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Evaluation of the Efficiency of Science and Technology Financial Ecosystem in the Yangtze River Delta Region: From the Perspective of Ecological Theory

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Abstract: This paper focuses on the construction and operation efficiency of the science and technology finance system in Shanghai, Nanjing, Hangzhou and Hefei, and uses the DEA model to analyze the efficiency of the integration of science and technology finance in the four cities, and evaluates the effectiveness of the construction mode, promotion path and innovation mechanism of science and technology finance. Finally, combined with the calculation results, corresponding policy suggestions are put forward for the implementation of policy optimization, the improvement of the science and technology financial service system, and the promotion of scientific and technological innovation and industrialization.

Keywords: Ecosystem; Yangtze River Delta Region; Fintech Finance.

1. Introduction

The combination of science and technology and finance is an important source of power for economic transformation and upgrading, innovation-driven and high-quality development, and has always been highly valued by the CPC Central Committee and the State Council. Since the term "science and technology finance" was officially used in 1993 at the first council meeting of the China Association for the Promotion of Science and Technology Finance, a series of policy documents issued by the CPC Central Committee and the State Council have become the top-level design of science and technology finance. In 2006, the State Council promulgated the Outline of the National Medium and Long-term Science and Technology Development Plan (2006-2020), which put forward the policy of science and technology finance to promote scientific and technological innovation, marking that science and technology finance was officially listed as a national science and technology innovation strategy. In 2011, the Ministry of Science and Technology's "National Twelfth Five-Year Plan for Science and Technology Development" specifically elaborated on the integration of science and technology and finance, as well as the service mechanism and multi-channel and multi-level financing system of financial support for the development of science and technology industry. In 2012, the Ministry of Science and Technology took a series of scientific and technological services such as science and technology finance as the focus of the construction of modern services, and vigorously encouraged and supported the development of related enterprises; In 2015, the Central Committee of the Communist Party of China and the State Council promulgated the "Several Opinions on Deepening the Reform of Institutional Mechanisms and Accelerating the Implementation of the Innovation-Driven Development Strategy", which emphasized: "give full play to the role of financial innovation in promoting technological innovation, cultivate and expand venture capital and capital markets, improve the flexibility and convenience of credit to support innovation, and form various financial instruments to support innovation and development." As an important pillar and driving force of China's national economic development, the Yangtze River Delta region is second to none in the development of science and technology and finance, and the combination of the two has long become an important feature of the economic development of the Yangtze River Delta region. As early as 2010, in accordance with the requirements of the Ministry of Science and Technology, the People's Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission, and the China Insurance Regulatory Commission's "Notice on Printing and Distributing the Pilot Implementation Plan for Promoting the Integration of Science and Technology and Finance" (Guo Ke Fa Cai [20 1 0] No. 7 20), combined with the pilot plans for promoting the integration of science and technology and finance proposed by various localities, The first batch of pilot areas for promoting the integration of science and technology and finance have been identified, among which Shanghai City, Jiangsu Province, Zhejiang Province's "Hangzhou-Wenhu-Ningbo" area, and Anhui Province's Hewubang Independent Innovation Comprehensive Pilot Zone are located in the Yangtze River Delta region. As representatives of the above four regions, about one-third of the supporting policy documents for innovation and development formulated and implemented in Shanghai, Hangzhou, Nanjing and Hefei belong to the field of science and technology finance, involving science and technology banks, venture capital, government funds, guarantee insurance, fiscal and tax incentives, etc.

2. Literature Review

The former IMF and the World Bank Financial Sector Assessment Project (FSAP) has become a widely accepted framework for financial stability assessments. FSAP assesses the soundness of the financial system at three levels: First, at the macro level, which measures the effectiveness of macroprudential supervision. It mainly judges the vulnerability and loss tolerance of the financial system through the compilation and analysis of financial soundness indicators, and evaluates the impact of shocks on the banking

system through stress testing. The second is the micro level, judging whether the financial infrastructure is perfect. By comparing international standards and guidelines,[1] check whether a country's payment system, accounting standards, corporate governance, etc. are complete. The third is the level of supervision, which assesses whether the supervision of the financial sector is effective. Focus on assessing whether the supervision of banking, securities, insurance, and payment systems meets international standards. The IMF and the World Bank build on these three levels to produce financial stability reports for the economies assessed. Scholars have improved or supplemented the connotation of science and technology finance from various perspectives, and gradually formed a relatively clear concept of science and technology finance. "Ecosystem" [2] is a concept proposed by the British ecologist Tansley in the 30s of the 20th century, inspired by the Danish botanist Warming. Ecosystem theory treats organisms and the environment as a system, and studies the function and structure of the system. In the process of studying the interaction between human activities and the natural environment, foreign scholars have integrated ecology and economics to form an interdisciplinary "ecological economics", which provides a pioneering idea for the proposal of financial ecology. The idea of financial ecology originated from the British economics Marshall [3], and has attracted more and more attention from scholars with the increase in the frequency of financial crises and the expansion of their scope. The frequent outbreak of financial crises and the increasing harm of financial crises have attracted extensive attention to the stability and robustness of the financial system [4]. Comparing the composition of the ecosystem, this paper studies the development status of China's financial ecosystem from the aspects of financial ecological subject, financial ecological regulation, and financial ecological environment, and analyzes the development advantages and disadvantages of it [5].

This paper analyzes the relationship between the financial system and its subsystems from the perspective of system theory, and intuitively illustrates many problems existing in China's financial ecosystem by means of theoretical elaboration and actual statistical data, and points out that the stability of China's financial ecosystem should be enhanced by improving the immunity and market competitiveness of financial ecological subjects [6]. With the deepening of research, scholars have found that providing a good external environment for the operation of financial entities is the decisive factor for maintaining the stability of the financial ecosystem, so they have begun to pay attention to the impact of institutional environment and other factors on the financial ecosystem. For example, from the perspective of institutional economics, Kuang Guojian believes that law is the "rule of the game" of the financial ecosystem, and that only by reasonably and standardly restricting the behavior of each subject in the system can financial activities be regulated and the efficiency of financial operation can be improved, and the legal system is the basic environment of the financial ecosystem[7].

3. Obstacles to the Integrated Development of Science and Technology and Finance

The degree of development of science and technology finance determines the ability of science and technology innovation and the development momentum of science and technology innovation industry in a city, a region and even a country. The improvement of regional competitiveness needs to rely on the industrial chain and innovation chain, form regional industrial clusters through industrial gradient transfer, and at the same time, drive the development of regional scientific and technological innovation through spillover effects. The formation of the science and technology innovation industry chain and innovation chain in the Yangtze River Delta requires the integration and coordination of regional science and technology finance, improving the service efficiency and service capacity of the overall science and technology finance, and providing important financial services and support for the science and technology innovation industry and scientific and technological innovation.

The integrated development and collaborative innovation of regional science and technology finance are the inherent needs of building regional industrial chains and innovation chains. The Yangtze River Delta region carries the national strategy and builds a world-class urban agglomeration with international competitive advantages, which needs to build an industrial chain in the field of science and technology innovation in the Yangtze River Delta, and then build an innovation chain based on the industrial chain. From the perspective of regional competitiveness, the Yangtze River Delta aims at the key industries related to the development of the country, builds a complete industrial chain in the region, and closely cooperates upstream and downstream to promote the completion of the industrial chain. On the basis of the overall industrial chain of the Yangtze River Delta region, each city has formed an industrial agglomeration with local industrial characteristics, echoing the overall industrial chain of the Yangtze River Delta region. According to the chain on the industrial chain carried by each city, Xiudan's best innovation field can be a certain industry or a certain link, giving full play to the advantages of innovation resources that each city is best at, and maximizing the efficiency of human resource allocation. Eventually, an industrial cluster facing the Yangtze River Delta will be formed, and the internal elements of the industrial cluster will interact with each other and communicate closely with the external system to promote the development of the industrial cluster. According to Porter's diamond model, industrial clusters need to be developed in the dimensions of demand conditions, factor endowment resources, related and supporting industries, corporate strategy, structure and peer competition, while considering opportunities and government factors, to optimize the industrial layout in the region. "

From the perspective of the value chain of science and technology enterprises, science and technology enterprises may distribute the enterprise value chain to different cities in the Yangtze River Delta according to the needs of strategic development, and the remote establishment of R&D, marketing, production and capacity requires the integration and coordination of regional science and technology finance, so as to provide a full range of services for science and technology enterprises. Science and technology enterprises have a neat value chain, including R&D, marketing, production base, logistics and warehousing, customer service, etc.

Science and technology enterprises pursue the cost minimization of the value chain, or implement the regional and urban distribution of the value chain based on a certain

strategic purpose. For relatively small scale science and technology enterprises, the development of the distribution of the distribution in the Yangtze River Delta region, including the R & D and marketing departments of the enterprise headquarters in Shanghai, the production base in Suzhou, Hefei and other Yangtze River Delta cities, can achieve the strategic goals of the enterprise, while reducing production costs.

Science and technology enterprises optimize the layout of the Yangtze River Delta value chain. Maximize corporate value. According to the value chain theory, the ability to create value can be improved by the proper distribution of each chain link to create value. In the layout of the value chain, science and technology enterprises can maximize the value of the enterprise with the help of the endowment conditions required by various places in the region. From the perspective of the government, support the remote layout of the value chain of science and technology enterprises.

4. Efficiency Evaluation

4.1. Data Envelopment Analysis Model (DEA)

In recent years, scholars have mainly used analytic hierarchy process (Zhang Mingxi, 2015), parametric methods based on data envelopment models (Du Jinmin, Liang and Lv Han, 2016, Li Yanjun and Wang Haichuan, 2016), and non-parametric methods based on random western numbers (Luo Jiawen and Chen Langnan, 2013; Min Chen and Jianmin Li, 20125. For example, Li Helong and Duan Ziwei (2018) used the AHP-DEA-Malmguist model to conduct a static and dynamic empirical analysis of the efficiency of science and technology finance in 21 prefecture-level cities in Guangdong Province from 2004 to 2015. Based on the above research, this paper intends to use the Data Envelopment Analysis (DEA) model to test and evaluate the integration and operation efficiency of science and technology finance in Shanghai, Hangzhou, Nanjing and Hefei.

Suppose there are n evaluation units, and each evaluation unit has m input variables and S output variables, x_{ij} (x_{ij}>0, i=1, 2,.....,m) represents the input of the ith input of the j-th evaluation unit, and y_{rj} (y_{rj}>0, r=1, 2,.....,s) represents the output of the r-type output of the j-th evaluation unit. The model is represented as follows:

$$\min[\theta - \varepsilon(e^{\mathrm{T}}s^{-}+e^{T}s^{+})]$$

According to the DEA model score meaning, the larger the output efficiency value of 0, 9 (0≤ day ≤1), the higher the relative performance level of the city's technology-finance integration activities, and the lower the vice versa. When the evaluation value of comprehensive efficiency is 1, and the efficiency of pure technical wood and scale efficiency are both 1, the DEA is fully effective, and the economic activity of the decision-making unit is both technically effective and scale-effective. When the comprehensive efficiency value is 0.9, the pure technical efficiency and scale efficiency are only 1 on one side, and the other side is less than 1, then the DEA is relatively effective, and the pure technical efficiency and scale efficiency are not optimal at the same time: if the comprehensive efficiency value is less than 0.9, the decision-making unit DEA is not effective, and the economic activity does not reach the optimal pure technical efficiency and the scale efficiency is not optimal.

The above calculation results show that from 2014 to 2017, Shanghai, Hangzhou, Nanjing and Hefei showed a steady upward trend in the efficiency of financial investment and technology output, and the output performance increased year by year, reflecting the construction path and mechanism construction of the science and technology financial service system in these four cities. A series of policy innovations, such as pain points in the start-up stage, have effectively promoted the output and industrialization of scientific and technological innovation, and have been reflected in the index data and model calculation results.

5. Recommendations

5.1. Improve the Mechanism of "Discovery, Cultivation and Docking"

Optimize the transformation of scientific and technological achievements in the Yangtze River Delta region, build a mechanism, discover valuable scientific and technological innovation projects, effectively cultivate valuable scientific and technological innovation projects in the seed stage, and efficiently connect with internal and external credit institutions, investment institutions, insurance institutions and capital markets in the start-up stage of science and technology small and micro enterprises, promote the transformation of science and technology in the Yangtze River Delta region, and realize the coordinated development of science and technology enterprises in the Yangtze River Delta. Incubators at all levels of Fuzi The function of institutional rehabilitation such as intellectual property trading institutions, technology exchanges, etc., especially the discovery, cultivation and docking functions of Tonghua. By establishing a mechanism design for the distribution of benefits and performance assessment of incubators in the park, incubators are encouraged to discover more dominant science and technology enterprise projects, and incubators are stimulated to actively explore the source power of science and technology innovation projects. Through the mechanism design of the linkage between the branch park and its own direct investment, we will discover and cultivate scientific and technological innovation projects, and do a good job in the transformation of scientific and technological innovation achievements.

5.2. Give Full Play to the Central Role of the Market in Resource Allocation

The Yangtze River Delta is not a long-term solution to solve the problem of coordinated development of science and technology finance through administrative coordination, the key is to set up a mechanism of interest bundling, fundamentally stimulate the willingness of all parties to cooperate, promote the flow of scientific and technological resources and financial resources within the scope of the Changsan, and maintain sustainable cooperative development For the interest bundling mechanism, first of all, to achieve the king

Benefit from the rules. The resource sharing of science and technology finance is an ideal goal, but no party is willing to divide its own resources with other irrelevant ones, so it is necessary to establish a benefit-sharing mechanism to stimulate the sharing of resources. The three provinces and one municipality in the Yangtze River Delta have promoted the "Joint Action Plan", first defining the rules for the distribution of benefits, and reaching a consensus on the rules of benefits through joint action, which is in line with the expected benefit expectations of all participants. Economically developed cities should make up for the lack of

land resources with the management experience of the first choice, while economically less developed cities should use their own unique resources in exchange for the spillover effect of developed cities, so as to realize the development of the overall regional science and technology innovation industry.

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