan balance of SMEs in Liaoning province accounts for 3% of the province's financial institutions, while this credit fund can merely fulfill 10% of the financing needs of SMEs. Therefore, in addition to the loans that banks and other financial organisations can supply, SMEs are still face with a substantial capital gap.

Inclusive finance was first articulated by the United Nations in 2005. It refers to a financial system that can effectively and holistically provide services for all social classes and groups, notably the poor and low-income population, concentrating on product and institutional-level activities such as individual consumption loan and micro and small businesses operators. In 2016, the concept and technical framework of digital financial inclusion were first formulated at the G20 Summit in Hangzhou, China, which means the application of emerging information technologies such as big data and cloud computing to microfinance business through digitalisation and networking, taking advantage of new technologies to lower the threshold of traditional financial institutions and better fulfill the diversified needs of all social strata and groups, with SMEs being its major inclusion group. Making use of its technological and information technology nature, digital financial inclusion can enhance the transparency of credit information and risk management level compared with traditional financing channels, broaden financing channels and service scope, and have a specific impact on the financing efficiency of SME financing, for the sake of better serve the real economy. Therefore, this paper will take Liaoning Province as an example to explore the mechanism and principle behind whether digital financial inclusion can affect the financing efficiency and extent of SMEs to provide a reference for the long-term sustainable development of SMEs in China under the premise of ensuring financial security, and serving the real economy and put forward effective suggestions for stakeholders in conformity with the ultimate conclusions.

1.2 Research Purpose

In a case of Liaoning Province, this topic explores the impact of digital financial inclusion on SME financing in Liaoning province by analysing the financial information of enterprises in Liaoning province and combining it with the Digital Financial Inclusion Index (DFII) to determine the extent of the impact of digital financial inclusion on SME financing in Liaoning province and to propose more effective solutions to enable them to focus on research and development, production and marketing, thus making them vital in promoting the healthy economic and social development of the country.

1.3 Significance of Research

SMEs have an irreplaceable position in the country's development process, and their healthy development is pivotal to the country's economic transformation and upgrading. This research takes the relationship between digital financial inclusion and the efficiency of SME financing in Liaoning Province as its entry point, provides an in-depth analysis of where digital financial inclusion can influence SME financing, and rationalises the allocation of digital financial inclusion and internet technology resources to enhance the economic status of SMEs, lower funding costs and further promote steady economic development. Furthermore, given the pivotal position that SMEs occupy in Liaoning Province, a profound study on the efficiency of investment and financing for SMEs in Liaoning Province will be valuable for the stable advancement of Liaoning Province's economy, seizing the major historical opportunity of the country's implementation of a new round of revitalisation of the old industrial bases in Northeast China, and becoming a leader in the development of the three Northeastern provinces.

1.4 Innovation Points

1.4.1 Innovation on Topic Selection

Existing studies have principally centered on the field of traditional inclusive finance, while in the study of digital financial inclusion, many researchers have focused on the poverty reduction effect, the financing constraints of SMEs, and the future development of SMEs. This topic intends to explore the relationship between digital financial inclusion and SME financing from a

micro perspective and examine their role mechanism and the extent and direction of their influence.

1.4.2 Innovation on Sample Selection

Most previous researchers who have studied these issues have chosen companies from Small and Medium Enterprise Board market (SME Board). However, some of the larger SMEs on the SME Board are overqualified, and there needs to be more research on SMEs on NEEQ (National Equities Exchange and Quotations). At this stage, the main ways of financing SMEs in China are bank loans, stock exchange listings, and equity transfers on NEEQ. As it is too costly for SMEs to obtain funds from banks and difficult to list on the stock market, many SMEs choose to raise funds on NEEQ. In this context, conducting a survey on NEEQ financing for SMEs is innovative.

1.5 Conceptual Framework

This writing comprises six parts. The first part briefly introduces the investigation's background, purpose, and significance and potential innovation points. The second part discusses the issue of enterprise financing and relevant domestic and international studies on digital financial inclusion. The third part is prepared with an elaborate design as a prerequisite for the empirical test and a demonstrate the empirical study. The following two parts yield some key findings from the results generated from the test before, and conduct some discussions and implications. The concluding part concludes the study and provides feasible recommendations for further application in the future.

Part 2 Literature Review

The issue of financing for SMEs has been of considerable concern to scholars at home and abroad, who have examined the problem from different perspectives, analysed its causes, developed innovative financing models, and produced results that provide some justification for financing solutions. The emergence and accelerated implementation of the concept of "digital financial inclusion" have generated new ideas and approaches to solve the financing dilemma of SMEs.

2.1 Causes of SME Financing Problematic

Ambiguous information, the lack of detailed micro-economic data on the small business sector, and the funds raised by SMEs in the private equity and debt markets make SME finance one of the most challenging areas in which to conduct empirical research (Berger, and Udell, 1998, p. 633). Strahan, P. E. and Weston, J. P. (1998) noted that financial institutions are frequently reluctant to lend to SMEs in consideration of their incomplete and non-transparent information disclosure, the high transaction costs that financiers have to pay, and the regulatory costs at a later stage of the transaction. Chinese researchers have also raised such issues. At the macro level, researchers such as Yao, Y. and Dong, G. (2014) reviewed the historical development of China, where large banks have dominated the banking sector and have had more difficulty meeting the financing needs of SMEs than smaller banks, resulting in SMEs facing an uneven allocation of resources. Lin, Y. and Sun, X. (2005) also proposed that SMEs' information needs to be more transparent in the SME financing process. They often cannot provide sufficient guarantees or collateral, making it burdensome for non-bank financial institutions to overcome the information asymmetry challenge. On the micro side, Ji, K. (2011) contended that from the perspective of SMEs, on the one hand, they have a biased perception of financing, which leads to a direct impact of external financing on credit issues. On the other hand, the instability and high failure rate of SMEs themselves, their vulnerability to market fluctuations and changes in the macro environment, coupled with the inadequacy of China's SME financing system, resulting in information asymmetry and untrue information in statements, are all considerations that make it difficult for financial institutions to issue loans.

2.2 Research Literature on the Efficiency of SME Financing

2.2.1 Factors Influencing the Efficiency of Financing

Song, W. (1997) indicated that financing efficiency should include at least two elements: capital allocation and transaction efficiency. Capital allocation efficiency is the ability of a firm to utilise the funds obtained from various sources and apply them effectively. In contrast, transaction efficiency is the ability of a firm to obtain as many funds as possible at the minimum financing

cost. Subsequently, Song, Z. and Zhang, Y. (2005) also stated that the efficiency of corporate finance could be assessed in terms of both capital allocation efficiency and financing costs, while found that the transparency of information could affect the efficiency of corporate finance and that good information could promote the efficiency of corporate finance (Bynum, 2006, p. 70).

2.2.2 Methods for Evaluating the Efficiency of Financing

With the continuous research on financing efficiency, the primary methods used by various scholars for measuring financing efficiency include the data envelopment method and the entropy method. Gan, S. (2000) introduced elements correlated with them, such as the tax shield effect of corporate debt and corporate financing risk, into the input-output approach to analyse corporate financing efficiency, which was also an early study on the comprehensive assessment of financing efficiency proposed in China. While Lei, H. and Liu, Q. (2020), whose research object is green and low-carbon companies, predominantly construct a DEA model, the results present that the financing efficiency values of listed companies subject to pure technology constraints are low. In contrast, when studying the financing efficiency of SMEs, Yao, D. and Dai, Y. (2020) used supply-side reform as a background, using the DEA-Tobit method to illustrate that financing constraints and costs hurt financing efficiency. To understand the magnitude of financing efficiency of strategic emerging companies, Zeng, G. (2019) constructed a Super-SBM model using company data from 2010-2016. Xu, K. (2018) built a DEA model and used the financial data of SMEs to calculate the Malmquist index, and the analysis concluded that the overall financing efficiency of the listed companies was low.

2.2.3 Researches on NEEQ

NEEQ can increase the liquidity of a company's shares and improve its creditworthiness and market visibility, which in turn makes it easier for companies to obtain financing (Ji, 2010, p. 9). Zhou, M. and Yin, Z. (2011) argued that the NEEQ market can help to enhance a company's market reputation, financial management, and governance and contribute to the multi-level development of the capital market. In recent years, this has been explored by many researchers as problems have been encountered in the development of NEEQ. He, M. and Zhang, Y. (2017) signposted that the system of NEEQ is different from other capital market systems and suffers from serious illiquidity problems, and the operation of NEEQ still needs to be further explored

and improved. Additionally, company should improve its governance structure, introduce a scientific business model, improve operational efficiency, expand its funding sources, and use brokerage firms to supervise it effectively (Gao, 2018, p. 94). The study by Qi, S. and Wang, Y. (2018) showed that the high entry barrier, poor liquidity, and unclear transfer mechanism of the NNEQ severely restrict the financing effectiveness of SMEs.

2.3 Papers of Digital Financial Inclusion

Shahrokhi, M. E. (2008) proposed that financial financing services using internet information can significantly raise their financing constraints and enhance the quality and efficiency of financing for SMEs. Solms, J. V. (2020) pointed out that human life will become digital as technologies like machine learning, artificial intelligence, and blockchain permeate the banking sector. At the same time, he also suggests that one of the results of digitalisation is the increasing commoditisation of financial services and the inevitable integration of banks with technology. However, as the idea of digital financial inclusion was introduced relatively late, its related research is still weak, and the current research work can be broadly divided into two main directions. The first focuses on the impact of digital financial inclusion on corporate R&D and innovation and investment; the second part is a quantitative analysis based on the population benefiting from digital financial inclusion, focusing on the role of digital financial inclusion in areas such as SME development, urban-rural differentiation, residential consumption, and rural poverty alleviation. With a sample of registered companies on the SME Board from 2011-2016, Yu, P. and Dou, J. (2020) proved through empirical analysis that digital financial inclusion can foster technological innovation among SMEs and have a greater effect on SMEs with high information asymmetry and low internal governance quality. According to Teng, L. (2020) study presented that the development of digital financial inclusion can boost the number of patent applications of Chinese SMEs. Yao, J., Wang, C. and Zhang, Y. (2016) suggested that digital financial inclusion can effectively complement the deficiencies of inclusive finance in the "three rural areas" and promote the implementation of inclusive finance in rural areas. Tang, M. (2017) also found that the use of digital technology can effectively alleviate the constraints encountered in the development of inclusive finance, which can be beneficial to micro, small, and medium enterprises and low-income people.

2.4 Research on the Impact of Digital Financial inclusion on SME Finance

Ozili, P. E. (2017) asserted that digital financial inclusion, with its financial compatibility and lower cost of services, facilitates the emergency and small capital needs of small and medium-sized enterprises, with more incredible benefits than paying higher fees to access services from conventional regulated banks. The literature has focused on the role of digital financial inclusion on SMEs' financing constraints, with some scholars arguing that digital inclusion has a significant moderating effect on SMEs' financing constraints. By means of the Cash-Cash Flow Sensitivity Model, Liang, B. and Zhang, J. (2018) found that digital financial inclusion has a moderating effect on SMEs' financing constraints. Huang, B. (2019) took a sample of SMEs listed on the SME Board from 2011-2018 and concludes that the use of digital technology's low cost, fast speed, and broad reach has enabled traditional credit resources to be reallocated according to the long-tail effect distribution was redistributed, which in turn reduced the financing constraints on firms. Other scholars take the opposite view. Lee, I. and Shin, Y. J. (2018) explained that digital financial inclusion is still in its infancy, and the development of digital technology is far from achieving the expected goal of effectively screening out high-quality SMEs, thus failing to solve the problem of financing constraints essentially. Li, H. and Wu, F. (2019) argued that the development of digital financial inclusion cannot really provide SMEs with more financing platforms and channels due to digital technology.

2.5 Research Appraisal

With regard to the efficiency of SME financing, firstly, the analysis shows that SMEs have difficulties in financing, and multitude factors can have an impact on the efficiency of corporate financing. However, most scholars still focus on the study of traditional factors such as the financial system and economic policies. For the evaluation of financing efficiency, there are many evaluation methods, among which scholars use the data envelopment method most often. Secondly, there are relatively few studies on the Chinese NSS market at home and abroad. This has led to the need to gradually figure out the operational mechanism and construction methods of the NEEQ market in the process of its development. Thirdly, inclusive financial services are mainly aimed at small and medium-sized enterprises, and this is especially true of digital financial inclusion. Notwithstanding there are a quantities of literatures on inclusive finance and enterprise financing, most scholars focus more on how inclusive finance affects the financing

constraints of enterprises. Meanwhile, even less research has been conducted on the relationship between digital financial inclusion and the financing efficiency of SMEs. Based on this, this paper takes Liaoning Province as an example and explores the relationship between the two through data from the Digital Finance Research Centre of Peking University and data from listed companies listed on NEEQ in Liaoning Province and proposes strategic policy recommendations on the final empirical results. To summarise, in contrast to traditional inclusive finance, digital financial inclusion is the integration of information technology in daily financial activities, which can broaden access to finance, reduce the cost of finance, and advance the transparency of information about companies. Therefore, this article makes the following hypotheses:

H_1 . Digital financial inclusion index can have a facilitating effect on financing efficiency of SMEs.

H_2 . In accordance with the three secondary indicators of coverage breadth, usage depth and digitalisation level of digital financial inclusion, it can promote the efficiency of SMEs' financing.

Part 3 Methodology

3.1 Research Methods

3.1.1 Literature Research Method

A comprehensive understanding of the definition, development, role and metrics of digital financial inclusion and the contemporary state of research associated to the financing of SMEs based on reading and collating relevant literature.

3.2.2 Empirical Analysis Method

This study conducts a comprehensive collection of all financial information of companies enrolled on NEEQ in Liaoning Province from 2016-2021, screened the sample companies required for the research, and constructed a DEA-Tobit model with the DEA method to investigate the financing efficiency of SMEs.

3.2 Construction of a Financing Efficiency Evaluation System

3.2.1 Research Question

As per the public annual report data of compliant SMEs listed on NEEQ of Liaoning Province, indicators are selected to institute an assessment system, and the DEA model was applied to statically evaluate the technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) of SME financing. Then, the investigation will take the evaluated financing efficiency as the basis, construct the Tobit regression model to analyse the influence of various factors - the digital financial inclusion index and three secondary indicators - on SMEs' financing efficiency, and eventually test the robustness of the model.

3.2.2 Research of Evaluation Model

DEA, also known as Data Envelopment Analysis, was introduced in 1978 by statisticians Charnes, Cooper, and Rhodes. It is a multidisciplinary model involving operations research, management, economics, and other disciplines. This model focuses on the relative comparability (i.e., efficiency values) of comparable units of the same type, using input and output indicators and applying a linear programming approach to the data analysis. The main objective of the DEA model is to evaluate the relative effectiveness of Decision Making Units (DMU) with multiple inputs and outputs. The basic idea of the DEA model is to find the efficiency frontier of the evaluated object by dimensionless processing of each input and output data and by linear programming, which involves all decision-making units. Thus it is termed the data envelopment analysis method. Then, according to the distance between each decision unit and the efficiency frontier surface, the relative efficiency level of each decision unit is determined by this distance.

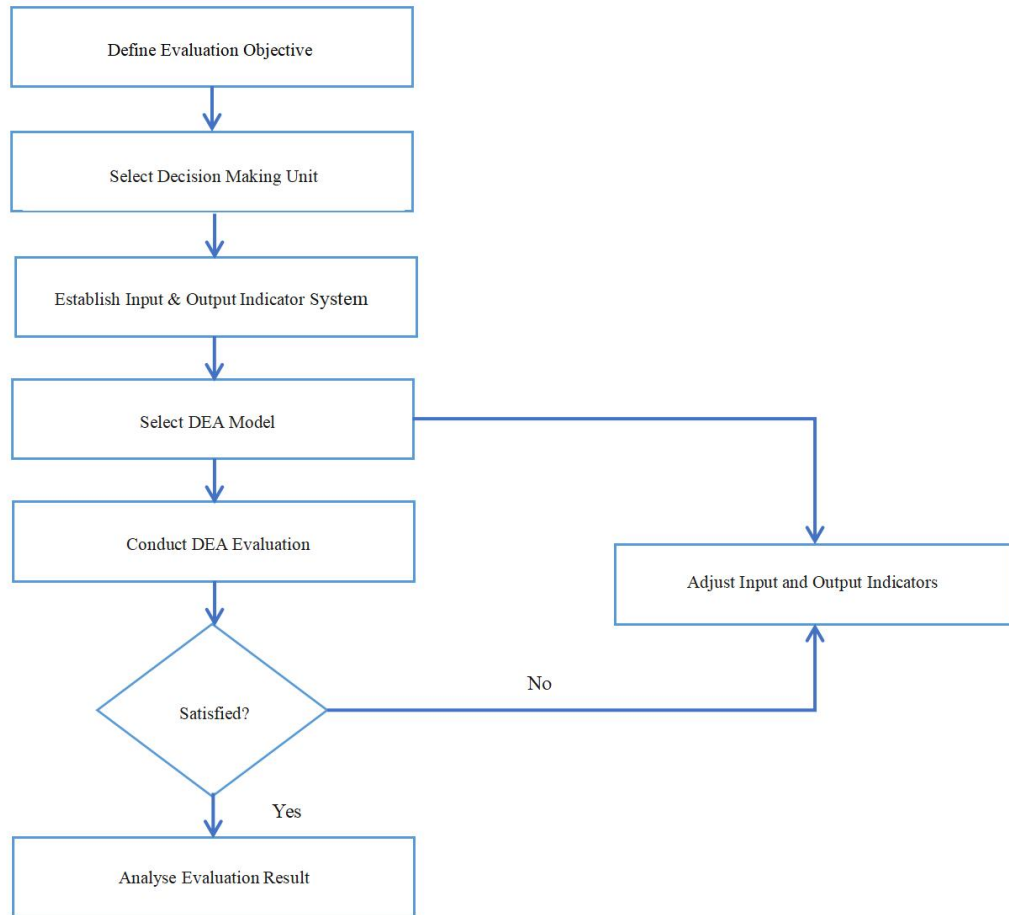


Figure 1 Description of DEA Model Logic

The most common DEA models are the CCR model (constant returns to scale) and the BBC (variable returns to scale), the difference between these two models being whether or not they assume "variable pay for scale".

In fact, in actual production, the returns to scale of the project subject must have changed, so the research first adopts the DEA model with BBC. The BBC model measures the technical efficiency of decision-making enterprises and regards the technical efficiency as the synthesis of scale efficiency and pure technical efficiency, which clearly reflects the internal mechanism of financing efficiency of decision-making units, i.e., $TE=SE \cdot PTE$, the level of technical efficiency is jointly determined by pure technical efficiency and scale efficiency.

3.2.3 Indicator Selection

3.2.3.1 Indicator Selection Principles. Indicators should be selected to objectively and

genuinely reflect the development status of SMEs and the actual relationship between the indicators. Each evaluation indicator should be typical and representative, not too many and too complicated, or too few and too simple to avoid errors in the information of the indicators. This survey will start from the micro-impact perspective when measuring SMEs' financing efficiency.

3.2.3.2 Selection of Input Indicators. First, the Total Asset, which is defined as the total assets item in the enterprise's balance sheet. When the size of a company's financing increases or decreases, the company's total assets also change, so the company's total capital can reflect the changes in the company's total financing. In addition, when a company's total assets are larger, it has more collateralisable assets, easier access to external financing, and greater financing strength. The next one is Gearing Ratio. It means the ratio of an enterprise's total liabilities to its total assets, reflecting the enterprise's capital structure. A high gearing ratio is associated with greater financial risk and poor overall solvency, which can cause investors to raise their investment requirements when investing with them, resulting in higher financing costs and lower financing efficiency for the enterprise. The third input indicator is Operating Cost, that is, the costs invested by an enterprise in its business activities. When financing is going well, companies tend to invest more in their operating activities, which means higher operating costs. Therefore, operating cost is the most effective use of capital for a company and can also reflect an enterprise's ability to raise capital.

3.2.3.3 Selection of Output Indicator. The prime indicator is called Return on Equity (ROE). It is an indicator that evaluates an enterprise's ability to earn profits from its business activities and reflects the ability of an enterprise to obtain returns by using the funds of the original shareholders at the time of establishment. When an enterprise has an idea ROE, it means that the stronger the enterprise's ability to make profits from the original capital is, the more efficient the use of capital utilisation is. The Main Income Growth Rate is the second one. It represents the growth and development ability of the enterprise's main business of using capital to earn income each year; to a certain extent, it can reflect the enterprise's annual production and management effect. When main income growth rate of an SME continues to grow, it means that the main business income of the enterprise has increased to a certain extent every year compared with the previous year, and the production and operation of the enterprise are in a better condition. Hence, the enterprise is good at using capital to obtain output and will have a brighter future. The last

one is the Total Asset Turnover Ratio, which stands for the proportion of total assets in the operating income, indicating the size of the enterprise in the production and operation activities of the total asset turnover speed and the ability to bring income. When an enterprise's total asset turnover ratio is large, it indicates a faster flow of assets, greater liquidity, better capital management efficiency, more extraordinary ability of capital to generate revenue, high capital operation capability, and internal management level.

3.2.4 Sample Selection and Data Processing

3.2.4.1 Sample Selection. This research first measures the financing efficiency of SMEs in Liaoning Province, mainly by adopting the DEA model and balancing panel data during measurement. Because of the high business risks and frequent fluctuations of the companies listed on NEEQ, there are objective companies listed and delisted in a short period of time. In order to ensure the consistency of the financial data of the sample listed companies and the required balanced panel data, and the annual report data of SMEs in Liaoning Province on NEEQ in 2022 have not yet been published at the time of writing, this paper selects SMEs listed on NEEQ in Liaoning Province from 2016 to 2021 as the sample. Excluding ST, ST* and financial companies and those with missing financial data, there are 70 companies.

3.2.4.2 Data Source. The relevant sample companies in this research are obtained from the iFind financial terminal and the official website of the National Small and Medium Enterprises Stock Transfer System. Moreover, the input and output indicators are sorted out in Excel. In measuring the financing efficiency of SMEs, the DEA model was used to calculate the size of the financing efficiency with Deap 2.1 software.

3.2.4.3 Data Processing. The DEA model requires that the choice of input and output indicators be non-negative; before the data analysis, the data needs to be dimensionless, and all data is processed to a dimensionless interval of $[0,1]$. By reason that the DEA model's special nature, the decision-making unit's effectiveness has nothing to do with the dimension of each input and output indicator. The following process method is used to dimensionless the raw data:

$$Y_{ij} = 0.1 + \frac{X_{ij} - \min(X_{ij})}{\max(X_{ij}) - \min(X_{ij})} * 0.9$$

Y_{ij} is the dimensionless data after processing, X_{ij} is the original data of variable, $\max(X_{ij})$ is the maximum value of the original variable, $\min(X_{ij})$ is the minimum value of the original variable, $X_{ij} \in (0,1)$, eliminates the unapplicability of negative value.

3.2.5 Evaluation Analysis of Financing Efficiency of SMEs in Liaoning Province

3.2.5.1 Standard Classification of Financing Efficiency. The calculation requirement of DEA model is that the sample size should be at least twice the number of input and output indicators. The research sample and the sum of the number of input and output indicators is 6, which satisfies the requirement. The standard division of financing efficiency is as follows:

Table 1 Classification of Financing Efficiency				
Financing Efficiency Size	$0 < H < 0.5$	$0.5 < H < 0.8$	$0.8 < H < 1$	$H = 1$
Financing Efficiency Rating	ineffective	relatively ineffective	relatively effective	effective

This financing efficiency value mainly includes technical efficiency value (crste), pure technical efficiency value (vrste), and scale efficiency value (scale). Technical efficiency reflects the efficiency brought about by technical factors; a value equal to 1 indicates that the factors are used rationally, while the opposite implies that there is still room for improvement in the technical efficiency of the factors. The larger the value, the better the management capability, resource allocation, scale of the company, and the better the financing efficiency of the company. Pure technical efficiency is a refined reflection of the level of management and technical skills of the enterprise. The larger the value, the more it indicates that the enterprise financing efficiency has reached the practical level and the enterprise has reached the maximum efficiency in utilising funds. Scale efficiency is an indicator of how well an enterprise is able to use its input capital to obtain the output. It can be seen whether an enterprise has input excess and output insufficiency through the efficiency value. In detail, the larger the value, the more efficient the enterprise is in an optimal position to maximise the use of inputs to obtain the output.

3.2.5.2 DEA Efficiency Means and Analysis. Table 2 summarises the mean values of TE, PTE, and SE for SMEs listed on the NEEQ of Liaoning Province in each year from 2016 to 2021.

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Overall, most of the efficiency values are below 0.8 and are ineffective, which shows that all 70 SMEs in the sample have low financing efficiency.

Table 2 **Average Results of DEA Efficiency from 2016 to 2021**

Year	TE	PTE	SE
2016	0.277	0.334	0.862
2017	0.264	0.328	0.857
2018	0.236	0.281	0.877
2019	0.251	0.300	0.878
2020	0.247	0.299	0.876
2021	0.232	0.291	0.876

TE values are all in a null state and have declined year by year after reaching a maximum in 2019 - this may be due to the impact of Covid-19 that SMEs have difficulty operating or even accessing operating capital production has been hampered, and companies have been facing difficulties in financing.

As a detailed decomposition of an enterprise's management capability and technical level, PTE for each year also shows ineffectiveness. Resemble TE, because of the impact of the epidemic, the financing efficiency of enterprises is not only related to their own management ability and technical level but also affected by the overall economic environment. The economic recession and the increases in the risk of lending will correspondingly increase the financing cost, which will also make it difficult for SMEs to raise funds and make financing inefficient.

SE values in the past six years are all above 0.8, indicating that the total scale efficiency of SMEs in recent years is relatively effective, and enterprises are more efficient in using capital to obtain output scale. This result reveals that the whole external business environment and operating conditions of SMEs in Liaoning province are relatively good and that enterprises can improve their scale efficiency by innovating enterprise technology or management level.

3.3 Empirical Analysis

3.3.1 Tobit Regression Model

The Tobit model is a restricted dependent variable regression model where the dependent variable is subject to certain conditions, and the observed values do not fully reflect the actual state of change in the dependent variable. The values of financing efficiency obtained from the DEA model are distributed between $[0,1]$, with some data missing. If a traditional ordinary least square regression model (OLS) is used, the results will be biased toward zero due to the limitations of the dependent variable. Therefore, the Tobit basic model is used to study the impact of the Digital Financial Inclusion Index on the financing efficiency of SMEs:

$$y^* = \beta x_i + \mu_i \quad i=1,2, \dots, n,$$

$$y_i^* = \begin{cases} y_i, & \text{if } y_i^* > 0 \\ 0, & \text{if } y_i^* \leq 0 \end{cases}$$

In this formula, y_i^* represents the potential dependent variable, which is observed when it is greater than 0, and taking a value of y_i , and is truncated at 0 when it is less than or equal to 0. x_i represents independent variable, β representative coefficient variable; μ_i represents the error term, and $\mu_i \sim (0, \sigma^2)$.

3.3.2 Tobit Regression Model Construction

3.3.2.1 Source and Selection of Indicators. This study selects the latest Digital Inclusive Financial Index (DFII) released in 2022, provided by the Institute of Digital Finance, Peking University. The index system uses the digital financial inclusion index, coverage breadth, usage depth, and digitisation level as indicators to measure the extent of digital financial inclusion. Since the value of the DFII is too large compared with the financing efficiency of SMEs, these four indicators are scaled down by 100 times as independent variables.

Table 3 **Meaning of Digital Inclusive Financial Indicators**

Primary Dimension	Secondary Dimension	
Coverage Breadth (CB)	Account Coverage Rate	
Usage Depth (UD)	Payments Business Money Fund Business Credit Business	Individual Consumption Loan

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	Investment Business Credit Transaction Insurance Business	Micro and Small Businesses Operators
Digitisation Level (DL)	Mobility Affordability Creditability Convenience	

TE measured by the DEA model is chosen as the dependent variable, and the Tobit regression model is constructed in conjunction with DFII. The software Stata 15 was used to perform the operational calculations in building the Tobit regression model. However, the efficiency of SME financing is caused by a combination of factors, so in addition to digital financial inclusion as the independent variables, three indicators are selected as control variables. As a large amount of financial data is used in evaluating the efficiency of corporate financing, three variables, namely company scale, change in net working capital, and change in short-term debt, are selected as control variables in order to avoid data covariance as far as possible.

First, Company Scale, the natural logarithm of total assets is used to measure the size of the SMEs, mainly reflecting how the growth of the firm affects the efficiency of SME financing. Second, Changes in Net Working Capital - primarily the proportion of total assets that are net assets, examining the impact of a firm's solvency and financial risk on the efficiency of SMEs financing. The following one is Change in Short-Term Debt. It is an indicator of how much current debt is a proportion of total assets, used to examine the impact of the relative amount of debt of SMEs on the efficiency of corporate finance.

On the basis of the selected variable indicators, the Tobit regression model affecting the financing efficiency of SMEs is established:

$$TE^* = \alpha_1 DFII + \alpha_2 CB + \alpha_3 UD + \alpha_4 DL + \alpha_5 X_1 + \alpha_6 X_2 + \alpha_7 X_3 + \mu$$

TE^* is the magnitude of the financing efficiency of SMEs in different periods, DFII, CB, UD and DL represent DFII and three secondary indicators respectively, $X_n (n = 1, 2, 3)$ denotes control variables, $\alpha_n (n = 1, 2, 3)$ represents regression coefficients, and μ is random error terms.

Table 4

Model Variables and Definitions

Type of Indicators	Name of Indicators	Meaning
Independent Variable	TE	TE of DEA
Dependent Variables	DFII CB UD DL	Overall Digital Financial Inclusion Index Account Coverage of Digital Financial Inclusion Number of Users of Digital Financial Inclusion Usage Proportion of Ordinary Products
Control Variables	X_1 X_2 X_3	Natural Logarithm of Total Assets (Current Assets- Current Liability) / Total Assets Current Liability / Total Assets

Part 4 Findings

4.1 Descriptive Statistics

Based on the results in Table 5, the results are now analysed descriptively separately as follows:

Table 5 Descriptive Statistics of Regression Variables

Variables	Mean	Medium	Standard Deviation	Minimum	Maximum
TE	0.305	0.199	0.278	0.025	1.000
DFII	2.498	2.540	0.302	1.748	3.018
CB	2.437	2.477	0.383	1.507	3.128
UD	2.449	2.494	0.244	1.847	2.816
DL	2.788	2.831	0.203	1.942	3.089
X_1	18.633	18.647	1.258	15.362	22.001
X_2	0.330	0.325	0.304	-0.520	0.898
X_3	0.341	0.344	0.195	0.027	0.972

4.1.1 Descriptive Analysis of TE

With regarding to TE, the mean value is 0.305, and the median value is 0.199, signaling that most SMEs are more efficient in financing than the median, but the technical efficiency is still on the low side. The maximum value is 1, and the minimum value is 0.025, with a large gap between the two, the difference hints that there is still much room for improvement in financing efficiency. The minimum value is much smaller than the mean value, indicating that there are still a small number of enterprises with low financing efficiency, lowering the technical efficiency level. The standard deviation of financing efficiency is 0.278, implying that SMEs'

financing efficiency is more concentrated and less dispersed.

4.1.2 Descriptive Analysis of DFII, CB, UD, and DL

The maximum values are 3.018, 3.128, 2.816, and 3.089 respectively, while the minimum values are 1.748, 1.507, 1.847, and 1.942 respectively, proving that the DFII and the secondary sub-indexes in different regions of Liaoning Province vary greatly, and the degree of digital financial inclusion development in different regions also varies greatly. The mean value of DFII is 2.498, which is also larger than the minimum value 1.748, suggesting that there are still some regions with a low level of digital financial inclusion.

4.1.3 Descriptive Analysis of Company Scale

The standard deviation is 1.258, with a maximum value of 22.001 and a minimum value of 15.362. The standard deviation is greater than 1, and the difference between the maximum and minimum values is 6.639, illustrating that the 70 SMEs have a wide range of company scales within the sample interval and uneven development between companies.

4.1.4 Descriptive Analysis of Changes in Net Working Capital

The table shows that the mean value is 0.330 and the median value is 0.325, with a relatively small difference and a standard deviation of only 0.304, which points out that the ability of SMEs to service their debts is relatively concentrated and that overall the increase in current liabilities is smaller than the increase in current assets. However, the minimum value appears negative, with a difference of 1.418 between the maximum and minimum values, a significant difference, suggesting that there is a considerable gap in the ability of enterprises to repay their debts.

4.1.5 Descriptive Analysis of Change in Short-Term Debt

As results can be seen from the data in the table, the difference between the maximum value and the minimum value is 0.945, depicting that some SMEs still have more room to grow and that

there is a significant gap in the relative debt of each company.

4.2 Stationarity Test

In order to confirm that there is no random trend or definite trend in the series of variables selected; otherwise, a "pseudo-regression" problem will occur, resulting in the final regression equation not explaining the dependent variable. Therefore, the selected variables need to be tested for stationarity. The time dimension studied in this paper is only six years, which is a short panel of data, and the number of variables relative to time is large, so the H-T Test proposed by Harris and Tzavalis will be used.

The specific test results are shown in Table 6: After the H-T test, it can be seen that the Z-values of TE, DFII, CB, UD, DL, X_2 and X_3 are all smaller than the statistical values, and the P-values of the test are all less than 0.05, so the original series of TE, DFII, CB, UD, DL, X_2 and X_3 are stationary. The Z value of X_1 is greater than the statistical value, and the P value is larger, so the original hypothesis cannot be rejected, and the difference test is continued, resulting in the Z test value of $D(X_1)$ being less than the critical value and the P is 0. The original hypothesis is not valid. Combined with the above analysis TE, DFII, CB, UD, DL, X_2 and X_3 original series stationary, X_1 series integrated of order 1, the following then use the first order difference after X_1 to do the subsequent regression.

Table 6 Results of Stationarity Test

Variables	Statistic	Z-Value	P-Value	Stationarity
TE	0.0572	-10.1962	0	Y
DFII	-0.0079	-11.4857	0	Y
CB	0.2343	-15.9743	0	Y
UD	0.2260	-6.8491	0	Y
DL	0.2491	-6.3915	0	Y
X_1	0.7159	2.8636	0.9979	N
$D(X_1)$	0.1597	-11.3263	0	Y
X_2	0.4818	-1.7771	0.0378	Y
X_3	0.3342	-4.7037	0	Y

4.3 Full-Sample Regression Analysis

This section is to conduct a full-sample Tobit regression model analysis. A Tobit regression model was developed using the DEA-evaluated TE as the independent variable, the digital financial inclusion Index (DFII), coverage breadth (CB), usage depth (UD) and digitisation level (DL) as dependent variables, and company scale (X_1), change in net working capital (X_2) and change in short-term debt (X_3) as control variables. The analysis was conducted to determine whether DFII and the three secondary indicators indices could improve the financing efficiency of SMEs in Liaoning Province, and the regression results are shown in the table below:

Table 7 Results of Full-Sample Regression Analysis

Variables	Coefficient	P-Value
DFII	2.143687**	0.034
CB	-1.486186**	0.027
UD	-0.1150739**	0.012
DL	0	
$D_{-}(X_1)$	0.0952511*	0.083
X_2	0.2187379)	0.025
X_3	-0.1994867	0.128

*p-values in parentheses: * - $p < 0.1$, ** - $p < 0.05$, *** - $p < 0.01$

It is found that the coefficient of the digital inclusion finance secondary indicator, DL is 0. This is due to its linear collinearity with other indicators of digital inclusion finance, so the study and analysis of the impact of the indicator of digitalisation level on the efficiency of SME financing are removed.

4.3.1 Analysis of Digital Financial Inclusion Index

The financing efficiency of SMEs and DFII are significant at the 5% level with a positive coefficient, which indicates that the DFII has a positive impact on the financing efficiency of SMEs, with the financing efficiency of SMEs increasing by 2.143687 units when the DFII

increases by 1 unit. The increase in financing efficiency per unit is nearly twice as large as the increase in DFII, which implies that digital financial inclusion has improved financing efficiency by making it easier for SMEs to access finance through the use of Internet technology to finance SMEs.

4.3.2 Analysis of Coverage Breadth

SME financing efficiency and digital financial inclusion secondary indicator of coverage breadth (CB) and usage depth (UD) are also significant at the 5% level, but the coefficient is negative and less than 0, which means that CB and UD cannot positively contribute to SME financing efficiency. It is possible that although the increased coverage breadth of digital financial inclusion has lowered the threshold for SMEs in terms of credit, in view of various reasons such as the poor ability of SMEs to resist indebtedness and weak awareness of risk prevention, the financial status of these SMEs still struggles to meet the requirements of financial institutions, and the coverage of digital financial inclusion does not cover these SMEs as eligible lenders, so these financial institutions still prefer to look for financial help such as loans from companies with large volumes. For usage depth, though the decline is not significant, the usage depth mainly relates to the payment business, money fund business, etc. The only form of business directly related to SMEs is the credit business for micro and small operators in the credit business. It is possible that the other businesses in the usage depth have a greater and negative impact on the financing efficiency of SMEs, resulting in a negative correlation between the overall indicator and financing efficiency.

4.3.3 Analysis of Company Scale

Company scale (X_1) can steadily contribute to the improvement of financing efficiency and is significant at the 5% level, it points that as the size of SMEs increases, their financing efficiency may escalate on the one hand, but on the other hand, if the size of SMEs only surges without focusing on the development of corporate management capacity and resource allocation level, it may instead have a negative effect on the financing efficiency of SMEs.

4.3.4 Analysis of Change in Net Working Capital Change in Short-Term Debt

Change in Net working capital (X_2) and change in short-term debt (X_3) are not significantly related to SME financing efficiency, means that for each sub-sample of SMEs, the size of solvency or the relative amount of debt does not fundamentally affect the financing efficiency of the firms.

4.4 Robustness Test

4.4.1 Substitution Variables

To ensure the authenticity of the Tobit model regression results, the robustness of the Tobit regression model was tested. By selecting the PTE and SE values of SMEs in Liaoning Province evaluated by the DEA model above to replace the TE results as the independent variables and keeping the other dependent variables and control variables unchanged, the Tobit model was constructed as follows:

$$\begin{aligned} PTE^* &= \beta_1 DFII + \beta_2 CB + \beta_3 UD + \beta_4 X_1 + \beta_5 X_2 + \beta_6 X_3 + \mu_1 \\ SE^* &= \gamma_1 DFII + \gamma_2 CB + \gamma_3 UD + \gamma_4 X_1 + \gamma_5 X_2 + \gamma_6 X_3 + \mu_2 \end{aligned}$$

In the formula, PTE^* and SE^* represent the magnitude of pure technical financing efficiency and scale efficiency of SMEs at different periods, DFII, CB and UD denote the total digital financial inclusion index and two secondary indicators, $X_n (n = 1, 2, 3)$ means company scale, change in net working capital and change in short-term debt respectively, of the control variables in the two formulae, $\beta_n (n = 1, 2, 3)$ and $\gamma_n (n = 1, 2, 3)$ refer to the regression coefficients, and μ is random error terms.

4.4.2 Test Results

Table 8

Results of Robustness Test		
	PTE	SE
DFII	2.143726** (0.034)	6.398914** (0.034)
CB	-1.486212** (0.027)	-.5486172** (0.027)
UD	-0.1152155** (0.012)	-0.2382993** (0.024)

d_X_1	0.0950328* (0.084)	0.2486561*** (0.000)
X_2	0.2189303** (0.024)	0.0222879 (0.733)
X_3	-0.1991699 (0.129)	-0.095882 (0.309)

The abular data reveals that:

After replacing TE with PTE, the effects of the main explanatory variables DFII, CB, and UD on the financing efficiency of SMEs in Liaoning Province are all significant at the 5% level, with approximate coefficients consistent with the results of the full sample regression above. Besides, the effect of company scale (X_1) on the pure technical efficiency of SMEs in the new regression is significant at the 5% level. In other words, the new regression model of PTE still confirms that the DFII has a specific effect on the financing efficiency of SMEs in Liaoning Province, while the coverage breadth does not improve the financing efficiency of SMEs in Liaoning Province.

After replacing TE with SE, there is still an impact on the financing efficiency of SMEs in Liaoning Province. The direction of impact is the same as the results of the full-sample regression above, but the coefficients differ more. Specifically, the extent to which the DFII lifts the scale efficiency of SMEs in Liaoning Province is much greater than the full sample impact, and the extent to which the coverage breadth reduces the financing efficiency is much greater. This may be because the scale efficiencies of SMEs in Liaoning Province all reach a relatively efficient state, which is inherently much higher than technical efficiency.

Part 5 Discussions and Implications

5.1 Discussions of the Findings

5.2.1 SME Financing Efficiency in Liaoning Province is Generally Low

For the three efficiency indicators measured by the DEA model, both TE and PTE are inefficient in all sample intervals, while SE is relatively effective in all cases. It can be concluded that the reason for low TE makes that PTE is almost ineffective. The main reasons for this may be because, firstly, although Liaoning Province has introduced a series of policies and systems for

SME financing in recent years, the lack of specific operability of these systems has led to many limitations in their implementation. For example, the Regulations on the Management of Credit Guarantees for Small Businesses issued by Liaoning Province have made many restrictions on credit guarantees for SMEs, which will make it difficult for SMEs to enjoy credit guarantees and ultimately lead to SMEs not enjoying the benefits of the policy; in addition, credit procedures are cumbersome, and financing costs are relatively high. In addition to internal financing, SMEs must also apply for loans from financial institutions. However, the current procedures for SMEs to apply for loans from financial institutions are rather cumbersome and require SMEs to provide more information, which will inevitably increase the cost of financing for SMEs. Secondly, most SMEs in Liaoning Province have a family history management model, with a high degree of concentration on management and ownership. As SMEs are relatively small in scale, they do not have a sound system of rules and regulations. The most crucial thing is that SMEs lack professional financial personnel and have not established a scientific, financial system, which leads to confusion in the operation of SMEs, which is not conducive to financial institutions grasping the financial information of SMEs in a timely manner; secondly, the collateral security capacity of SMEs is insufficient. The lack of collateral available to SMEs is the main factor that makes it difficult for SMEs to conduct credit business with financial institutions. Although a credit guarantee system has been established in Liaoning Province, the credit guarantee system in Liaoning Province is not yet perfect, resulting in many SMEs not being able to enjoy the preferential policies of credit guarantee; thirdly, SMEs have poor profitability and high experience risk. SMEs in Liaoning Province mainly rely on internal accumulation to expand and reproduce, so the profits of SMEs are relatively low, which makes financial institutions riskier when providing them with credit support. Therefore financial institutions are reluctant to provide them with credit due to safety considerations. So for the purpose of improving the efficiency of SME financing, in addition to the scale efficiency of the firm itself, there is a need to focus on improving the technical and managerial skills of the firm's technical staff.

5.2.2 DFII can Boost Financing Efficiency of SMEs in Liaoning Province

When DFII rises by one unit, the efficiency of SME financing in Liaoning Province increases by two units. This is in line with the previous chapters' discussion that digital financial inclusion uses digital means to enable inclusive finance to break through the constraints of time and space,

enhance the reach of inclusive finance, and reduce operational costs and lending risks. The use of technology has enabled the improvement of micro and small loan accessibility, risk control levels and service efficiency. In contrast, the other two sub-indices hinder the increase in efficiency. This may be due to the fact that while the coverage depth and usage depth have increased, Liaoning SMEs are not included as eligible lenders due to their high-risk financial profile, and their ability to withstand risk is difficult to meet the standards of financial institutions. Furthermore, in terms of usage depth, only micro and small business lending activities are relevant to these disadvantaged groups in the overall inclusion program, which makes it difficult to significantly reduce the cost of funding for SMEs, and there is still a need to supplement lending forms and diversify funding sources to improve financial efficiency for SMEs.

5.2 Implications

5.2.1 Theoretical Implications

Although inclusive finance was put into practice at the beginning of this century, digital financial inclusion has progressed over a relatively short period of time. As an essential form of implementing inclusive finance, it possesses the advantages of low cost and high efficiency. At present, most of the existing literature focuses on the role of inclusive finance in facilitating economic growth, explicit poverty alleviation, and innovative development of SMEs. Whereas there is less research on the effect of digital financial inclusion in promoting SME financing. The work in this study adds to some extent to the research on the area of SME finance.

5.2.2 Realistic Implications

The difficulty of financing for SMEs has been of considerable concern. Taking Liaoning Province as an example, this study provides an in-depth understanding of the level of development of digital financial inclusion in China and the extent of its role in financing various types of SMEs, provides references for the government, financial institutions, and other relevant institutions in China, and makes suggestions for developing and promoting better and more balanced digital inclusive financial services, for the purpose of improving the problem of intricate financing for SMEs.

Part 6 Conclusion

6.1 Conclusions

This article takes the listed SMEs on NEEQ in Liaoning Province as the research object. Firstly, it analyses the current situation of SMEs' financing and the problems in the financing process and finds that the causes of SMEs' financing constraints are mainly information asymmetry, high business risks, an inadequate commercial banking system, and poor credit system construction. Next, the current situation of the development of digital financial inclusion and the impact of digital financial inclusion on the financing of SMEs are analysed. The paper then extends the DEA-Tobit model to include the DFII and its secondary indicators to examine the impact of digital financial inclusion on SME financing in Liaoning Province. As the data available for the annual report is from 2016-2021, the financial data of 70 SMEs listed on NEEQ in Liaoning Province for these six years are selected for empirical analysis, leading to the conclusion that digital financial inclusion can promote the efficiency of SME financing. However, its secondary indicators are the opposite, based on which recommendations are made at the level of the enterprises themselves, the government, and the financial institutions.

6.2 Limitations and Suggestions

6.2.1 Limitations

There is a multitude of factors that affect the financing efficiency of SMEs. This paper uses the financial data of DFII introduced by Peking University and NEEQ-listed SMEs in Liaoning Province to examine only the impact of the DFII and other relevant control variables on the financing efficiency of SMEs. In addition to the indicators and variables discussed in this paper, other factors, such as the financing environment, regulations, and the level of corporate governance, may be involved in improving or controlling the financing efficiency of SMEs, these numerous variables cannot be fully explained comprehensively.

6.2.2 Future Suggestions

6.2.2.1 At SMEs' Own Level. Firstly, SMEs should standardise their development, advance their business management capabilities, enhance their competitiveness, disclose complete and accurate corporate information, reduce non-performing loans, and gradually improve their credit rating. Optimise core business, strengthen profitability and increase the economic benefits of the company. Reasonably adjust the staff training system, increase talent absorption, and strengthen the core quality management of SMEs. SMEs should actively cooperate with banks and other financial institutions to cut down information asymmetry and optimise transparency. Secondly, SMEs need to make reasonable use of digital means to invest in projects with high internal returns after obtaining consolidated funds, improve the speed and efficiency of capital turnover, avoid investing in projects with long lead times and low returns, and increase the internal financial flexibility of SMEs.

6.2.2.2 At the Government Level. The government should actively foster the development of digital financial inclusion by coordinating and improving top-level planning and supporting policies. This includes but is not confined to the implementation of relevant legislation and the establishment of different levels of digital financial inclusion systems to improve the spread, coverage, and visibility of digital financial inclusion. Secondly, it is a necessity for the government to strengthen regional policy and talent funding support to enable SMEs to reduce financing costs and facilitate the quality of the financing environment.

6.2.2.3 At Financial Institutions Level. Firstly, financial institutions should apply their digital technologies, such as the Internet, to reduce information asymmetry with SMEs, lower the risk of adverse selection, and develop a new credit scoring system for their clients based on information about their original SME customers, where each company's financial rating, working capital, credit worthiness, and solvency should be accurately assessed. Secondly, it is imperative for financial institutions to become more adept at integrating traditional financial services with Internet technology, innovating financial products and designing and developing them scientifically to accommodate the financing needs of different companies, providing diversified services, improving security and controlling risk, and decreasing the cost of loans to SMEs. Digital technology is used to enhance the attractiveness and capital of external financing, thus laying a sturdy foundation for SME financing.

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指导教师评语

The theme selected for the dissertation is in line with the professional training objectives and can meet the comprehensive training objectives. Additionally, the chosen topic has a certain academic reference value, with clear and strong arguments and sufficient and reliable arguments. Furthermore, the thesis can be submitted in time and revised carefully according to the suggestions. In general, the requirements of the thesis are fulfilled.

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