

On Investment Efficiency and Trend Forecast of High-tech Industries in Anhui Province

Na Jin, Lijing Guo*, Liu Yan

School of Economics, Anhui University of Finance and Economics, Bengbu, Anhui, China

*Corresponding author email: guolijing0379@163.com

Abstract: The investment efficiency of high-tech industries plays an important role in the innovation and development of regional economy. This paper measures the data of various cities in Anhui Province from 2019 to 2020 through the high-tech industrial efficiency evaluation system and the DEA data envelope model. The results show that the investment efficiency of high-tech industries in different cities varies greatly. According to different regions, the technical efficiency and comprehensive efficiency of northern Anhui are higher than those of southern and northern Anhui. Compared with the surrounding provinces and cities, the investment efficiency of high-tech industries in the Yangtze River Delta region in 2020 is higher than that in the central region, but most provinces and cities in the central region have an increasing scale effect. Finally, this paper analyzes the development trend of high-tech industry investment in Anhui Province, and draws four conclusions in the future: continuous optimization of the investment environment of high-tech industry in Anhui Province, further increase of investment and its specific forecast value, continuous adjustment of investment structure, and continuous improvement of innovation level.

Keywords: High-tech industry; investment efficiency; DEA data envelopment model; Trend forecast.

1. Introduction

High-tech industry is a technology group at the forefront of contemporary technological development, and its development reflects the continuous innovation and progress of technology [1]. High technology means high innovation, high investment, high diffusion and high value-added. The development of high-tech industries is not only manifested in the independent development of a certain industry or the industry itself, but also the mutually beneficial development of multiple industries interacting with each other, which has an irreplaceable role in promoting the long-term, stable and sustainable development of my country's national economy. Therefore, high-tech industries are of great significance to the adjustment and reform of the regional industrial structure and the high-quality development of the regional economy.

Scholars at home and abroad have mainly analyzed the changing trend of investment efficiency in high-tech industries from the perspectives of efficiency evaluation system construction, model differences, and regional differences. First, for the construction of the high-tech industry investment efficiency evaluation system, some scholars use human, material and financial resources as input indicators, and high-tech enterprises' operating income as output indicators (Zhou Shuzhen, 2016) [2]. In further research, some scholars have added the impact on the environment to the output index as a negative index to improve the evaluation system (Wang Wei, Sun Fangcheng, 2018) [3]. Secondly, for the difference of evaluation models, scholars use DSBM model (Yan Taihua, Liu Songtao and Liu Huanpeng, 2015) [4], DEA model (Zhou Shuzhen, 2016) [2] to measure the efficiency of high-tech industries. Finally, in terms of regional differences, some scholars (Wang Qingjin, Wang Qiang, Zhou Xue, 2018) pointed out that the eastern region has lower high-tech efficiency R&D, but it has obvious location advantages compared with the central and western regions [5].

By constructing an input-output evaluation system and

using the DEA data envelopment model, this paper measures and analyzes the investment efficiency of high-tech industries in various cities in Anhui Province. It also forecasts the future trend of investment in high-tech industries, which is beneficial to the development of high-tech industries in Anhui Province.

2. Study Design

The development of high-tech industries is an important measure for Anhui Province to optimize its industrial structure and improve its economic quality. In this section, the data envelopment analysis method is used to analyze and evaluate the investment efficiency of high-tech industries in Anhui Province. By selecting input and output indicators, constructing an evaluation system to analyze the investment efficiency of high-tech industries in various cities, provinces and surrounding cities in the province, and provide data reference for understanding the problems existing in high-tech industry investment in Anhui Province.

2.1. Evaluation Method

Data Envelope Analysis (DEA) is a new comprehensive model method improved by famous scholars A. Charns and W. W. Copper under the premise of "relative efficiency evaluation" theory [6]. This model does not need to establish the correlation between input and output variables, eliminates the interference of most non-objective factors, and has good fairness. Specifically, it refers to the analysis of the original input-output data to obtain the input-output ratio, that is, the technical efficiency; in addition, the difference between the actual technical efficiency value and the ideal technical efficiency value can be obtained. Selecting this method to evaluate and analyze the investment efficiency of high-tech industries in various cities in Anhui Province is conducive to understanding the technical efficiency, comprehensive efficiency and scale efficiency of investment in various cities, showing the investment input and output of high-tech industries in various regions, so as to be used in Anhui.

2.2. Model Selection

To evaluate the relative effectiveness of the same departments, the data envelopment analysis method has an ideal effect on evaluating the "scale efficiency" and "technical efficiency" of "production departments" with multiple inputs and outputs. The initial efficiency evaluation is carried out using raw input-output data. Generally speaking, the input-oriented DEA-BCC (variable returns to scale) model is used [7]. For any decision-making unit, the input-oriented dual-form BCC model can be expressed as:

$$\begin{aligned} & \min[\theta - \varepsilon(\hat{e}^T S^- + e^T S^+)] \\ & \text{s.t.} \begin{cases} \sum_{j=1}^n X_j \lambda_j + S^- = \theta X_0 \\ \sum_{j=1}^n Y_j \lambda_j - S^+ = Y_0 \\ \lambda_j \geq 0, S^- \geq 0, S^+ \geq 0 \end{cases} \end{aligned} \quad (1)$$

Where, $j=1, 2, \dots, n$, represents the decision-making unit; X , Y represent the input and output vectors; θ represent the efficiency evaluation value; S^+ and S^- represent the slack variable of the technical market input and output indicators; λ_j represent the j th decision-making unit Weights. If $\theta=1$, $S^+=S^-=0$, the decision-making unit DEA is valid; if $\theta=1$, $S^+ \neq 0$ or $S^- \neq 0$, the decision-making unit weak DEA is valid;

if $\theta < 1$, the decision-making unit non-DEA is valid.

2.3. Indicators and Data Selection

2.3.1. Input Indicators

From the perspective of production, input is divided into capital input and labor input, neither of which is easy to obtain for high-tech industries. In order to simplify the analysis, and according to the actual investment proportion, the fixed asset investment is selected as the measurement index of capital investment. However, due to the particularity of labor input in high-tech industries, the number of employees at the end of the year is finally selected as the measure of labor force. In addition, in the high-tech industry, R&D investment is also an indicator that cannot be ignored, so from the perspective of investment, three indicators are selected into the evaluation system.

2.3.2. Output Indicators

The output of high-tech industries is presented in two forms: on the one hand, the sales revenue of high-tech enterprises, as a part of economic output, should be considered in the system; on the other hand, the development of high-tech industries is also reflected in technological progress and technological progress. At the level of innovation, the form of results can be represented by the patent grant of regional applications.

Table 1. Data of various cities in 2019

Area	Certification of technology contracts by city	Growth in added value of high-tech industries	Invention patents granted	Number of R&D Employed Persons	R&D expenditure (100 million yuan)
Huangshan	62	13.9	94	4382	8.55
Wuhu	679	10.7	2555	37094	111.56
Ma On Shan	461	18.9	1197	16141	60.62
Tongling	52	9.6	301	8117	28.1
Xuancheng	448	16.7	542	12842	29.59
Chizhou	102	19.6	70	3400	10.31
Hefei	14962	11.5	5981	97331	291.76
Lu'an	67	9	353	7376	15.55
Chuzhou	167	13.1	897	16226	50.63
Anqing	212	18.5	330	10334	25.67
Suzhou	44	31.6	336	3990	11.02
Huaibei	149	1E-16	224	10145	16.74
Bozhou	19	14.7	501	4668	10.54
Fuyang	129	15.2	704	7881	23.22
Bengbu	1663	10.8	537	14780	48.55
Huainan	347	23.5	336	7791	11.61

Table 2. Data of cities in Anhui Province in 2020

Area	Certification of technology contracts by city	Growth in the added value of high-tech industries	Invention patents granted	Number of R&D Employed Persons	R&D expenditure (100 million yuan)
Huangshan	247	4.7	723	4601	10.6
Wuhu	654	10.5	10101	38371	125.3
Ma'anshan	457	24.6	7445	16878	70.8
Tongling	60	8.7	1205	10344	33.1
Xuancheng	512	15.9	2333	14744	33
Chizhou	61	21	878	3968	13
Hefei	11910	16.7	27818	96712	353.5
Lu'an	249	35.5	3166	7801	18.3
Chuzhou	296	23	4671	17591	53.2
Anqing	459	30.1	3617	12136	32
Suzhou	880	21.5	3848	3896	13.0
Huaibei	404	13.4	1975	11074	20.3
Bozhou	61	14.6	2182	6353	12.9
Fuyang	644	8.7	4753	9400	28.1
Bengbu	1694	12.5	2799	17338	52.4
Huainan	471	30.4	2531	7615	13.8

2.3.3. Data Sources and Processing

The data in this study are mainly from the data released by the National Bureau of Statistics, Anhui Provincial Bureau of

Statistics, and the Provincial Department of Science and Technology, as well as data from the China Science and Technology Statistical Yearbook. In 2019, the increase in the

output value of the high-tech industry in Huaibei was negative. In order to enable software implementation, a very small positive value was used instead. The specific data are shown in Table 1 and Table 2:

3. Empirical Analysis

The DEAP2.1 software is used for calculation and the traditional DEA model is used to measure the pure technical

efficiency, scale efficiency, and comprehensive efficiency of 16 cities in Anhui Province in 2019 and 2020, which are used to analyze the investment efficiency of high-tech industries in various cities.

3.1. Pure Technical Efficiency Evaluation

The pure technical efficiency of high-tech industry investment in 16 cities and three major regions in Anhui Province is shown in Table 3.

Table 3. Pure technical efficiency evaluation

	City	2019	2020
Southern Anhui	Huangshan	1	1
	Wuhu	1	0.813
	Ma'anshan	1	1
	Tongling	0.482	0.384
	Xuancheng	0.579	0.367
	Chizhou	1.000	0.994
	Mean	0.844	0.760
Central Anhui	Hefei	1	1
	Lu'an	0.651	1
	Chuzhou	0.673	0.498
	Anqing	0.500	0.593
	Mean	0.706	0.773
Northern Anhui	Suzhou	1	1
	Huaibei	0.585	0.581
	Bozhou	1	0.927
	Fuyang	1	0.920
	Bengbu	0.898	0.728
	Huainan	1	1
	Mean	0.914	0.859
Provincial average		0.836	0.800

It can be seen from the above table that the pure technical efficiency of the province in 2019 is 0.836, of which the average pure technical efficiency in northern Anhui is 0.914, and the average in central Anhui is 0.706. In 2020, the province's pure technical efficiency is 0.800, and the average in northern Anhui the pure technical efficiency of 0.859 is still the highest in the province, but it has decreased compared to 2019. The pure technical efficiency level of Tongling in 2019 is 0.482, which is lower than 0.5, indicating that at this technical level, the use of its input resources has not been effective, which is the focus of reform. Xuancheng, Lu'an, Anqing and Huaibei Pure technical efficiency is also at a lower level. In 2020, the pure technical efficiency of Tongling, Xuancheng, Chuzhou, and Anqing will also decrease, and they are key cities that need reform.

In addition, the pure technical efficiency of Huangshan, Ma'anshan Hefei, Suzhou and Huainan in 2019 and 2020 are all 1, indicating that at the current technical level, the use of their input resources is efficient, so in the future development, more attention should be paid to how to make better use of its economies of scale.

3.2. Scale Efficiency Evaluation

Scale efficiency refers to the effect of industrial structure on output units through optimized allocation. By analyzing the changes in scale efficiency in various cities, the regional industrial investment structure can be adjusted. Table 4 shows the changes in returns to scale in various cities in Anhui Province in 2019 and 2020.

Table 4. Scale Efficiency Evaluation

Region	Cty	2019	2020
Southern Anhui	Huangshan	increment	increment
	Wuhu	decrease	decrease
	Ma'anshan	decrease	decrease
	Tongling	increment	increment
	Xuancheng	increment	increment
	Chizhou	increment	increment
Central Anhui	Hefei	constant	decrease
	Lu'an	increment	constant
	Chuzhou	decrease	decrease
	Anqing	increment	decrease
Northern Anhui	Suzhou	constant	constant
	Huaibei	increment	increment
	Bozhou	constant	increment
	Fuyang	decrease	decrease
	Bengbu	increment	decrease
	Huainan	constant	constant

From the table above, it can be seen that in 2019 and 2020, the returns to scale of Huangshan, Tongling and Xuancheng in southern Anhui are all increasing, and the return to scale of high-tech industry investment in Wuhu and Ma'anshan is decreasing. In central Anhui, Hefei has changed from constant returns to scale to diminishing returns, Lu'an and Anqing have changed from increasing returns to scale to diminishing returns, and Chuzhou has been in a state of decreasing returns to scale. From 2019 to 2020, Suzhou and Huainan in northern Anhui remained unchanged in returns to scale. Fuyang had been experiencing decreasing returns to scale, Huaibei and Bozhou both changed to increasing returns to scale, and Bengbu changed from increasing returns to scale

to decreasing returns to scale. It can be seen that there are large differences in returns to scale between regions, and large differences in the return on investment of high-tech industries between regions.

3.3. Comprehensive Efficiency Evaluation

The comprehensive efficiency value is the value obtained by multiplying the technical efficiency and the scale efficiency value, which is used to comprehensively evaluate the maximum efficiency value in all aspects of regional investment. Table 5 shows the comprehensive efficiency of each region in Anhui Province in 2019 and 2020:

Table 5. Comprehensive Efficiency Evaluation

Region	City	2019	2020
Southern Anhui	Huangshan	0.621	0.344
	Wuhu	0.686	0.272
	Ma'anshan	0.764	0.447
	Tongling	0.365	0.156
	Xuancheng	0.562	0.267
	Chizhou	0.869	0.969
	Mean	0.645	0.409
Central Anhui	Hefei	1	0.545
	Lu'an	0.516	1
	Chuzhou	0.538	0.297
	Anqing	0.420	0.513
	Mean	0.619	0.589
Northern Anhui	Suzhou	1	1
	Huaibei	0.367	0.366
	Bozhou	1	0.632
	Fuyang	0.869	0.571
	Bengbu	0.808	0.478
	Huainan	1	1
Mean	0.841	0.6745	
Provincial average		0.712	0.554

It can be seen from the table that the average comprehensive efficiency of the province was 0.712 in 2019 and 0.554 in 2020. Due to the impact of other external environmental factors such as the epidemic situation, the comprehensive efficiency values of most cities in 2020 will decrease. However, comparing the southern and central Anhui regions, it can be seen that the comprehensive efficiency value of the northern Anhui region is at a relatively high level, indicating that the northern Anhui region has a strong comprehensive ability in the allocation and use of technical resources. In particular, the comprehensive efficiency levels of Suzhou and Huainan in 2019 and 2020 are both 1, indicating that the production efficiency of input factors in this city has maximized. The comprehensive efficiency levels of Tongling and Huaibei in 2019 and 2020 are both lower than 0.5, the comprehensive efficiency value is low, and the

production efficiency of input factors is not high, which needs to be adjusted reasonably.

4. Analysis on Investment Efficiency in Anhui Province and Surrounding Provinces and Cities

4.1. Indicators and Data Processing

This part of the model method is the same as the investment efficiency analysis of various cities, and the traditional DEA model is selected for analysis. The central region and the Yangtze River Delta region were selected for comparative analysis of investment efficiency, and the index system was constructed as shown in Table 6. The data of surrounding provinces and cities in 2020 are shown in Table 7:

Table 6. Efficiency Evaluation Index System

First-level indicator	Secondary indicators	Unit
Input indicator	R&D expenditure	billion
	Academician of the Chinese Academy of Sciences	people
	Local financial technology expenditure	billion
Output indicator	Invention patents granted	item
	Technical contract turnover	billion

Table 7. Specific data of provinces and cities in 2020

Area	R & D expenditure (100 million yuan)	Number of academicians of the two academies	Local financial science and technology expenditure (100 million yuan)	Number of invention patents authorized (items)	Technical contract turnover (100 million yuan)
Anhui	883.2	38	369.7	18264	672.19
Hubei	1005.3	73	287.85	17555	1686.97
Hunan	898.7	38	220.66	11537	735.95
Henan	901.3	24	254.3	9183	384.5
Shanxi	211.1	8	66.09	2987	44.98
Jiangxi	430.7	4	193.9	4407	233.43
Jiangsu	3005.9	105	584.4	45975	2335.81
Zhejiang	1859.9	55	472.13	49888	1478.24
Shanghai	1615.7	178	406.2	24208	1815.27

4.2. Results Analysis

By running DEAP2.1, the investment efficiency of the

central region and the Yangtze River Delta region is obtained, as shown in Table 8.

Table 8. Investment Efficiency Results

Area	Provinces and cities	Overall efficiency	Pure technical efficiency	Scale efficiency	Economies of scale
Central Region	Anhui	0.816	0.890	0.916	increment
	Hubei	1	1	1	constant
	Hunan	0.787	0.865	0.910	increment
	Henan	0.563	0.673	0.836	increment
	Shanxi	0.528	1	0.528	increment
	Jiangxi	1	1	1	constant
	Mean	0.782	0.905	0.865	
Yangtze River Delta region	Jiangsu	0.918	1	0.918	decrease
	Zhejiang	1	1	1	constant
	Shanghai	0.846	0.890	0.950	decrease
	Anhui	0.816	0.890	0.916	
	Mean	0.895	0.945	0.946	
	Population mean	0.829	0.924	0.895	

It can be seen from the table that the average value of the Yangtze River Delta region is higher than the average value of the central region, and the comprehensive efficiency, pure technical efficiency and scale efficiency of the Yangtze River Delta region are all at a high level. In terms of different regions, Hubei Province, Jiangxi Province and Zhejiang Province all have an efficiency value of 1, indicating that the return on technology investment in this region is relatively high. From the perspective of economies of scale, most provinces and cities in the central region have increasing returns to scale. However, due to the weak economic foundation of the central region and insufficient input of regional innovation resources, the innovation output of high-tech industries in the six central provinces is not high [8]. Most of the fast-growing provinces and cities in the Yangtze River Delta have diminishing returns to scale, and continued expansion of scale will not bring about improved benefits. Therefore, the scale benefits of high-tech industries in the central region should be brought into play, and the scale of investment in the central region should be expanded to achieve a higher level of efficiency.

5. Trend Forecast of Investment in High-tech Industries in Anhui

The accelerated development of China's traditional equipment manufacturing industry towards digitization, networking and intelligence is the strategic focus and development trend of China's current and future industrial structure adjustment [9], which shows that the development

of high-tech industries has broad prospects. By summarizing the above content, analyze and predict the investment environment, investment amount, investment structure and changes in innovation level and ability of high-tech industry investment in Anhui Province in the next three years.

5.1. The Investment Environment for High-Tech Industries Is Continuously Optimized

The state and the Anhui provincial government have issued a series of policies for high-tech industries to ensure a stable environment for investment in high-tech industries. The establishment of high-tech industrial parks and university research institutes in various cities shows that the development of high-tech industries is increasingly valued by the Anhui provincial government and local cities. The introduction of technical talents has attracted more and more practitioners to engage in high-tech industry research work. Of course, in addition to policy guarantees, it also provides economic support, continuously simplifying the application and registration process for companies in high-tech industries, reducing taxes, and providing green channels. Therefore, in the future development of high-tech industries, in order to better play the leading role of high-tech industries on the local economy, the state and the government will further improve the institutional policies of various industries in the high-tech industry, and continuously provide technical, personnel, and financial support, optimize the investment environment of high-tech industries [10].

5.2. Further Increase in Investment in High-Tech Industries

In 2021, the national high-tech industry investment will increase by 17.1% over the previous year, which is 12.2 percentage points higher than the growth rate of all investment, driving the growth of all investment by 1.2 percentage points. Anhui Province strives to keep pace with the whole country. In 2021, fixed asset investment will be 3,744.9 billion yuan, an increase of 9.4% over the previous year, ranking ninth in the country and second in the Yangtze River Delta, while investment in high-tech industries has increased by 13.9% year-on-year, driving all investment. An increase of 1.06 percentage points. According to the reasonable judgment of the current situation, Anhui Province will continue to expand investment in high-tech fields in the future.

In the future, the high-tech industry in Anhui Province will increase investment in both human and financial resources. From the perspective of investment, both financial and technological expenditures, R&D funds and R&D personnel

are constantly increasing. In recent years, Anhui's financial science and technology expenditure has increased year by year, from 6.99 billion yuan in 2011 to 41.55 billion yuan in 2021, a full increase of nearly 6 times. It can be seen that Anhui Province attaches great importance to the development of science and technology, and it is reasonable to infer, invest in high-tech industries will continue to increase in the next few years. On the other hand, from the perspective of output, comparing the input and output of various cities analyzed in the previous chapters, we can see that the funds and personnel input in Hefei and Wuhu are relatively high, and the final high-tech industry output value, signing the number of contracts in China is also higher than other cities, and there is still a rising trend, and it is expected to further increase investment in the future. Anhui Province implements the strategy of "revitalizing the province through science and technology" and encourages all cities in the province to actively develop high-tech industries. Therefore, the investment in high-tech fields will increase year by year in the future. The specific forecast values of the province are shown in Table 9.

Table 9. Forecast of human and financial investment in high-tech industries in Anhui Province in the next five years

Years	2022	2023	2024	2025	2026
Investment (100 million yuan)	3619.09	3985.14	4351.20	4717.26	5083.31
Number of R&D personnel (person)	48878	53039	56050	60211	63222
R&D expenditure (100 million yuan)	191.19	205.04	218.89	232.75	246.60
Year-on-year increase in output value (%)	18.82	19.02	19.22	19.42	19.63

The investment in R&D funds in various cities in Anhui Province and the increase in the added value of high-tech industries are conducive to the adjustment of investment

distribution in various cities. The forecast values for the period from 2022 to 2026 are shown in Table 10:

Table 10. R&D expenditures and increase in the added value of high-tech industries in various cities in Anhui Province

Area	R&D expenditure (100 million yuan)					Year-on-year increase in the added value of high-tech industries (%)				
	471.5	530.5	589.5	648.5	707.46	23.5	25.4	27.2	29.1	30.9
Hefei	27.3	30.8	34.3	37.8	41.33	7.2	8.1	9.0	10.0	10.9
Huaibei	17.6	20.0	22.3	24.7	27.03	5.2	2.8	0.4	-2.0	-4.4
Bozhou	16.0	17.6	19.1	20.6	22.16	23.0	22.2	21.4	20.6	19.8
Suzhou	64.3	69.6	74.8	80.0	85.21	3.7	-4.8	-13.4	-21.9	-30.4
Bengbu	37.9	42.9	47.8	52.7	57.63	4.7	8.0	-3.0	0.3	-10.6
Fuyang	12.6	12.2	11.8	11.5	11.11	18.2	24.0	29.8	35.6	41.4
Huainan	65.9	72.0	78.2	84.4	90.51	20.4	21.7	22.9	24.2	25.5
Chuzhou	22.1	24.0	25.9	27.8	29.74	25.4	22.3	25.3	22.2	25.2
Lu'an	92.7	103.6	114.5	125.4	136.30	19.2	21.2	23.2	25.2	27.2
Ma'anshan	146.6	157.4	168.2	179.0	189.79	14.6	15.6	16.6	17.5	18.5
Wuhu	40.6	44.3	48.1	51.9	55.63	14.4	13.0	13.0	11.6	11.6
Xuancheng	35.3	37.1	38.9	40.7	42.54	12.8	14.3	15.8	17.3	18.8
Tongling	18.7	21.6	24.5	27.3	30.23	22.4	23.7	24.9	26.2	27.5
Chizhou	44.5	50.7	56.9	63.1	69.35	24.5	26.2	27.9	29.5	31.2
Anqing	11.5	12.4	13.4	14.3	15.17	15.1	15.9	16.6	17.4	18.2
Huangshan	471.5	530.5	589.5	648.5	707.46	23.5	25.4	27.2	29.1	30.9

5.3. The Investment Structure of High-Tech Industries Is Constantly Being Adjusted

5.3.1. Steady Growth of Investment in Key High-Tech Industries

Medical, pharmaceutical and electronic communication and equipment manufacturing are key industries of high-tech industries in Anhui Province, and the investment structure of various industries within the industry is predicted to be adjusted in the future. Under the situation that the epidemic

situation gradually stabilizes, people's demand for high-tech service industry will continue to increase, so the proportion of investment in this industry is expected to continue to grow in the future.

In the field of biopharmaceuticals, the pharmaceutical industry in Anhui Province actively promotes the equal development of the four major industrial fields of biopharmaceuticals, chemical pharmaceuticals, modern traditional Chinese medicine and medical devices, and basically builds a modern pharmaceutical industry system

with outstanding advantages, reasonable structure and complete industrial chain, with comprehensive industrial strength. And the competitiveness is significantly improved [11]. In addition, with the continuous and repeated impact of the new crown epidemic on social life and economic development, the state and the Anhui provincial government will continue to increase investment in the pharmaceutical manufacturing industry in order to stabilize people's lives as soon as possible. Therefore, it is reasonable to speculate that in the future high-tech industry investment in Anhui, the investment in the new material industry and the biomedical manufacturing field will continue to expand. According to industry investment in research and development projects, investment in electronic communication and equipment manufacturing will continue to rise steadily. However, for industries such as aviation, spacecraft and equipment manufacturing, Anhui Province's future R&D and investment are not expected to be very high. The main reason is that Anhui Province has no foundation in aerospace, resulting in high R&D costs and low technical content.

5.3.2. Investment Resources Flow to Northern Anhui

Unbalanced distribution of regional resources has led to large differences in development between regions in Anhui Province, and there is a certain gap compared with surrounding provinces and cities. In Anhui Province, most of the investment resources are in Hefei and Wuhu areas, but through the efficiency analysis above, it can be seen that the return to scale in Hefei and Wuhu areas has been in a decreasing trend, indicating that the rate of return brought by the investment of resources in this area has been increasing. Even in 2020, the comprehensive efficiency value of Wuhu is only 0.272, and the comprehensive efficiency value of Hefei is only 0.545. Compared with the northern Anhui region, whether it is technical efficiency, scale efficiency or comprehensive efficiency, it is at a relatively high level in the province. For the purpose of return on investment, it is expected that although there will be a certain growth in investment in Hefei and Wuhu in the future development, the growth rate will continue to decline. The investment in high-tech industries in northern Anhui will continue to increase, which will bring about the continuous development of high-tech industries in the region.

5.4. The Innovation Level of Investment in High-Tech Industries Continues to Improve

5.4.1. Increase the Construction of Innovative Projects and Build Innovative Enterprises

Innovation determines the core competitiveness of high-tech industries. Anhui Province pays more and more attention to its innovation level in investment in high-tech industries. In the next few years, it will continue to implement the key role of technological innovation in leading economic and social development and enhancing the comprehensive strength of a major country. Improve the innovation and cutting-edge nature of high-tech industries, and give full play to the technological innovation capabilities of world-leading large-scale scientific installations and top universities, research institutes, and leading enterprises. Further promote the research and development of innovative projects, encourage more traditional and low-efficiency enterprises to transform into high-tech industries, and establish high-tech industrial parks in various cities across the province to attract

more innovative enterprises to settle in. At the same time, improve relevant laws and regulations to provide strong legal protection for the property rights of innovative projects. In the next few years, through the construction of innovative projects and innovative enterprises, Anhui's high-tech industries will be more competitive and investment more directional.

5.4.2. Introduce and Support Innovative Talents and Enhance Innovation Ability

High-tech talents are the embodiment of the innovation level of regional high-tech industries, and also the most critical factor to make the industry have core competitiveness. In the future, Anhui Province will still formulate more innovative talent introduction strategies and increase support for innovative teams for research on the development of high-tech industries in Anhui Province. In recent years, our province has continuously strengthened the introduction and support of high-level talents, and it is reasonable to judge that our province will implement a new round of "Jianghuai Talents Program" in the future, accelerate the construction of an innovative talent gathering platform, and take the lead in exploring the "talent team + scientific and technological achievements + The model of " government participation + equity incentive" gives leading talents full autonomy. It is estimated that nearly 10 billion yuan will be invested to support more high-level scientific and technological talent teams to settle in Anhui for innovation and entrepreneurship, and enhance the scientific and technological innovation capabilities of Anhui Province.

References

- [1] Tang Huamao. High-tech industry development and innovation [D]. Graduate School of Chinese Academy of Social Sciences, 2001.
- [2] Zhou Shuzhen. Human Capital, Technology Spillover and High-Tech Industrial Production Efficiency [J]. Modern Commerce and Industry, 2016, 37(02): 95-97.
- [3] Wang Wei, Sun Fangcheng. Research on the change of innovation efficiency in three stages of high-tech industry: SBM model and EBM model based on internal undesired output [J]. Science and Technology Progress and Countermeasures, 2018, 35(03): 67- 71.
- [4] Yan Taihua, Liu Songtao, Liu Huanpeng. Dynamic Efficiency Measurement and Convergence Analysis of China's High-tech Industry: An Empirical Study Based on the Output-Oriented DSBM Model [J]. Chinese Journal of Management Engineering, 2015, 29(03): 222-230.
- [5] Wang Qingjin, Wang Qiang, Zhou Xue. Efficiency evaluation and influencing factors of regional high-tech industry R&D activities [J]. Science and Technology Progress and Countermeasures, 2018, 35(23): 59-65.
- [6] Liu Xiangjun. Research on technical efficiency evaluation of high-tech industries in Anhui Province based on improved DEA method [D]. Anhui University, 2014.
- [7] Zhang Lin, Rao Jian. Research on China's provincial technology market efficiency - based on three-stage DEA model [J]. Journal of Guangxi University of Finance and Economics, 2021, 34(06): 55-69.
- [8] Zhang Zhongying, Cao Changfang. An Empirical Study on the Innovation Efficiency and Influencing Factors of High-tech Industries in Six Central Provinces [J]. Journal of Tonghua Normal University, 2021, 42(03): 47-52.

- [9] Ren Baoping, Song Wenyue. The effect and path of the deep integration of a new generation of artificial intelligence and the real economy to promote high-quality development [J]. Journal of Northwestern University (Philosophy and Social Sciences Edition), 2019, 49(05): 6-13.
- [10] Wang Yang. Research on the development trend of technological innovation in high-tech industries in Anhui Province during the "14th Five-Year Plan" period [J]. Modern Management Science, 2022(01):61-68.
- [11] Look! How the top ten industries in Anhui grow rapidly [N]. Anhui Economic News, 2021-01-12(006).