

# *Efficiency Evaluation and Driving Factors of Regional Financial Resource Allocation: A Case Study of Guangdong Province*

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**Abstract:** Evaluating the efficiency of regional financial resources allocation scientifically plays an important role in promoting the healthy development of financial industry and driving regional economic growth. In this paper, the panel data of cities in Guangdong Province from 2010 to 2017 are used to measure the financial resource allocation efficiency of cities in Guangdong from static and dynamic levels by first applying DEA model and Malmquist indicator, and then constructing a Tobit regression model to explore the driving factors of financial allocation efficiency. The results show that the efficiency of financial resource allocation in Guangdong Province is generally on the rise, but the overall efficiency is not effective, with the wide gap between cities, unbalanced regional development and the highest efficiency of financial resource allocation in the Pearl River Delta region. Regional industrial structure, local financial intervention, degree of opening to the outside world and regional business environment all have significant positive effects on the efficiency of financial resource allocation. The conclusion can provide corresponding enlightenment for the rational allocation of financial resources in provinces and cities.

## 1. Introduction

Finance, as the core of modern economy, plays a great role in promoting social and economic development, and its coordinated development and support play a vital role in the process of rapid economic development, industrial structure optimization and industrial efficiency improvement. A sound financial system is an important guarantee for achieving rapid economic development. At the 2017 National Financial Work Conference, "finance is an important core competitiveness of the country" was pointed out. Due to the scarcity of financial resources, we must abandon the previous resource consumption and quantity expansion model and turn to the quality improvement model in the use of resources, and invest them in the key areas of economic and social development, that is, areas that will play a positive role in future economic restructuring and industry leading, and support innovative enterprises with high added value and enterprises in strategic emerging

industries. At the same time, when using financial resources, regional financial service ability and spatial distribution pattern should be considered so as to finally achieve the coordination and sustainable development between regional economy, urban development and financial resources.

The efficient allocation of financial resources to the real economy, combined with the financial system reform, and the improvement of financial efficiency have a significant role in promoting technological progress, accelerating the transformation of economic growth mode and even export growth. Thus, financial efficiency determines the speed of financial growth and is the key to promote the benign interactive development of economy and finance. In view of this, in this paper, the efficiency of financial resource allocation in Guangdong Province, which has a relatively high level of financial development, is selected as the research object, and the evaluation indicator system of input-output efficiency of financial resources in Guangdong Province is constructed to measure the efficiency of financial resource allocation in Guangdong Province and various urban areas, so as to find out the influencing factors, put forward countermeasures to improve the efficiency of financial resource allocation in Guangdong Province, and strive to eliminate regional differences, with a view to maximizing the coordinated development of the province's finance, providing strong support for Guangdong to turn to high-quality development in an all-round way and realizing the "Four Leading", and also providing reference for other provinces to improve the efficiency of financial resource allocation.

## 2. Literature Review

Wurgler applied capital allocation efficiency as an agent variable of financial development degree to study the allocation efficiency of financial systems in 65 countries <sup>[1]</sup>. Levine measured the efficiency of financial resources allocation by using indicators such as the proportion of bank loans, the proportion of private enterprise loans and the conversion rate of savings and investment <sup>[2]</sup>. Dai Wei and Zhang Xuefang found that the allocation efficiency of financial resources in our country is quite different in each region, and the overall level of allocation efficiency is low. They also found that there is a correlation between the allocation efficiency of financial resources and the level of local economic development <sup>[3]</sup>. Zhang Yumiao used super-efficiency DEA model to study the efficiency of financial resource allocation in Beijing-Tianjin-Hebei region, and found that the allocation of financial resources in Beijing-Tianjin-Hebei region was in an inefficient state with obvious regional differences <sup>[4]</sup>. Lin Jinzhong et al. evaluated the allocation efficiency of financial resources in Fujian Province, and concluded that the allocation efficiency of financial resources in Fujian Province is not effective and there is redundancy in the allocation efficiency of financial resources in various cities in Fujian Province <sup>[5]</sup>. Yang Haiwen et al. studied the efficiency of financial resource allocation in various provinces of China, and concluded that there are significant differences in the efficiency of financial resource allocation among different provinces <sup>[6]</sup>. Zhang Yonggang and Zhang Qian found through the study of rural finance that the efficiency of rural financial allocation is low, and the effect of rural finance on the promotion of rural economic growth is not significant <sup>[7]</sup>. Li Junxia et al. found that the efficiency of resource allocation in technology and finance in China has not reached an effective state as a whole from the quality perspective of "financial resources" and "innovation achievements" by using the method of relative numerical indicator and dynamic and static combination <sup>[8]</sup>. Li Cangshu used DEA-Malulquist indicator to measure the efficiency of China's financial industry, and found that the efficiency of China's financial resource allocation changed little from year to year <sup>[9]</sup>. Xu Xiaoguang measured the financial resource allocation efficiency of 11 cities in Mainland China and Hong Kong, China by using data envelopment analysis, and analyzed the differences of financial efficiency components between Mainland China and Hong Kong, and finally found that there are great

differences between Mainland China and Hong Kong in terms of technological progress rate, pure technical efficiency and scale efficiency <sup>[10]</sup>. Ren Guanggan et al. conducted a comprehensive evaluation on the financial efficiency of countries along the "belt and road initiative", and the results showed that each country along the line had low input-output efficiency of financial resources, and the efficiency differences between different countries were relatively large <sup>[11]</sup>. Lu Yuanquan and Zhang Degang measured the financial efficiency of different regions in China by using the data from 1995 to 2009, and measured the difference of financial efficiency of different regions by Gini coefficient and Theil indicator, and concluded that the overall level of regional financial efficiency in China was low<sup>[12]</sup>. Zhang Jun used the panel data of 31 provinces to study the relationship between financial allocation efficiency and local government behavior, and found that local government intervention would reduce the efficiency of financial resource allocation, hinder the transformation of regional economic structure and weaken the regional market economic environment <sup>[13]</sup>. An Qiangshen and Jiang Zhanying studied the relationship between the efficiency of financial resource allocation and total factor productivity and economic growth, and found that the inefficient use of government-led funds and state-owned banks' funds is a major cause of financial mismatch in China, and the inefficient allocation of financial resources will affect the promotion of total factor productivity <sup>[14]</sup>. Tian Xinmin et al. found that financial technological innovation will improve the efficiency of financial resources allocation to a certain extent, and the improvement of financial allocation efficiency will help economic growth <sup>[15]</sup>. Zhang Mubin and Sun Yaqiong applied the data of listed companies in manufacturing industry to study the impact of financial development on the efficiency of financial resource allocation from the micro-enterprise level, and concluded that the efficiency of financial resource allocation of enterprises has not been improved because of economic financialization, but economic financialization may worsen the external environment of enterprise production and operation<sup>[16]</sup>. Zhang Yumiao found that financial resource allocation efficiency has a significant positive correlation with economic development level, industrial structure optimization level, consumption efficiency and location advantages, but has a significant negative correlation with local government intervention through the study of factors affecting financial resource allocation efficiency in 13 cities in the Beijing-Tianjin-Jilin region from 2004 to 2013<sup>[4]</sup>. Zhong Chen and Wu Xiong found that there is a significant positive correlation between rural financial institutions and the construction of new urbanization, and the efficiency of resource allocation of financial institutions will help the construction of new urbanization by studying the relationship between resource allocation of rural financial institutions and the construction of new urbanization in China<sup>[17]</sup>.

At present, there are abundant achievements in the research on the effect of financial resources allocation, but there are still some deficiencies, mainly in the following two aspects: firstly, the sample scope is mainly concentrated on the national and rural levels, and there is a lack of research on a province as the research object; secondly, the research on Influencing Factors of financial resources allocation efficiency is insufficient. Guangdong Province, as a frontier of reform and opening up, has a relatively high level of economic development, opening up and marketization, and a rapid development of financial industry, but with unbalanced economic development and financial level among regions. Therefore, in this paper, firstly using the financial input and output data of Guangdong Province from 2010 to 2017, the BCC-DEA model with variable input-output-oriented returns and Malmquist indicator are selected to estimate the efficiency of financial resource allocation in Guangdong Province and cities from both static and dynamic perspectives; then Tobit model is used to measure the driving factors that affect the efficiency of financial resource allocation to analyze the financial resource allocation in Guangdong Province; and finally make policy recommendations. On the one hand, this study can make up for the insufficiency of research on financial resource allocation efficiency at the provincial level, on the

other hand, it enriches the research on the influencing factors of financial resource allocation efficiency.

### 3. Model Design and Data Description

#### 3.1 DEA

Data Envelopment Analysis (DEA), proposed by Charnes, Cooper, and Rhodes, can be used to evaluate the relative effectiveness of multiple input and output decision units. Because the use of this method requires neither knowing the functional relationship between input and output in advance, nor setting the weight of input and output in advance, which avoids the possibility of invalid evaluation results caused by function setting deviation, and the use of global data has strong objectivity. BCC model with variable return on scale, one of the typical models in DEA method, is widely used in evaluating financial efficiency, innovation efficiency and energy efficiency. In this paper, the BCC model with variable return on scale is applied to study the relationship between financial resources input and output of banks, insurance institutions, governments and other subjects, and then to judge whether the efficiency of financial resources allocation is effective, and whether the ineffectiveness (if so) is caused by technical inefficiency or scale inefficiency.

It is assumed that there are n comparative studies on the efficiency of financial resources in each region, with m financial input variables in each region and n economic output variables in each region.  $X_{ij}$  is the type i financial resources input of the region j, and  $Y_{ij}$  is the type i economic output of the region j. The input vector of financial resources is  $X = (x_1, x_2, \dots, x_m)^T$ , and the output vector is  $Y = (y_1, y_2, \dots, y_n)^T$

The BCC model with Non-Archimedean dimensionless  $\epsilon$  is

$$\overline{D_\epsilon} \left\{ \begin{array}{l} \min \theta - \epsilon(e^- s^- + e^+ s^+), \\ s.t. \sum_{j=1}^n X_j \lambda_j + s^- = \theta X_{j0} \\ \sum_{j=1}^n Y_j \lambda_j - s^+ = Y_{j0} \\ \sum_{j=1}^n \lambda_j = 1 \\ s^- \geq 0, s^+ \geq 0, \lambda_j \geq 0, j = 1, 2, 3, \dots, n. \end{array} \right.$$

Where,

$\lambda_j$ = the combination coefficient of each unit;

$x_0, y_0$ = the financial input indicator and financial output indicator of the assessed area;

$\theta$ = the evaluation indicator of regional financial efficiency;

$s^-, s^+$ =the slack variables.

When  $\theta < 1$ , the decision-making unit is invalid; when  $\theta = 1$ , the decision-making unit is weak DEA effective, when  $\theta = 1$  and  $s^- = 0, s^+ = 0$ , then the decision-making unit is DEA valid. Then

$$crste = vrste \times scale$$

Where,

$crste$ = the comprehensive efficiency value when the return to scale is variable;

$vrste$ = the value of technical efficiency (also called pure technical efficiency) when the return to scale is variable;

$scale$ =the scale efficiency.

When scale efficiency equals 1, the production process is in the best state at this time. When

scale efficiency does not equal 1, it is divided into two situations: decreasing return on scale and increasing return on scale.

### 3.2. Malmquist

The DEA-BCC model can measure the efficiency value at the same time point, but it is not strong enough for panel data analysis to give trend information of efficiency change. Fare et al. (1994) established a Malmquist productivity index based on DEA to measure the change of productivity in different periods, which can be used to analyze panel data in different industries and regions and give a better description of the dynamic change of efficiency values. The Malmquist index can be used to calculate the change in productivity from t to t+1 by the geometric average of the two Malmquist productivity indices as follows:

$$M(x^t, y^t, x^{t+1}, y^{t+1}) = [D_v^t(x^{t+1}, y^{t+1}) D_v^{t+1}(x^{t+1}, y^{t+1})]^{1/2} / [D_v^t(x^t, y^t) D_v^{t+1}(x^t, y^t)]^{1/2}$$

Where,

$x^t$ = the input of the decision making unit in period t;

$y^t$ = the output of the decision making unit in period t.

$D_v^t(x^t, y^t)$ ,  $D_v^{t+1}(x^t, y^t)$ ,  $D_v^t(x^{t+1}, y^{t+1})$ ,  $D_v^{t+1}(x^{t+1}, y^{t+1})$  are distance functions.

The Malmquist index can be further decomposed into an integrated technical efficiency change index (effch) and a technical progress index (techch), where the former can be further decomposed into a pure technical efficiency change index (pech) and a scale efficiency change index (sech). Malmquist index greater than 1 indicates that the overall efficiency from t to t+1 is on an upward trend and has an improved efficiency. The Malmquist index less than 1 indicates that the comprehensive efficiency from t to t+1 is on a downward trend and has a decreased efficiency. The Malmquist index equal to 1 indicates that there is no change in the overall efficiency from t to t+1.

### 3.3. Tobit Model

DEA-BCC method measures the efficiency of financial resource allocation from the static level. Malmquist index measures the change of efficiency between different years, but cannot find the influencing factors of input-output efficiency of financial resources from the whole system because decision-making units are in a complex economic environment system, it is necessary to build a Tobit regression model to study the influencing factors of efficiency of financial resources allocation of each decision-making unit in depth. In this method, the DEA method is applied to get the financial resource allocation efficiency value of each decision-making unit as the explained variable. Since the efficiency value is between 0 and 1, data truncation will occur when using ordinary least squares regression model, so the panel Tobit model is used for empirical research in this paper. Fixed-effect Tobit model and stochastic-effect Tobit model are mainly included in the Tobit regression model, but stochastic-effect Tobit model can be used in this paper because the estimates of fixed-effect Tobit model are not consistent and stochastic-effect Tobit model can solve this problem.

### 3.4. Indicator Selection

Because the value of regional financial resource allocation efficiency studied in this paper is influenced by multi-input index and multi-output index, after drawing lessons from previous research results, the following related indexes are selected based on the characteristics of data relevance, scientificity, representativeness and data availability.

The financial resources input indicators are selected from three aspects of human resources, financial resources and material resources, and the number of employees in financial institutions

and the number of financial institutions are taken as the human resources input; the financial factor indicator is replaced by the loans of regional financial institutions and the premium income of insurance institutions; and the indicator of material elements is replaced by the investment in fixed assets of financial institutions.

The output value of regional financial industry is directly used as the output indicator of financial resources, which directly reflects the development of regional financial industry itself and the industrial added value it brings. See Table 1 for related indicators.

Table 1: Evaluation indicator system of financial resource allocation efficiency.

Types	Specific indicators
Input indicators	Number of employees in financial institutions
	Number of financial institutions
	Loans of financial institutions
	Premium income of insurance institutions
	Investment in fixed assets of financial institutions
Output indicators	Output value of financial industry

In this paper, the financial resources allocation of each region in Guangdong Province is mainly studied. Therefore, the relevant data of 21 cities in Guangdong Province from 2010 to 2017 are selected for research. At the same time, Guangdong Province is divided into the Pearl River Delta, western Guangdong, eastern Guangdong and mountain areas for analysis. The data comes from the *Statistical Yearbook of Guangdong Province* from 2011 to 2018 and the statistical yearbooks of various cities.

## 4. Results of Empirical Analysis

### 4.1. Static Efficiency Analysis

In this paper, Deap 2.1 software is used to calculate the allocation efficiency of financing in different regions of Guangdong province. Table 2 shows that the allocation of financial resources in Guangdong Province in each year is less than 1 and has not been effective. Among them, the financial allocation efficiency in 2013 was the lowest, at 0.845, and that in 2017 was the highest, at 0.911. Overall, the financial allocation efficiency in Guangdong Province has shown an upward trend. Guangdong Province is divided into four regions, among which the Pearl River Delta region has the highest financial resource allocation efficiency, with the efficiency of financial resources allocation over 0.9 in each year, the average allocation efficiency of 0.911, 0.772 in mountainous areas, 0.563 in western Guangdong and 0.544 in eastern Guangdong, which is the lowest in Guangdong Province.

The high efficiency of financial resources in the Pearl River Delta region is mainly due to, on the one hand, the relatively perfect financial system and strong financial innovation capability in the region, as well as the high quality of financial management and personnel in the region, which makes the efficiency of the financial system in the region relatively high; on the other hand, the high level of economic development and rapid economic development in the region, with a relatively high degree of financial demand, which will also bring demand to promote financial efficiency.

Table 2: Allocation efficiency of financial resources in different regions of Guangdong Province from 2010 to 2017

Regions	2010	2011	2012	2013	2014	2015	2016	2017
Guangdong	0.863	0.864	0.884	0.845	0.875	0.862	0.894	0.911
The Pearl River Delta	0.906	0.912	0.916	0.893	0.900	0.900	0.922	0.944
Eastern Guangdong	0.49	0.537	0.572	0.506	0.555	0.493	0.503	0.697
Western Guangdong	0.484	0.52	0.553	0.443	0.678	0.610	0.576	0.644
Mountain area	0.676	0.704	0.702	0.716	0.852	0.881	0.822	0.829

Table 3 lists the financial resource allocation efficiency of 21 cities in Guangdong Province in 2017. The table shows that the financial resource allocation efficiency of eight cities, namely Guangzhou, Shenzhen, Zhuhai, Shaoguan, Huizhou, Shanwei, Dongguan and Chaozhou, is 1, i.e. DEA efficient, indicating that the above cities are efficient in terms of both technical efficiency and scale efficiency of financial resources. Other cities have inefficient allocation of financial resources, with efficiency values ranging from 0.443 to 0.987, among which Jieyang has the lowest comprehensive efficiency value of 0.443, indicating that the allocation efficiency of financial resources in this city has not reached an effective state. Foshan has a technical efficiency value of 1 and a scale efficiency of 0.86, which shows that Foshan's financial operation system and technical management are efficient, but have not reached the optimal scale efficiency. From a regional point of view, the Pearl River Delta region and the mountain areas have an effective pure technical efficiency but decreasing scale efficiency. The Pearl River Delta region has the highest comprehensive efficiency value, which is 0.944, and the mountain areas have the second highest comprehensive efficiency value, which is 0.829. Besides, the scale efficiency and technical efficiency in eastern Guangdong and western Guangdong are relatively low, resulting in relatively low comprehensive efficiency of financial resources, and the comprehensive efficiency value in eastern Guangdong is slightly higher than that in western Guangdong.

Table 3: Allocation efficiency of financial resources in cities of Guangdong Province in 2017

Regions	crste	vrste	scale	Returns to scale
Guangdong Province	0.911	1	0.911	Decreasing returns to scale
Guangzhou	1	1	1	Constant returns to scale
Shenzhen	1	1	1	Constant returns to scale
Zhuhai	1	1	1	Constant returns to scale
Shantou	0.698	0.75	0.931	Decreasing returns to scale
Foshan	0.816	1	0.816	Decreasing returns to scale
Shaoguan	1	1	1	Constant returns to scale
Heyuan	0.987	0.995	0.992	Increasing returns to scale
Meizhou	0.884	0.931	0.949	Increasing returns to scale
Huizhou	1	1	1	Constant returns to scale
Shanwei	1	1	1	Constant returns to scale
Dongguan	1	1	1	Constant returns to scale
Zhongshan	0.925	0.928	0.997	Increasing returns to scale
Jiangmen	0.724	0.766	0.945	Decreasing returns to scale
Yangjiang	0.76	0.902	0.843	Increasing returns to scale
Zhanjiang	0.603	0.615	0.979	Decreasing returns to scale
Maoming	0.728	0.768	0.947	Decreasing returns to scale
Zhaoqing	0.685	0.703	0.975	Decreasing returns to scale
Qingyuan	0.773	0.791	0.977	Decreasing returns to scale
Chaozhou	1	1	1	Constant returns to scale
Jieyang	0.443	0.458	0.968	Increasing returns to scale
Yunfu	0.866	0.942	0.919	Increasing returns to scale
Pearl River Delta	0.944	1	0.944	Decreasing returns to scale
Eastern Guangdong	0.697	0.876	0.795	Decreasing returns to scale
Western Guangdong	0.644	0.754	0.854	Decreasing returns to scale

Mountain area	0.829	1	0.829	Decreasing returns to scale
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## 4.2. Malmquist Analysis of Dynamic Financial Resource Efficiency

Malmquist index is used to calculate the dynamic changes of financial resource allocation efficiency in Guangdong province from 2010 to 2017. The specific calculation results are shown in Table 4 that total factor productivity showed an upward trend from 2010 to 2013, a downward trend from 2014 to 2015, and an upward trend from 2015 to 2017; and the total factor productivity of Guangdong Province was greater than 1 except for 2014-2015, indicating that the efficiency of financial resource allocation in Guangdong Province was increasing positively except for 2014-2015. Except for 2015-2016, the TECHCH is greater than 1, indicating that technological progress is positive growth, which plays a positive role in promoting the change of total factor productivity. The PTECH remains unchanged every year, while the SECH is negative growth in 2012-2013 and 2014-2015, but positive growth in other years. The change of scale efficiency is the main reason for the change of technical efficiency. The positive growth of total factor productivity in most years is mainly due to the positive growth of technological progress and scale efficiency.

Table 4: Malmquist index of financial resources in Guangdong Province from 2010 to 2017

Years	EFFCH	TECHCH	PTECH	SECH	TFPCH
2010-2011	1.001	1.067	1.000	1.001	1.068
2011-2012	1.023	1.050	1.000	1.023	1.075
2012-2013	0.956	1.158	1.000	0.956	1.108
2013-2014	1.035	1.028	1.000	1.035	1.064
2014-2015	0.985	1.007	1.000	0.985	0.992
2015-2016	1.037	0.999	1.000	1.037	1.036
2016-2017	1.019	1.000	1.000	1.019	1.019
Mean	1.008	1.043	1.000	1.008	1.051

Table 5 shows Malmquist index of financial resources of cities in Guangdong Province. The TECHCH shows that Heyuan City and Yunfu City have negative growth, while the other 19 cities have positive growth, among which Zhuhai City's technological progress has the highest growth rate of 9%. The PTECH shows that Jiangmen City and Jieyang are negative growth, while other cities are positive growth. SECH shows that Foshan, Heyuan and Yangjiang have negative growth, while other cities have positive growth. TFPCH shows that only the total factor productivity of Heyuan City is negative growth, and the main reason is that both technological progress and scale efficiency are brought about by negative growth. The growth rate of other cities ranges from 1.2% to 16.6%, among which Dongguan has the highest growth rate of 16.6% and Zhanjiang the lowest growth rate of 1.2%.

Table 5: Malmquist efficiency value of financial resources in cities of Guangdong Province

Regions	EFFCH	TECHCH	PTECH	SECH	TFPCH
Guangzhou	1	1.052	1	1	1.052
Shenzhen	1	1.013	1	1	1.013
Zhuhai	1	1.090	1	1	1.09
Shantou	1.062	1.060	1.06	1.002	1.126
Foshan	1.004	1.051	1.027	0.978	1.055
Shaoguan	1.058	1.047	1.023	1.034	1.108
Heyuan	0.998	0.957	1	0.998	0.955



Meizhou	1.011	1.032	1	1.011	1.044
Huizhou	1.072	1.083	1.069	1.003	1.161
Shanwei	1.093	1.045	1	1.093	1.143
Dongguan	1.121	1.041	1.117	1.003	1.166
Zhongshan	1.015	1.067	1.013	1.002	1.082
Jiangmen	0.989	1.030	0.985	1.005	1.019
Yangjiang	1.008	1.042	1.012	0.996	1.051
Zhanjiang	1.005	1.007	1.002	1.003	1.012
Maoming	1.083	1.067	1.051	1.03	1.155
Zhaoqing	1.018	1.008	1.016	1.001	1.026
Qingyuan	1.055	1.030	1.033	1.022	1.087
Chaozhou	1.025	1.055	1	1.025	1.082
Jieyang	1.046	1.012	0.946	1.105	1.058
Yunfu	1.11	0.973	1	1.11	1.08

### 4.3. Tobit Regression Analysis

The above empirical results show that the efficiency of financial allocation in Guangdong Province is quite different in different regions. In order to explore the differences of regional financial allocation efficiency, in this paper, the value of financial allocation efficiency of each city obtained above is taken as an interpreted variable, and the factors affecting the efficiency of financial resource allocation are selected to construct Tobit regression model. The specific indicators include: (1) regional industrial structure, which is measured by the ratio of the output value of tertiary industry in each city to the output value of the city, so as to evaluate the influence of the differences in industrial structure of each city on the efficiency of financial resource allocation; (2) local financial intervention, which is measured by the proportion of local government's fiscal expenditure to the city's output value, so as to evaluate the degree of influence of government intervention on the allocation of financial resources; (3) degree of openness, which is measured by the proportion of foreign investment in the output value of the city, and the higher the value, the greater the external capital investment, which will promote the utilization efficiency of financial resources; (4) regional business environment, which is used to reflect the impact of different location environment on the efficiency of financial resource allocation as cities located in different regions have different levels and speeds of financial development in different operating environments (including legal environment, market environment and institutional environment). In view of the economic basis, resource endowment, talent agglomeration, policy system and other advantages of the Pearl River Delta Region of Guangdong Province, the variable of regional operating advantages of nine cities in the Pearl River Delta Region is set to 1, while the operating advantages of other cities are set to 0; (5) per capita resident income, which is based on the income increase efficiency to evaluate the influence of per capita disposable income of each city on the efficiency of financial resource allocation. In this paper, Tobit regression analysis was performed with Stata13, and the results are as follows:

Table 6: Regression results of Tobit model for efficiency of financial resource allocation

Explained variable	Explaining variables	Coefficients	Standard errors	P values
Efficiency of financial resource allocation	Regional industrial structure	1.206 ***	0.264	0.000
	Local fiscal intervention	1.600 ***	0.254	0.000
	Degree of openness	0.001**	0.001	0.038
	Regional operation advantages	0.134**	0.054	0.014
	Per capita resident income	0.000	0.000	0.388
	Constant term	-0.106	0.091	0.245

Note: \* \* \*, \* \* and \* respectively indicate significant at the level of 1%, 5% and 10%,  $R^2=99\%$

Table 6 shows that regional industrial structure, local financial intervention, degree of opening to the outside world, regional operating environment and per capita income of residents all have a positive impact on the efficiency of financial resource allocation, among which regional industrial structure and local financial intervention will increase the efficiency of financial resource allocation by 1.26% and 1.6% respectively when the level is increased by 1% that are significantly positively correlated at the level of 1%, indicating that the more developed the tertiary industry is in a region, the more supportive the local government is to the regional economic development, and the more efficient the financial resource allocation is in the region. The efficiency of financial resource allocation increases by 0.001% and 0.134% when the degree of opening to the outside world and the advantage of regional operation increase by 1%, which shows that the higher the degree of opening to the outside world and the stronger the ability to obtain external funds, the more efficient the allocation of financial resources in a region will be, and it is significant at the level of 5%. In addition, a region's regional business environment, legal environment, institutional environment and other location advantages have a significant positive impact on the efficiency of financial resource allocation. To a certain extent, the increase of residents' per capita income will increase the deposits of financial institutions, and improve the deposit scale of financial institutions and the efficiency of financial capital circulation and utilization. Residents' per capita income has a positive effect on the efficiency of financial resource allocation, but not significantly.

## 5. Conclusions and Enlightenment

### 5.1. Research Conclusions

Improving the efficiency of regional financial resources allocation is conducive to promoting regional economic transformation and upgrading of industrial structure, and driving regional economic development. In this paper, firstly, the evaluation index system of financial resource allocation efficiency is constructed, and then the DEA and Malmquist index methods are combined to evaluate the input-output efficiency of financial resources in Guangdong Province and various urban areas from both static and dynamic levels. Finally, Tobit regression model is constructed to explore the influencing factors of financial resource allocation efficiency. The following conclusions are drawn: (1) From a static perspective, the financial resources allocation in Guangdong Province has not reached the optimal state but has a high overall level, and from a time perspective, the efficiency of financial resources allocation is on the rise. Regionally, the financial resources allocation efficiency in the Pearl River Delta region is the highest, while that in eastern and western Guangdong is relatively low. In terms of cities, the eight cities of Guangzhou,

Shenzhen, Zhuhai, Shaoguan, Huizhou, Shanwei, Dongguan and Chaozhou all achieved the optimal allocation of financial resources, while the efficiency value of other cities was less than 1. The allocation efficiency of financial resources varies greatly among regions. (2) From a dynamic perspective, the total factor productivity of Guangdong Province is greater than 1 except for 2014-2015, showing a positive growth trend, with the fastest growth rate of 10.8% in 2012-2013. The pure technical efficiency keeps constant at 1 every year, so the change of technological progress and the change of scale efficiency are the main reasons that lead to the improvement of total factor productivity. Judging from each urban area, except Heyuan City, which has negative growth, the other 20 cities have positive growth in total factor productivity, with the highest growth rate of 16.6% in Dongguan and the lowest growth rate of 1.2% in Zhanjiang. (3) Tobit regression analysis shows that regional industrial structure, local financial intervention, degree of opening to the outside world and regional business environment all promote the efficiency of financial resource allocation and have significant effects. The increase of per capita income of residents will promote the efficiency of financial resource allocation, but not significantly.

## 5.2. Enlightenment

In order to solve the problem that the allocation efficiency of financial resources in Guangdong Province has not reached the optimal state and there are great differences among various regions, the first thing to do is to optimize the allocation structure of financial resources and improve the allocation efficiency, allocate more and better financial resources to high-quality enterprises with development potential, increase support for local pillar industries and key areas, direct resources to industries with higher output efficiency, reduce the space occupied by low-efficiency enterprises for financial resources, form a good match between financial supply and demand, form a good situation in which finance and regional economy can promote each other, and improve the efficiency of the use of financial resources. Secondly, it is necessary to eliminate the short-term effect and promote the coordinated development of finance in various cities. In order to give full play to the industrial radiation effect of cities such as Guangzhou, Shenzhen and Zhuhai, while relying on the existing economic foundation and resource endowments, the eastern and western Guangdong regions should accelerate the industrial upgrading and transformation, and actively adjust the industrial structure according to the regional characteristics. As the development of the financial market is based on industrial development, a balanced development model should be formed in Guangdong Province, with the Pearl River Delta as the center, with each region cooperating with each other, to avoid the problem of unbalanced allocation of financial resources due to regional differences, and to promote the improvement of the overall economic level of each region in Guangdong Province. Finally, it is necessary to deepen financial reform measures, intensify opening-up efforts and expand the scale of financial resources. On the basis of Guangdong-Hong Kong-Macao Greater Bay Area's construction platform, we should intensify the reform of financial policy system and financial organization, deepen financial business exchanges with Hong Kong and Macau, learn from the experience and measures of financial reform in other Bay Areas of the world, constantly innovate financial instruments, increase investment in financial innovation, broaden the financial innovation fields, encourage financial institutions in Guangdong Province to go abroad and increase investment in the belt and road initiative countries. At the same time, the reform and opening-up efforts should continue to be strengthened to provide a good business environment, attract more foreign investment into Guangdong Province, encourage foreign capital to continue to invest in Guangdong, improve the utilization efficiency of foreign capital, and expand the scale of foreign financial investment.

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