Review on the research of technological small and medium-sized enterprises financing

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***Abstract*—The Technological small and medium-sized enterprise is an important part of our national economy, playing a vital role in promoting the development of national economy, optimizing the economic structure and promoting scientific and technological innovation and other aspects. The existing research on financing of technological small and medium-sized enterprises mainly concentrated on the factors of financing in small and medium-sized enterprises, financing structure, financing efficiency and the dilemma of finance and so on, exploring the problem of the growth of SME financing from a macro point of view, but it is rarely involved that whether specific financing factors interaction relations has significant influence and mechanism of individual financing channels for the financing of small and medium enterprises. In this thesis, the literature of the technological small and medium-sized enterprises financing is systematically reviewed, summarized and commented, hoping to have a more comprehensive understanding of SME financing on the basis of previous studies, and actively explore new areas for financing.**

Keywords—scientific and technological innovation; small and medium-sized enterprises; financing research

I. INTRODUCTION

Sci-tech SMEs are the most active and promising groups in China's scientific and technological innovation. They are the main carriers for promoting the transformation of scientific and technological achievements and play a very important role in the field of scientific and technological innovation. The report of the 19th National Congress of the Communist Party of China put forward "to deepen the reform of the science and technology system, establish a technological innovation system with enterprises as the mainstay, market-oriented, and deep integration of production, education and research, strengthen support for innovation of small and medium-sized enterprises, leverage capital and market, and promote the transformation of scientific and technological achievements into productive forces. ". The development of deepening the national innovation system by science and technology small and medium-sized enterprises plays an irreplaceable role in China's economic development and technological innovation. However, SMEs face many difficulties in the financing process. The characteristics of SMEs determine that SMEs are difficult to obtain funds from traditional financing channels, which greatly restricts the enthusiasm and sustainability of their independent innovation. Sex. In particular, the current indirect financial system with banks as the main body cannot meet the financing needs of SMEs. In addition, the constraints of the economic environment and the imperfection of the capital market system have seriously restricted the development of China's SMEs.Based on the above financing difficulties, the existing literature has carried out a detailed analysis of the current situation of financing dilemma and proposed specific solutions, from macro to micro; followed by the thinking of financing dilemma led to the study of corporate financing structure and financing efficiency. The combination of internal and external factors has developed China's research system for financing SMEs. However, the shortcoming of the existing research is that the financing channels and structure of SMEs are only explained from the macro level. It is not analyzed whether the specific financing behavior has a significant impact on the financing of enterprises and then focuses on the research of financing behaviors. Secondly, in SMEs. There are few factors affecting the financing, such as the interaction between the influencing factors and whether it will work together in corporate financing. It is determined that the relationship between the primary and secondary relations can be more effective in research and solve the financing problem of small and medium-sized enterprises.The contributions of this paper are as follows: (1) combing, summarizing and reviewing the classic literature and the literatures reviewed, and dividing the research fields into financing sections, financing structure strategies, financing efficiency and influencing factors. (2) to explore the research areas that are rarely involved, such as the interaction of specific financing factors and whether it has a significant impact on corporate financing, the role of individual financing channels in financing SMEs, etc. Innovative points for further research.

II. SUMMARY OF SME FINANCING THEORY

As an applied subject of microeconomics and an important part of corporate finance, corporate finance theory, especially in the 1980s, due to the expansion of microeconomic theories such as corporate theory, property rights theory, and information economics, especially asymmetric information theory and agency. The introduction of theory and corporate governance structure, scholars' research is based on the traditional perspective of corporate finance theory, which has greatly expanded the theory of corporate finance.The research trends of scholars on financing issues in 2015-2018 are as follows:

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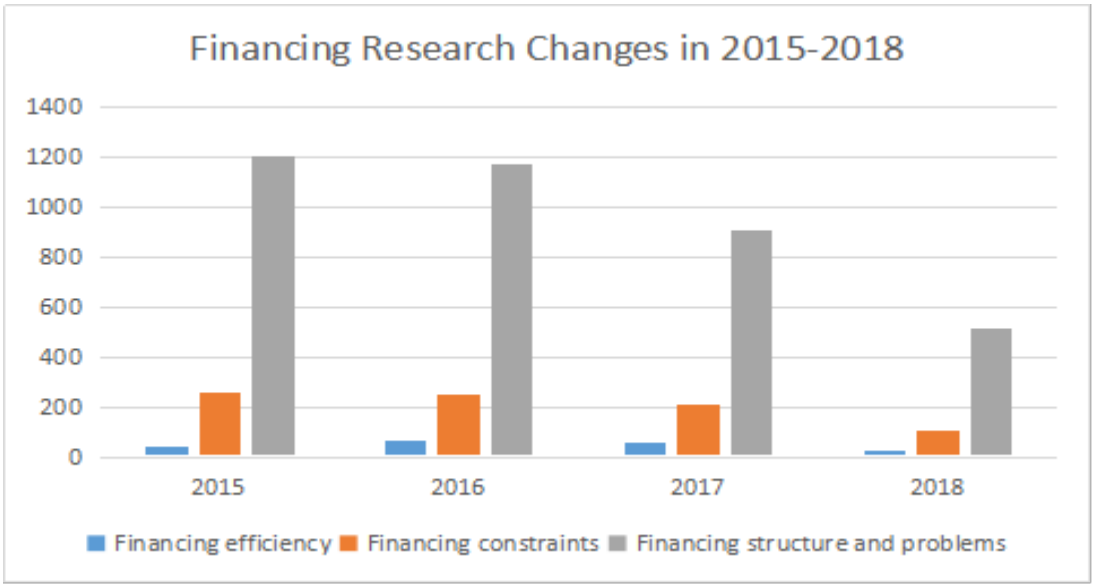

Figure 1 Changes in the amount of Financing Research

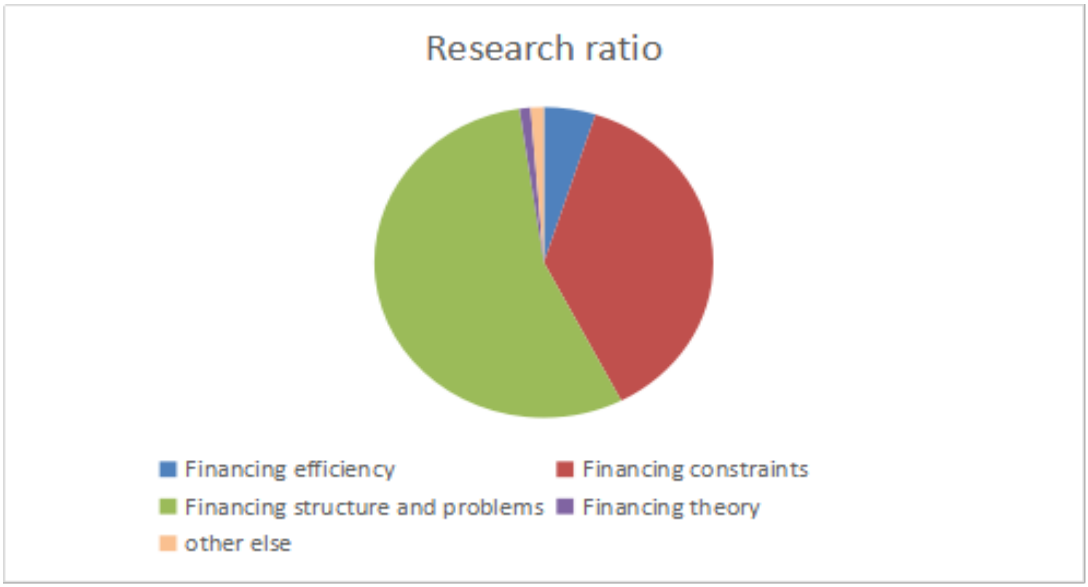

Figure 2 SME financing research content

A. MM Capital Structure Theory

The financing structure is closely linked with the capital structure. While studying the theory of financing structure, we need to explore the capital structure of enterprises. The most representative of the capital structure is the theory of MM capital structure. American scholars Modigliani and Miller (1958) published the article "Capital Costs, Corporate Finance and Investment Theory" in the American Economic Review, and proposed the famous MM theory and created the modern financing theory. The theories they proposed mainly include the early theory of non-corporate tax and the revised theory that there is a corporate tax theory and the Miller model. Modigliani and Miller's research proves that in the perfect capital market (the market is completely competitive, no tax, no transaction cost and no information asymmetry), the value of the enterprise has nothing to do with the capital structure, and the financing structure has nothing to do. Milestone significance; Fei Teng (2012) also pointed out that the concepts of financing structure and capital structure are not the same, and the financing structure is broader and finer than the capital structure. This also shows that the financing structure is related to the capital structure. We should also pay attention to the capital structure while studying financing, just as foreign scholars study. Tian Yuan (2013) believes that MM theory has drawn simple and intuitive conclusions through the ability of investors to conduct free arbitrage and other technical treatments, and has become the starting point and benchmark for corporate financial theory. MM capital structure theory is the necessary theory to study the financing structure of enterprises, which has led to a qualitative leap in corporate finance theory.

B. Information Asymmetry Theory

With the deepening of research, the theory of agency and asymmetric information theory are introduced. Through the concepts of signal, motivation and incentive in the theory of information asymmetry, the problem of corporate financing is analyzed from the "internal factors" of enterprises, and the trade-offs in traditional theory are The problem is transformed into structural or institutional design issues, thus opening up new research directions for corporate finance theory research. It is also because of the existence of agency problems that cause information asymmetry between investors and SMEs. Jensen and Meckling (1976) first proposed the agency cost model of corporate capital structure. The agency cost model is a good solution to the agency costs incurred by the company in the financing process, which is beneficial to the company to improve financing efficiency and reasonable budget to reduce financing costs. In addition, due to the high cost of agency, SMEs are reluctant to raise funds. Myers and Majluf (1984) also suggest that information asymmetry between corporate managers and external investors can lead to expensive external financing. Because when the internal cash flow is insufficient, the excessive financing cost makes the managers unwilling to raise funds to meet the investment demand, which leads to insufficient investment. Jensen, Michael C (1986) explained the agency costs from the perspective of cash flow free, and further expanded the theoretical research on agency costs and corporate finance.With the expansion of the knowledge system, most researchers have explored the problem of information asymmetry from another angle. Qin Hanfeng Huang Guoping (2001) pointed out that according to information economics, the information in economic society is incomplete and asymmetrical, and the information transmission mechanism is not smooth. Therefore, the cost of obtaining information constitutes an important part of market transaction costs. It is necessary to consider the cost of information when choosing a financing behavior. Since there is a problem of information asymmetry, scholars continue to explore ways to solve this problem. Zhong Ling (2006) believes that the growth evaluation system for small and medium-sized enterprises of science and technology can play a controlling role in the adverse selection problem caused by information asymmetry, so that investors can grasp whether the technology-based SMEs have investment value as a whole. The growth evaluation system of SMEs runs through the development of the enterprise. If investors fully grasp the information of the growth stage, they will increase their expectations for the company, increase their confidence and make investment decisions. Wu Chaopeng, Wu Shinong, Cheng Jingya, Wang Wei (2012) mentioned that after the company is listed, it can use the supervisory function, reputation resource and financing relationship network of venture capital institutions to solve the problem of agency and information asymmetry, and then promote the standardization and rationalization of corporate investment and financing behavior. From the perspective of dynamic analysis before and after listing, venture capital institutions can still play a supervisory function and financing relationship network to solve the financing problem, and use specific financing behaviors to solve specific financing problems, which has reference significance.

C. Financing cycle theory and superior order theory

Myers and majluf (1984) introduced their prioritization financing hypothesis based on the principle of signal transmission in their famous article “Enterprises know the financing and investment decisions when investors do not know the information”. They point out the financing order generally adopted by enterprises. It is internal financing, debt financing, and issuance of stocks. The financing priority theory provides the direction and way for the SMEs to start the period; Qin Hanfeng Huang Guoping (2001) considers the nature of capital, suggesting that enterprises can raise risky and profitable capital in the early and middle stages of development. In the medium and late stages of enterprise development, it is possible to raise capital with low risk and low profitability. Chang Maosong (2017) divides the financing cycle into five sectors, and the seed period is endogenous financing. At the same time, it should vigorously try to apply for financial support from various national support funds, venture capital funds and entrepreneurial service centers; the initial period is venture capital. Mode; growth policy loans and commercial short-term loans, financing leases; maturity is through the GEM listing method and the issuance of corporate bonds to obtain financing funds; in the recession period is mainly the securities bank financing, the focus is to Avoid corporate market value reduction.In summary, the technology-based SMEs in the early stage of development and early growth have relatively low financing channels, and the indirect financing costs are high and difficult. They generally rely on the input of endogenous financing and venture funds, supplemented by appropriate government policy financing. When technology-based SMEs enter the growth stage, venture capital and endogenous funds provided by venture funds alone are far from satisfying demand. Enterprises can raise funds through direct financing channels such as bonds and stocks, and indirect financing channels such as bank loans. Let the company grow and develop rapidly.

III. SUMMARY OF RESEARCH ON FINANCING OF SME

A. Summary of financing efficiency

Due to the high degree of marketization and the perfection of the property rights system in Western countries, the level of financing efficiency of enterprises is relatively high, resulting in less research on financing efficiency in foreign countries and less analysis on financing efficiency of SMEs. Regarding the research on the financing of SMEs, foreign scholars tend to focus on the discussion of financing structure and financing factors.

1) Definition of financing efficiency

In terms of the definition of financing efficiency, Zeng Kanglin (1993) used the concept of “funding efficiency” for the first time when analyzing the financing methods of direct financing and indirect financing, and analyzed seven factors affecting financing efficiency and cost. This is a breakthrough point in the field of financing research in China. The use of the term financing efficiency not only has a clear indicator of the financing ability of enterprises, but also makes reference to other fields.

Wang Xinhong (2007) defines the meaning of financing efficiency. She points out that the efficiency of corporate finance belongs to the category of microeconomic efficiency. It refers to the ability of the microeconomic entity to finance the production and operation and the effectiveness it achieves, including the manifestation of the efficiency of corporate financing. The efficiency of corporate financing efficiency and the efficiency of its institutional arrangements.

2) Indicators of financing efficiency

From the perspective of financing efficiency, Gao Youcai (2003) believes that corporate financing efficiency belongs to the scope of economic efficiency and is essentially consistent with economic efficiency. Corporate financing efficiency includes transaction efficiency, resource allocation efficiency, capital use efficiency, and corporate governance efficiency generated by the financing structure. He regards corporate financing efficiency as the extent of the impact and strength of corporate finance on economic development. Gaoshan (2010) explores the financing efficiency of technology-based SMEs from the perspective of financing costs and capital use. First, whether enterprises can raise the required funds at the lowest possible cost, and secondly, whether the funds raised by enterprises can be effectively use;

3) Factors affecting financing efficiency

In terms of studying the factors affecting financing efficiency, Wang Hongsheng (2014) believes that the poor financial financing environment affects the most common and most serious problem of financing efficiency. He analyzes the financing ability and the financing of SMEs in the context of the financial environment. significance. Sun Jia (2016) through empirical analysis, only indicators such as asset-liability ratio, return on net assets, working capital turnover rate, etc. represent the factors that influence the choice of financing methods, profitability, and efficiency of capital utilization, and the financing efficiency of sample enterprises are significant. It is concluded that the external financing environment, internal management ability and corporate stakeholder game are the main factors affecting the financing efficiency of sample enterprises. The existing research on the factors affecting the efficiency of financing is increasing, and its focus is different, and a unified view has not yet been formed.

B. Summary of research on financing constraints

Modigliani and Miller (1958) argue that under ideal conditions, capital can be freely circulated, and companies can acquire capital according to their own needs. Therefore, the internal capital market and the external capital market can be completely replaced. However, more research later believes that the ideal state does not exist. Due to information asymmetry and transaction costs in the capital market, the capital costs of internal and external capital markets are different, and enterprises may have to pay higher costs to obtain external capital. Therefore, there is a certain restriction on the use of funds by enterprises, that is, financing constraints.

Domestic research on financing constraints mainly uses empirical analysis. Wei Zhihua, Zeng Aimin, and Li Bo (2014) pointed out that SMEs face a significantly higher degree of financing constraints, and empirically conclude that the mechanism of a good financial eco-environment to alleviate corporate financing constraints is that it promotes financing-constrained enterprises. More commercial credits and bank loans have been obtained to bail out, and the nature of property rights and the size of the company will make the company different. From the concrete indicators of the financial ecological environment, new insights are put forward. It is believed that the optimization of the financial ecological environment can effectively alleviate the financing constraints of SMEs; Lu Taiping Zhang Dongxu (2014) combines the relationship between financing needs, financing constraints and earnings management to empirically draw conclusions: The cost of earnings control caused by financing constraints is relatively large, which will inhibit the earnings management behavior of enterprises to a certain extent. Scholars use the cost-benefit analysis method to analyze the dual role of financing constraints for earnings management, and expand the research on the role of financing constraints on related factors. Financing constraints are one aspect of financing problems, which is a phenomenon that exists in most enterprises. As discussed above, the information asymmetry theory and agency cost issues constitute the reasons for financing constraints. Theory combined with practice, normative and empirical is the best interpretation of research issues.

C. Summary of financing structure

Foreign scholars tend to focus on the discussion of the factors affecting the financing structure. Berger and Udell (1998) argue that changes in credit constraints, firm size, and funding needs that accompany the growth cycle of the firm are fundamental factors influencing changes in the financing structure. Beck and Asli (2005) believe that property rights protection and law enforcement can effectively improve corporate investment and financing willingness and research and development efficiency. Yusuf Ayturk (2017) argues that certain factors of government borrowing companies and other macroeconomic regulatory variables are important to the company's financial decisions. Analyze the government's mechanism of action on corporate finance from a statistical perspective. The financing structure and financing mode of domestic SMEs are the most studied in the existing literature, and such research is relatively mature.

1) Classification of financing structure

In terms of the classification of financing structure, Qin Hanfeng Huang Guoping (2001) divided financing methods into internal financing and external financing, and external financing was divided into indirect financing, direct financing and policy financing. This is a relatively complete classification of financing methods, and also provides a direction for follow-up researchers to study the financing structure. Li Weiming, Cui Yi, and Zhao Yunqi (2009) mentioned that the financing channel adopts the current division method of China's state-owned banking system, which is divided into enterprise own funds, new

capital injection by shareholders, government support funds, bank or private lending, and issuance of corporate bonds. Financing, financing through corporate listings, employee fundraising, venture capital funds, angel investment funds, pawns and others. This classification is more decentralized and not systematically summarized. Fei Teng (2012) combines credit rationing theory, relational loan theory, financial development theory, and financing cycle theory to explain the financing structure. According to the source of funds, it can be divided into internal financing and external financing, of which external financing comes from the relationship between financing parties. It can be divided into direct financing and indirect financing; it can be divided into debt financing and equity capital financing according to different capital attributes; it can be divided into long-term financing and short-term financing according to the length of occupation time. Using a variety of theories to systematically divide the financing structure, clear and easy to understand, so that readers have a deeper understanding of the financing structure;

2) Innovation in financing model

In terms of innovation in financing model, An Baoyang (2014)'s innovation in financing channels is to propose four models: P2P network lending model, public financing model, big data-based microfinance model, and internet financial portal model. Based on the rapid development of the Internet today, the combination of financing mode and the Internet has innovations.

3) Influencing factors of financing structure

When studying the factors affecting financing structure, Gao Shan and Gao Mingyu (2013) considered that policy factors, banking factors, private financial factors, capital market factors, and corporate factors are the main influencing factors of financing structure. Cheng Xinyi and Lin Lefen (2014) will innovate financial products. As the most important factors affecting the financing of SMEs, the type of enterprises, financial preferential policies and whether they are stationed in the park have little impact on the difficulty of financing SMEs; Zhong Tianli, Mana, Hu Yanbin (2014) from the industry From the perspective of organizational theory, the factors affecting the financing structure are mostly based on the assumption of the homogeneity of the enterprise, based on the characteristics of its external factor market, and based on the theory of asset specificity, the basic characteristics of each innovation input element of the enterprise and its The impact of the financing structure. Thinking about the same problem from different theoretical perspectives is the essence of research. In general, China's research on the factors affecting the financing model is relatively mature.

4) Specific financing structure

In terms of researching specific financing channels, Wen Yuechun and Wang Yuting (2010) pointed out that capital market financing is an important way to improve the proportion of direct financing of SMEs in China. Capital market financing can help enterprises to achieve high-efficiency and low-cost financing, and give full play to the role of capital market information disclosure and financing. Shen Yu (2017) focuses on the New Third Board and believes that the financing methods of SMEs in the New Third Board market are mainly Directional issuance, equity pledge, issuance of private equity for SMEs, etc., and broadly includes transfer of listings and mergers and acquisitions. This is the way to finance a specific capital sector.

From the above research, it can be seen that technology-based SMEs rely on short-term debt financing with strong liquidity, but the proportion of corporate financing in China is seriously out of balance, and the proportion of indirect financing reaches over 90%. The financing structure of foreign technology innovation enterprises is mainly based on direct financing of capital markets. For US technology-based SMEs, private equity funds are an important financing channel. China's technology-based SME financing needs to grasp indirect financing opportunities, but should also enhance its own strength and seize direct financing opportunities.

D. Summary of financing proposals

The general way to solve the financing problems of SMEs in foreign countries: a complete service system, perfect financial support, such as private equity financing and direct financing. An empirical study by Allen N. Berger and Gregory F. Udell (1998) found that there is a negative correlation between the size of banks and the bank's loan ratio to SMEs, that is, small banks are more inclined to provide loans to SMEs than large banks, and accelerate construction. Small and medium banks. Therefore, it is necessary to speed up the construction of small and medium-sized banks and alleviate the problem of financing difficulties for SMEs. On the basis of the previous, Allen N. Berger and Gregory F. Udell (2002) also believe that SMEs with bank-related loans are more likely to obtain financing. The bank's organizational structure is crucial for SME financing, in order to promote corporate financing. The government should strengthen the adjustment of the bank structure and alleviate the difficulty of financing.

Wen Yuechun, Wang Yuting (2010) suggested that SMEs that are in the early stage of development or early growth and are still unable to meet the requirements of the GEM and SME board can apply for the listing of the New Third Board and use the property rights trading market at the same time. Microfinance, through the incubation of the New Third Board, gradually upgraded to high-tech capital market in the growth stage of scientific and technological innovation-oriented small and medium-sized enterprises; Tian Gaoliang, Liu Xiaotong, Han Jie (2012) proposed from two aspects: First, for the company's own capabilities, Improve self-accumulation and development ability. Secondly, aim at the external environment, improve the construction of credit guarantee system for SMEs, improve the credit management mechanism for commercial banks, expand the equity financing market, expand equity financing channels, and develop venture capital to provide stability for SMEs. Financing channels; Gaoshan and Gaomingyu (2013) proposed to establish a credit guarantee system for SMEs, establish a policy-based S&T financial institution, fund the establishment of venture capital institutions and innovation funds, improve the public service platform for SMEs, and build a sound capital. Market system, standardizing private financial institutions. On the

one hand, Wang Hongsheng (2014) should reform and improve the financial ecological environment for the growth of small and medium-sized technology enterprises through multiple channels and channels, and create a good external environment for its financing; on the other hand, small and medium-sized technology enterprises should standardize their management and enhance their competition. Force, providing the necessary conditions for the entry of external funds.

In summary, China's review of financing proposals mainly focuses on internal and external factors. Through internal and external integration, while improving the company's own capabilities, it can develop financial markets, secured credit systems, government systems, etc. The capital demand has entered a virtuous cycle, thus truly establishing a long-term financing mechanism to adapt to the development of small and medium-sized technology enterprises, and promoting its growth and development.

E. Summary of financing research methods

The financing research method is mainly based on the financing efficiency. The DEA model is mainly used to analyze the efficiency factor, and the specification is combined with the empirical. Zhong Ling (2006) selected the combination of dynamic research and static analysis, and used the DEMATEL analysis model to model the strength of the influencing factors and identify the key influencing factors. Using the grey correlation analysis model to finance the technology-based SMEs Conducting evaluation research; Gao Shan (2010) explores the financing efficiency of technology-based SMEs from the perspective of financing costs and capital use, using the VRS model in the DEA method and the variable returns (VRS) (also known as the BCC model). ;

Tian Yuan (2013) used incentive theory, principal-agent theory, incentive financial contract design, financial development and corporate financing constraints to use the panel data of China's manufacturing listed companies and the dynamic panel generalized moment estimation method. At the same time, the sensitivity of investment to cash flow is used to measure corporate financing constraints, and the interaction variables of financial development and corporate cash flow are used to measure the mitigation effect of financial development on financing constraints. Wang Hongsheng (2014) designed a structured questionnaire, using multivariate statistical analysis techniques to empirically test the relationship between financing ability, financial ecological environment and the growth of small and medium-sized technology enterprises, and measure their utility coefficient for the growth of small and medium-sized technology enterprises. Cheng Xinyu and Lin Lefen (2014) constructed a financing indicator system from four perspectives: enterprise, bank, government and loan itself. Using the binary Probit model, the paper compares the impact of technology-based SMEs and general SMEs on commercial bank financing. The same points and differences. Sun Jia (2016) used the DEA-BBC model to calculate the financing efficiency of the sample enterprises, and further used the DEA-Malmquist evaluation method to measure the dynamic decomposition of the factors affecting the financing efficiency. On this basis, combined with the qualitative analysis and empirical analysis of corporate finance theory, the restricted dependent variable model (Tobit model) is used to empirically analyze the factors affecting the financing efficiency of SMEs. Shen Yu (2017) used the three-stage DEA model to study the new three-board enterprises, considering the external environmental factors on the basis of the two-stage and two-stage, and providing reference for the New Third Board and other capital markets.

IV. LITERATURE REVIEW

Due to the early entry into the era of market economy, the western financing environment, capital market and corporate financial background have greater advantages than domestic ones, and the level of financing efficiency of foreign SMEs is relatively high, which in turn makes foreign financing efficiency There are few studies, and foreign scholars tend to focus on the discussion of financing theory and financing structure. For China's domestic situation, because the institutional background environment is different from foreign countries, we need to think about corporate financing in light of national conditions. In order to solve the financing difficulties that are common in SMEs in China, the research direction mainly focuses on the financing structure and financing problems of SMEs, and the research is relatively mature, followed by financing efficiency and financing factors.

In summary, the existing research literature mainly studies the financing of SMEs from the following three aspects: First, empirical research is conducted with a certain region as a sample, for example, Shenzhen and Jiangsu; for example, capital market For the object, for example, based on the empirical analysis of the GEM, the new three board, the small and medium board; third, the use of a model as a sample for analysis. Although the existing research on financing has a wide range of fields, and the field of in-depth research has become more and more extensive, but the same is true, the real innovation is not enough. First of all, the research on the factors affecting the financing of small and medium-sized enterprises (SMEs) is mostly not reflected in the technology. Different from the special characteristics of ordinary SMEs, enterprises do not highlight the unique characteristics of “science and technology”. Secondly, it is rare to empirically examine the factors affecting the financing of SMEs and the interaction between influencing factors. The useful literature; Finally, although the impact of individual financing channels on corporate financing structure is studied, there are few studies, mainly researching capital market financing and bank financing. There are still many financing methods worth studying, such as venture capital investment. Combined with the government's institutional efficiency and other indicators to empirically explore the relationship between research and financing preferences, it is worth further exploration.

V. CONCLUSION

This paper analyzes, classifies and summarizes the financing research of SMEs at home and abroad in detail, and summarizes the scholars from six aspects: SME financing theory, financing efficiency, financing constraints, financing structure, financing suggestions and financing research methods. The research results have reached the following conclusions through literature analysis: (1) Domestic research on financing of small and medium-sized enterprises (SMEs) involves a wide range of research, and the existing research mainly focuses on financing structure and financing issues, among which financing issues are the most Generally speaking, it is difficult to finance; secondly, it is more about financing efficiency and financing influencing factors; (2) With the development of empirical research methods, scholars' financing problems for small and medium-sized enterprises are gradually biased towards empirical research, and the normative and empirical aspects are Combine and use the data model to draw more effective conclusions; (3) Although the existing financing research field is wide and the number of documents is increasing, but the quality is similar, you can try to innovate in the fields that are rarely involved.

The significance of this paper: Firstly, this paper systematically summarizes the research on the financing field of SMEs in science and technology. When different scholars expound their respective views on different viewpoints and the same viewpoints, they can have a more comprehensive understanding of corporate financing; Secondly, based on the existing research, the value points and blank points of the literature are excavated. From the literature analysis, the research on financing structure and financing problems accounts for a large proportion, so further research in the future can be developed in areas that are rarely explored.

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