Research on Risk Assessment and Management System of Science and Technology Finance

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Abstract: In recent years, China's science and technology finance has developed at a high speed, and the assessment of science and technology finance risks has also attracted great attention. From the perspective of existing science and technology finance risks, they are mainly concentrated in regulatory risk, science and technology risk, operation and maintenance security risk, capital risk, incomplete risk assessment system, weak science and technology finance intermediary service system, weak ability of science and technology finance system to integrate resources, and insufficient ability to balance risk returns. Through PLS regression analysis, this paper studies various risks, and optimizes countermeasures from the perspective of risk assessment management by preventing scientific and technological financial risks.

1. Introduction

Science and technology financial risks, generally speaking, are the concentrated expression of traditional financial risks in Internet finance. With the flash of P2P, the progress of science and technology finance has become relatively cautious, and the prevention and assessment of science and technology financial risks have become a crucial topic, including liquidity risk, regulatory risk, credit risk, capital risk, system risk, etc. It also includes new scientific and technological risks due to the Internet and computer technology environment, such as big data, cloud computing, AI, and touch technology. However, the progress of science and technology finance itself is an irreplaceable trend of current and future progress, so it is particularly crucial to better meet the risk assessment and management of science and technology finance and establish a systematic risk prevention barrier[1].

2. Demonstration Analysis of Scientific and Technological Financial Risks

2.1 Index System Composition

By selecting Shanghai, Nanjing, Suzhou, Hangzhou and Ningbo as the cities with active development of science and technology finance for this PLS regression analysis, eight indicator systems were established, including regulatory risk, science and technology risk, operation and maintenance security risk, capital risk, risk assessment system, intermediary service system, ability to integrate resources and balance risk returns. The PLS regression analysis method was used to empirically measure the risk of science and technology finance in different cities. When using the model for calculation, the design and selection of the indicator system will have a key impact on the objectivity and reliability of the measurement results. The experiment was carried out based on the principles of science, authenticity, effectiveness and quantification.

2.2 Source of Sample Data

The sample data of this experiment comes from the *2021 China Science and Technology Finance Risk Assessment Report* and the percentage of eight indicator data in five test cities, based on the data obtained from statistical bulletin, yearbook, science and technology statistics network and field

research[2-3]. Each city corresponds to eight indicators of five financial organizations for empirical analysis.

3. Pls Regression Analysis of Scientific and Technological Financial Risks

3.1 Empirical Process

Table 1 Mathematical relationship expression between principal components and research items								
	Principal component U1	Principal component U2	Principal component U3	Principal component U4	Principal component U5	Principal component U6	Principal component U7	Principal component U8
Regulatory risk	0.542	-0.576	0.164	-0.052	-0.248	0.122	-0.600	-0.195
Scientific and technological risks	0.434	-0.164	0.022	-0.386	0.828	0.060	-0.002	0.056
Operation and maintenance security risk	-0.055	0.850	0.494	-0.301	-0.039	0.110	-0.533	0.179
Capital risk	0.439	-0.135	0.015	0.103	-0.370	-0.479	0.553	0.680
Risk assessment system	-0.287	-0.187	0.060	0.087	0.269	0.569	-0.449	0.662
Intermediary service system	0.315	0.147	0.234	0.102	0.007	0.655	0.200	-0.131
Resource integration capability	0.050	0.112	0.163	0.827	0.235	-0.163	-0.065	-0.071
Ability to balance risk and return	-0.373	0.204	0.947	-0.400	0.003	-0.238	0.357	-0.077
	Principal component V1	Principal component V2	Principal component V3	Principal component V4	Principal component V5	Principal component V6	Principal component V7	Principal component V8
City	0.002	-0.006	-0.005	0.001	0.044	0.057	-0.006	0.011
Scientific and technological financial unit	0.097	-0.244	-0.203	0.027	0.005	0.008	0.080	0.466

The above table shows the mathematical relationship between the principal component and the research item, including the relationship between the principal component U and the independent variable X, and the relationship between the principal component V and the dependent variable Y, as shown below:

Principal component U1=0.542 * regulatory risk+0.434 * scientific and technological risk -0.055 * operation and maintenance security risk+0.439 * capital risk -0.287 * risk assessment system+0.315 * intermediary service system+0.050 * resource integration capacity -0.373 * ability to balance risk and return

Principal component U2=-0.576 * regulatory risk -0.164 * scientific and technological risk+0.850 * operation and maintenance security risk -0.135 * capital risk -0.187 * risk assessment system+0.147 * intermediary service system+0.112 * resource integration capacity+0.204 * ability to balance risk and return

Principal component U3=0.164 * regulatory risk+0.022 * scientific and technological risk+0.494 * operation and maintenance security risk+0.015 * capital risk+0.060 * risk assessment system+0.234 * intermediary service system+0.163 * resource integration capacity+0.947 * ability to balance risk and return

Principal component U4=-0.052 * regulatory risk -0.386 * scientific and technological risk -0.301 * operation and maintenance security risk+0.103 * capital risk+0.087 * risk assessment system+0.102 * intermediary service system+0.827 * resource integration capacity -0.400 * ability to balance risk and return

Principal component U5=-0.248 * regulatory risk+0.828 * scientific and technological risk -0.039 * operation and maintenance security risk -0.370 * capital risk+0.269 * risk assessment system+0.007 * intermediary service system+0.235 * resource integration capacity+0.003 * ability to balance risk and return

Principal component U6=0.122 * regulatory risk+0.060 * scientific and technological risk+0.110 * operation and maintenance security risk -0.479 * capital risk+0.569 * risk assessment system+0.655 * intermediary service system -0.163 * resource integration capacity -0.238 * ability to balance risk and return

Principal component U7=-0.600 * regulatory risk -0.002 * scientific and technological risk -0.533 * operation and maintenance security risk+0.553 * capital risk -0.449 * risk assessment system+0.200 * intermediary service system -0.065 * resource integration capacity+0.357 * ability to balance risk and return

Principal component U8=-0.195 * regulatory risk+0.056 * scientific and technological risk+0.179 * operation and maintenance security risk+0.680 * capital risk+0.662 * risk assessment system -0.131 * intermediary service system -0.071 * resource integration capacity -0.077 * ability to balance risk and return

Principal component V1=0.002 * city+0.097 * science and technology financial unit

Principal component V2=-0.006 * city -0.244 * science and technology financial unit

Principal component V3=-0.005 * city -0.203 * science and technology financial unit

Principal component V4=0.001 * city+0.027 * science and technology financial unit

Principal component V5=0.044 * city+0.005 * science and technology financial unit

Principal component V6=0.057 * city+0.008 * science and technology financial unit

Principal component V7=-0.006 * city+0.080 * science and technology financial unit

Principal component V8=0.011 * city+0.466 * science and technology financial unit

Table 2 Correlation analysis of principal components and research items (loading value)

	Principal component U1	Principal component U2	Principal component U3	Principal component U4	Principal component U5	Principal component U6	Principal component U7	Principal component U8
Regulatory risk	0.392	-0.524	0.422	-0.020	-0.313	-0.088	-0.525	-0.168
Scientific and technological risks	0.449	-0.006	-0.000	-0.293	0.844	-0.176	0.033	0.062
Operation and maintenance security risk	0.325	0.777	0.057	-0.156	-0.096	-0.138	-0.479	0.208
Capital risk	0.469	0.030	0.101	0.051	-0.247	-0.221	0.260	0.662
Risk assessment system	-0.433	-0.385	0.185	0.127	0.131	0.395	-0.173	0.670
Intermediary service system	0.449	0.216	0.219	0.171	-0.177	0.957	0.562	-0.156
Resource integration capability	0.112	0.084	0.385	0.917	0.404	-0.324	-0.161	-0.079
Ability to balance risk and return	-0.358	-0.358	0.819	-0.117	0.054	-0.111	0.237	-0.081
	Principal componen	Principal componen	Principal componen	Principal componen	Principal componen	Principal componen	Principal componen	Principal componen

	t V1	t V2	t V3	t V4	t V5	t V6	t V7	t V8
City	0.005	0.004	0.035	-0.017	8.380	10.938	-1.428	-0.018
Scientific and technological financial unit	0.291	-0.729	-0.607	0.080	-0.180	-0.232	0.271	1.392

Table 3 Regression coefficient of the relationship between dependent variable Y and independent variable X				
	City	Scientific and technological financial unit	City (standardized)	Scientific and technological financial unit (standardized)
constant	-69.917	12.098	0.000	0.000
Regulatory risk	0.004	0.002	0.130	0.056
Scientific and technological risks	1.205	0.023	7.605	0.116
Operation and maintenance security risk	0.472	-0.314	1.661	-0.874
Capital risk	-0.393	0.082	-9.147	1.500
Risk assessment system	0.495	0.044	9.108	0.644
Intermediary service system	0.711	-0.056	6.944	-0.430
Resource integration capability	0.043	-0.044	0.271	-0.221
Ability to balance risk and return	-0.182	-0.062	-3.046	-0.820

The above table shows the regression relationship expression between dependent variable Y and independent variable X, including the relationship expression between each dependent variable Y and all independent variables, as shown below:

City=0.130 * regulatory risk+7.605 * science and technology risk+1.661 * operation and maintenance security risk - 9.147 * capital risk+9.108 * risk assessment system+6.944 * intermediary service system+0.271 * resource integration capacity - 3.046 * ability to balance risk and return

Science and technology financial unit=0.056 * regulatory risk+0.116 * science and technology risk -0.874 * operation and maintenance security risk+1.500 * capital risk+0.644 * risk assessment system -0.430 * intermediary service system -0.221 * resource integration capacity -0.820 * ability to balance risk and return.
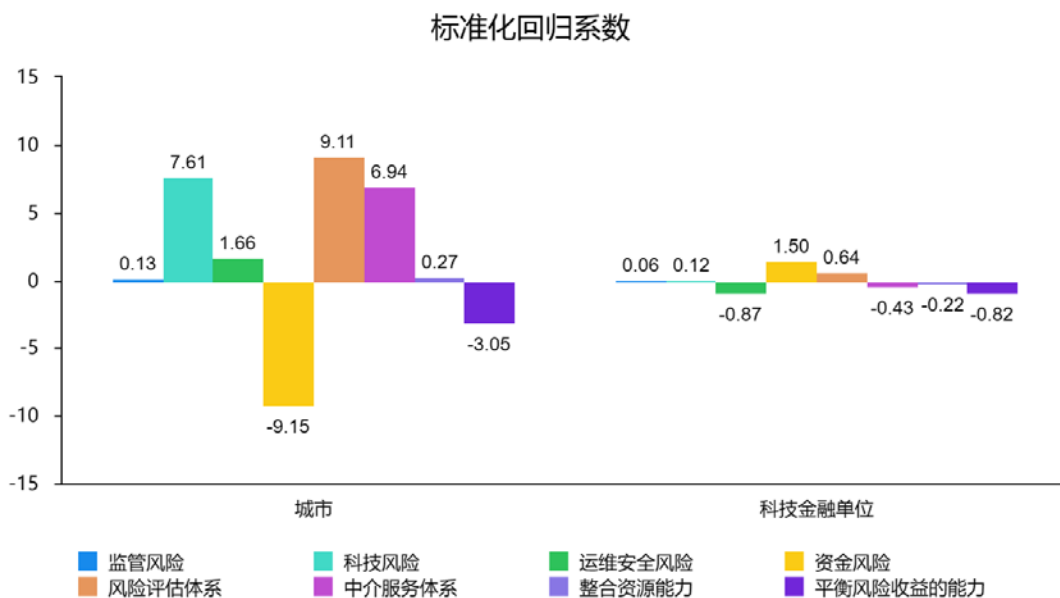

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Fig.1 : Normalized Regression Coefficients

Table 4 Precision analysis of principal component U and research items									
	Principal component U1	Principal component U2	Principal component U3	Principal component U4	Principal component U5	Principal component U6	Principal component U7	Principal component U8	Comprehensive
Regulatory risk	0.691	0.226	0.081	0.000	0.000	0.000	0.001	0.000	0.125
Scientific and technological risks	0.908	0.000	0.000	0.089	0.003	0.000	0.000	0.000	0.125
Operation and maintenance security risk	0.474	0.498	0.001	0.025	0.000	0.000	0.001	0.000	0.125
Capital risk	0.991	0.001	0.005	0.003	0.000	0.000	0.000	0.001	0.125
Risk assessment system	0.845	0.122	0.015	0.017	0.000	0.000	0.000	0.001	0.125
Intermediary service system	0.907	0.038	0.022	0.030	0.000	0.001	0.002	0.000	0.125
Resource integration capability	0.056	0.006	0.067	0.870	0.001	0.000	0.000	0.000	0.125
Ability to balance risk and return	0.575	0.106	0.304	0.014	0.000	0.000	0.000	0.000	0.125
comprehensive	0.681	0.125	0.062	0.131	0.001	0.000	0.001	0.000	0.125
	Principal component U1	Principal component U2	Principal component U3	Principal component U4	Principal component U5	Principal component U6	Principal component U7	Principal component U8	comprehensive
city	0.000	0.000	0.001	0.000	0.345	0.139	0.010	0.000	0.062
Scientific and technological financial unit	0.380	0.439	0.167	0.007	0.000	0.000	0.000	0.002	0.124
comprehensive	0.190	0.219	0.084	0.003	0.173	0.069	0.005	0.001	0.093

Table 5 Summary of Projection Importance Indicators (VIP)								
	1 principal component	2 principal components	3 principal components	4 principal components	5 principal components	6 principal components	7 principal components	8 principal components
Regulatory risk	1.534	1.245	1.240	1.235	1.124	1.084	1.087	1.086
Scientific and technological risks	1.227	0.839	0.773	0.775	1.310	1.258	1.254	1.253
Operation and maintenance security risk	0.155	1.712	1.564	1.559	1.346	1.285	1.285	1.285

Capital risk	1.240	0.856	0.785	0.783	0.849	0.868	0.868	0.870
Risk assessment system	0.811	0.861	0.803	0.800	0.798	0.869	0.866	0.869
Intermediary service system	0.890	0.857	0.804	0.802	0.692	0.868	0.875	0.874
Resource integration capability	0.141	0.296	0.299	0.363	0.570	0.580	0.579	0.579
Ability to balance risk and return	1.054	0.721	1.193	1.189	1.024	0.997	0.995	0.994
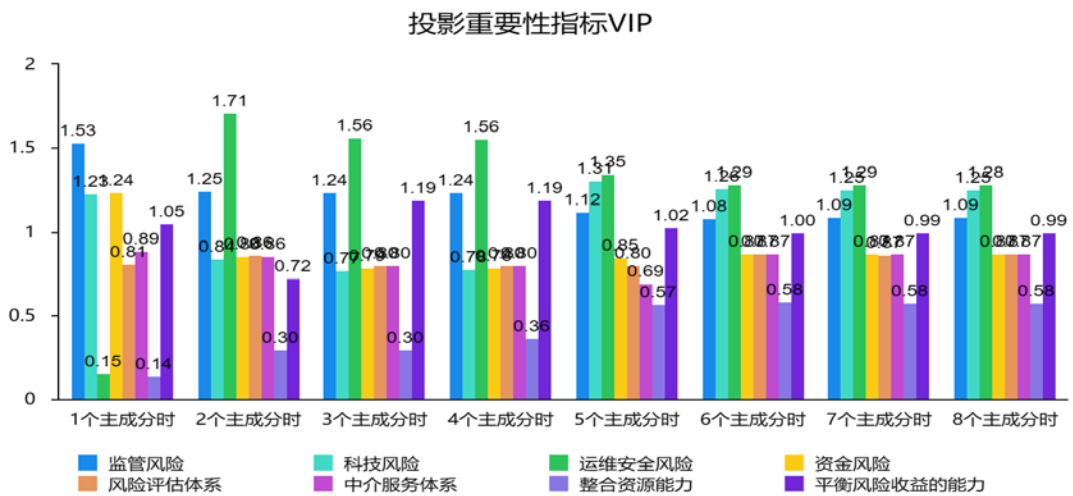
Fig.2 : Projection Importance Indicator Vip

Cross effectiveness analysis			
Component h	*SS*	PRESS	Qh2
1	49.798	61.336	1.000
2	32.256	45.816	0.080
3	25.563	40.900	-0.268
4	25.290	45.868	-0.794
5	16.652	38.387	-0.518
6	13.184	42.410	-1.547
7	12.925	42.345	-2.212
8	12.832	44.539	-2.446

| Table 6 Summary of Model R								
Dependent variable	1 principal component	2 principal components	3 principal components	4 principal components	5 principal components	6 principal components	7 principal components	8 principal components
City	0.000	0.000	0.001	0.001	0.346	0.485	0.495	0.495
Scientific and technological financial unit	0.380	0.819	0.986	0.992	0.992	0.992	0.993	0.995
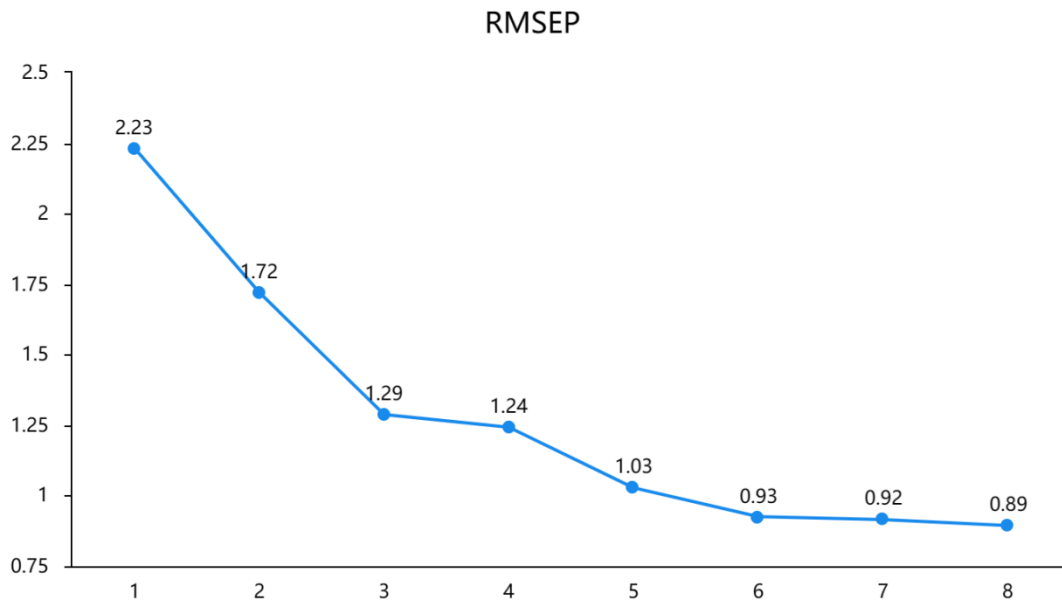
Fig.3 Rmsep

3.2 Result Analysis

From the PLS analysis results, the change degree of the eight indicators among the five cities is not large, which shows that the five cities with developed science and technology finance have a good foundation for the development of science and technology finance. In different scientific and technological financial organizations or units, there are obvious changes in the eight indicators. It is obvious that different financial institutions have different anti-risk capabilities. Among them, regulatory risk, scientific and technological risk, operation and maintenance security risk and capital risk are the most important risks, which require targeted design on countermeasures.

4. Countermeasures and Suggestions on Optimizing Risk Assessment Management of Science and Technology Finance

4.1 Perfect Scientific and Technological Financial Supervision and Public Policy System

We should prevent risks by improving the supervision of science and technology finance, and establish a public policy system on this basis to improve the effectiveness of the supervision of science and technology finance, so as to solve the problem of "powerlessness" faced by the government in the supervision of science and technology finance due to information asymmetry. In the field of science and technology finance, due to the rapid innovation of financial products and services, supervision is mainly aimed at risk management and evaluation. The role of the public policy system is to conduct dynamic policy management and guidance based on the framework of law, and strengthen the situation that the supervision means of science and technology finance lag behind the market. At the same time, it also creates conditions for financial science and technology innovation. The construction of financial supervision and public policy systematization will speed up the transparency and openness of information and protect the rights and interests of investors. Under the role of financial innovation and government supervision, the science and technology financial risk management and evaluation will form a closed loop.

4.2 Optimize the Systematic Risk of Financial Technology Innovation

Technology finance has a greater impact on the process reengineering of the financial system in terms of technology, and also affects the inevitable transformation of traditional finance to technology finance. In the process of this transformation and optimization of traditional financial processes, it is necessary to optimize the assessment and supervision of technology itself on the systematic risk of financial industry process innovation, and eliminate the service mode conflict and

poor upgrading after reengineering at the source, especially the particularity and periodicity of financial services. It is required to better reflect the risk resistance in terms of confidentiality and information of business processes and maintenance and expansion of product channels, effectively combine the application technology of financial science and technology with the management evaluation level to realize the innovation model of scientific and technological finance development with Chinese characteristics [4].

4.3 Strengthen Operation and Maintenance Security and Resist Capital Risk

Strengthening the management of operation and maintenance security risks and capital risks is an important choice at this stage. With the development of technology and financial technology, technology and financial operations have become normal, but financial institutions also face the need to achieve system operation through cooperation with other Internet information technology companies. When financial institutions cooperate with external Internet information technology companies, the latter often hold core data, which is risky for science and technology financial organizations. Therefore, strengthening the supervision of core data and establishing professional operation specifications for technicians in the process of processing corresponding information should be necessary. If conditions permit, independent research and development of key technologies should be accelerated to break through its own information technology development bottleneck and information security operation pressure. The capital risk is mainly reflected in a higher degree of information asymmetry, which requires scientific and technological means to achieve the design, tracking and positioning of financial products, so as to reduce the capital risk caused by complex products and hidden flows.

4.4 Perfect the Evaluation System and Technology Financial Intermediary Service System

By improving the evaluation system and technology financial intermediary service system, we can fight against various technology financial risks. In particular, the evaluation system can evaluate technology financial institutions at the source and analyze individual indicators, thus reducing the risk of customers when facing new financial products. The intermediary service system of science and technology finance is the concentrated embodiment after the platform of science and technology finance. More and more science and technology financial institutions have the function of intermediary service. They can achieve income generation by integrating resources, and at the same time, they can better balance the risk and income, so as to improve the overall level of science and technology finance.

5. Conclusion

The risk assessment and management of science and technology finance is the key to ensure that science and technology finance products are put on the market, and it also improves the security of capital and operation and maintenance, which has practical value. The process of science and technology finance innovation service is also an inevitable condition for the development of science and technology finance. The science and technology innovation and risk assessment management should be carried out at the same time, forming a situation of interaction and mutual promotion.

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