Research on the Performance Evaluation of China's Financial Science and Technology Expenditure under the Background of Innovation Driven

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Abstract: Under the background of innovation driven development strategy, China proposes to build an innovative country and attach great importance to the effect of technological innovation. Due to the special role of financial science and technology expenditure in innovation, this paper focuses on analyzing the benefits of financial science and technology expenditure in innovation and construction. In addition, a unified performance evaluation system of financial science and technology expenditure have been established, which provides the analytic hierarchy process for the benefit evaluation of financial science and technology expenditure. Finally, combined with the existing problems of financial science and technology expenditure, some targeted development suggestions have been put forward.

Keywords: Innovation Driven; Financial Science and Technology Expenditure; Performance Evaluation; AHP

1. Background

Based on the current situation, innovation is the first driving force for regional economic development and competitiveness improvement. In many national policy documents, China has clearly put forward the implementation of innovation driven development strategy. In order to become an innovative country, China's science and technology progress rate has been increased to more than 60%, and the added value of knowledge intensive industries has reached 20% of GDP. China's goal is to officially enter the ranks of innovative countries in 2020, and to join the forefront of innovative countries in 2030.

As it is known, the development of an innovative country needs to take the progress of science and technology as its internal driving force and innovation as its own development basis. Financial science and technology expenditure will play an important guiding role. Therefore, from the perspective of financial science and technology expenditure, this study focuses on exploring the influencing factors of financial science and technology expenditure in the process of innovation in China under the background of innovation driven in the new era, and building a scientific performance evaluation system.

2. Influencing factors of financial science and technology expenditure

The structure of fiscal expenditure has diversity in modern theory and practice, and it has different classification according to the function, department and economic nature of the government. In the context of innovation driven, China needs financial support to build an innovative country. The financial expenditure of science and technology is

included in the expenditure of social culture and education. Financial expenditure on science and technology is mainly used to meet the needs of the government's public functions. The scale and structure of expenditure play an important role in the allocation of resources.

Financial expenditure on science and technology reflects the will of national science and technology innovation. For the government, it is not arbitrary and will be restricted by many objective factors. In order to develop the socialist market economy in China, the allocation mechanism and distribution relationship of social resources will be different from the changes under the traditional system. Due to the changes of financial functions and the scope of financial expenditure, all kinds of financial expenditure also need to be adjusted accordingly. The scale, structure and efficiency of expenditure are all the influencing factors of the effect of financial expenditure on science and technology.

3. Performance evaluation system of financial science and technology expenditure

Relevant research at home and abroad has shown that there is a close relationship between financial investment in science and technology and economic growth. Financial science and technology expenditure plays an important role in innovation guidance and demonstration. AHP is used to study and establish a unified performance evaluation system of financial science and technology expenditure. This method is helpful for a comprehensive, accurate, objective and fair comprehensive evaluation of the financial science and technology expenditure under the innovation and construction of China.

3.1 Construction of index system

The performance evaluation system of financial science and technology expenditure has the characteristics of multi-objective evaluation. According to the idea of analytic hierarchy process, several indexes should be chosen reasonably and it is necessary to build a comprehensive evaluation system with performance evaluation as the core. Taking into account the characteristics of scientific and technological research activities, the indicators include economic and non economic indicators, indicators reflecting immediate benefits and indicators reflecting potential benefits.

In the selection of indicators, from the input and output perspectives and investment, it specifically includes the scale and structure of financial science and technology expenditure. From the perspective of production, The direct and indirect benefits of financial investment can be used to describe the performance of financial science and technology expenditure. It is mainly divided according to the benefit forms that can be produced by investment. The indirect and social benefits of financial investment are mainly to reflect the economic or social benefits that some science and technology projects may transform in the future[1]. Therefore, the following complete performance evaluation index system of science and technology financial expenditure have been established[2] (as shown in **Table 1**).

Target layer	Criterion layer	Indicator layer
Performance evaluation system of financial science and technology expenditure	Expenditure scale (B1)	Financial science and technology appropriation (C1)
		Proportion of financial science and technology expenditure (C2)
	Expenditure structure (B2)	Expenditure structure basic research expenditure (C3)
		Applied research expenditure (C4)
		Technology research and development expenditure (C5)
		Science and technology exchange and cooperation expenditure (C6)
		Social science expenditure (C7)
		Expenditure on science and technology management (C8)
	Direct benefit (B3)	number of science and technology projects (C9)
		Increase of high-tech industrial enterprises (C10)
		Number of science and technology projects increased (C11)
		Input output ratio of scientific research projects (C12)
	Indirect benefit (B4)	Contribution rate of scientific and technological achievements (C13)
		Driving rate of financial investment in science and technology (C14)
		Indicators for recognition or award of scientific and technological achievements (C15)
		Other social capital investment Number of science and technology projects increased (C16)
		Growth of scientific research personnel (C17)

Table 1. Performance evaluation system of financial science and technology expenditure

From the essence of science and technology input, it is impossible for the input to get the output effect immediately. Therefore, such an evaluation system more reflects the relationship between early input and late output under long-term and stable conditions. The true and accurate judgment can only be obtained after the evaluation and comparison year by year.

3.2 Application of performance evaluation system

When using the analytic hierarchy process to evaluate the performance of financial science and technology expenditure, the importance of each index for the standard level should be judged, and for the index level, the index into a homogeneous index that can be compared or calculated with each other should be transformed.

3.3 Application of performance evaluation system of financial science and technology expenditure

When using the analytic hierarchy process to evaluate the performance of financial science and technology expenditure, the importance of each index for the standard level should be judged, and for the index level, the index into the homogeneous index which can be compared or calculated with each other should be converted and calculated.

3.3.1 Construction of judgment matrix

Before calculating the weight of each index, the relative importance of each index should be judged. These judgments are expressed by numerical value and a judgment matrix is generated. The judgment matrix represents the

comparison of the relative importance of the relevant indicators of the upper target layer[3].

According to the comparison between the two, the judgment matrix A is as follows in **Table 2**.

Criteria level indicators	Expenditure scale (B1)	Expenditure structure (B2)	Direct benefit (B3)	Indirect benefit (B4)
Expenditure scale (B1)	1	1/4	1/3	1
Expenditure structure(B2)	4	1	3	4
Direct benefit(B3)	3	1/3	1	3
Indirect benefit (B4)	1	1/4	1/3	1

Table 2. Performance evaluation judgment matrix A of science and technology financial expenditure

The judgment matrix is constructed as follows:

$$A = \begin{vmatrix} 1 & a_{12} & a_{13} & a_{14} \\ 1/a_{12} & 1 & a_{23} & a_{24} \\ 1/a_{13} & 1/a_{23} & 1 & a_{34} \\ 1/a_{14} & 1/a_{24} & 1/a_{34} & 1 \end{vmatrix} = \begin{vmatrix} 1 & 1/4 & 1/3 & 1 \\ 4 & 1 & 3 & 4 \\ 3 & 1/3 & 1 & 3 \\ 1 & 1/4 & 1/3 & 1 \end{vmatrix}$$

Similarly, according to the above steps, the importance judgment matrix of each index layer under the criterion layer is established[4,5].

3.3.2 Calculation weight

In the application of performance index evaluation system of financial science and technology expenditure, the weight of judgment matrix is calculated. By the method of normalization, the weight vector value of the matrix A of the criterion layer can be calculated[6].

$$w_i = \begin{vmatrix} 0.107 \\ 0.520 \\ 0.266 \\ 0.107 \end{vmatrix}$$

3.3.3 Consistency inspection

In order to ensure the consistency of the judgment matrix, the consistency of the judgment matrix is tested. First, calculate the maximum eigenvalue of judgment matrix A, and get $\lambda_{max} = 4.085$; then, the deviation consistency index is calculated, according to $CI = (\lambda_{max} - n)/(n-1)$, $CI = 0.028$ can be gotten; by querying the data, the average random consistency index RI = 0.8931; finally, by formula $CR = CI / RI$, and the result is $CR = CI / RI = 0.03 < 0.1$. Therefore, the broken matrix A passes the consistency test[7].

Similarly, the same consistency test for other judgment matrices need to be done.

3.3.4 Evaluation results

Through the comprehensive calculation model, an overall evaluation result by integrating the evaluation values of multiple indicators can be gotten. The linear weighted summation model $d = \sum W_i d_i$ can be used to calculate the results. At this time, d_i and W_i are the evaluation values and weights of the next level index I respectively.

Finally, according to the evaluation standard range of the evaluation results, the benefits of financial investment in

science and technology can be estimated[8].

4. Conclusions and suggestions for optimizing the efficiency of financial science and technology expenditure

The development of science and technology plays an important role in improving China's innovation ability, so the financial investment in science and technology is particularly important. In particular, scientific research has strong external effects. Because of this feature, the investment and output mechanism of science and technology needs more financial support. By establishing a unified performance evaluation system of financial science and technology expenditure, the efficiency of financial science and technology expenditure can be evaluated. Finally, the following targeted suggestions based on the existing problems of financial science and technology expenditure in China's innovation and construction is put forward.

4.1 Promote the transformation and upgrading of traditional industries

In order to promote the high-quality development of China's economy, more investment in science and technology should be used for the transformation and upgrading of some traditional Chinese industries. By injecting new blood and vitality into traditional industries, it will help to promote the mutual absorption and integration of new technology and traditional Chinese industries, and in a short period of time, it will help traditional industries generate new power and release new momentum.

4.2 Promote efficient transformation of scientific achievements

Only when the results of scientific research are gestated can they really play a huge role. The platform for the transformation of scientific research achievements is an important way to connect scientific research achievements with the market. China's construction of a sound sharing mechanism for scientific and technological achievements will also encourage Chinese scientific researchers to carry out technological development, consultation and achievement training for enterprises. This mechanism is more direct and effective to realize the deep docking between scientific and technological innovation and enterprise creation. In addition, the government should promote inter regional institutional links, promote resource sharing, and encourage results exchange and cooperation between enterprises and local knowledge technology centers. Through scientific research to drive a new round of development of the industry, and industry development to feedback the scientific research field[9]. This is not only conducive to reducing the financial burden, but also conducive to high-quality economic development.

4.3 Build diversified and reasonable sources of financial science and technology funds

For a long time, China has attached great importance to the great role of financial investment in science and technology in economic growth. China has formulated a reasonable system to increase the overall scale of financial funds for science and technology. Under the current economic development situation, the growth rate of science and technology investment should be higher than the economic growth rate, which is also determined by the actual demand matching the innovation speed and economic growth rate of China. Therefore, the Chinese government should actively build a diversified source of funds, and form a mode of science and technology fund source that mainly relies on the government's guaranteed financial investment and integrates multiple social financing modes.

4.4 Supporting high-tech enterprises in China

With the in-depth implementation of China's innovation driven development strategy, the development of modern technology is changing with each passing day. The renewal speed of innovative technology is very fast. Only by following the trend of innovative development can modern enterprises survive in the renewal. If finance helps to develop new industries and high-tech enterprises, it will help to optimize the industrial structure and stimulate new vitality.

4.5 Increase the proportion of financial expenditure for basic scientific research

Through the comprehensive evaluation results of financial science and technology expenditure, it can be known that the structure of science and technology expenditure in China is insufficient. China's financial expenditure structure has the current situation of insufficient guarantee of basic scientific research expenditure. Limited financial investment in science and technology is absorbed by some projects with high level and high energy consumption, but there is a certain funding gap between basic scientific research conditions and production conditions. This will not be conducive to the birth of long-lasting achievements and benefits in the field of scientific research. Therefore, it is necessary to increase the proportion of financial expenditure for basic scientific research.

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