RESEARCH ON THE RELATIONSHIP BETWEEN REGIONAL FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN CHINA UNDER THE NEW PATTERN OF DOUBLE CIRCULATION DEVELOPMENT

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Abstract

As the core topic of China's economic development strategy in the new era, the new development pattern of double cycle has triggered a research upsurge among scholars. In the "double cycle" new development pattern, what is very worth studying is the relationship between finance and economy in the region. By studying the interaction between finance and economy, it can provide reference for the construction of China's new development pattern.According to the division method in the eleventh five-year plan report, this paper divides China into eight comprehensive economic regions. Firstly, it analyzes the economic status of each region from the total economic volume and industrial structure, and the financial development status of each region from the financial scale and financial efficiency. Then, it analyzes the correlation between the economy and finance of each region through the correlation analysis of the financial and economic indicators of each region, Through the panel data of eight regions, this paper constructs a multiple linear regression model and makes an empirical test. Through empirical research, it is found that there is a relationship between China's regional finance and economy. Finally, it analyzes the financial factors affecting economic growth, and puts forward suggestions on the construction of China's new development pattern, so as to make the financial development better drive the domestic economic development.

Keywords: Regional finance; Regional economy; New development pattern

1 INTRODUCTION

1.1 Research Background And Significance

1.1.1Research background

On May 14th, 2020, the member of the Standing Committee of the Political Bureau of the CPC Central Committee proposed: "give full play to China's super large-scale market advantages and domestic demand potential, and build a new development pattern of domestic and international double circulation." This indicates that the concept of the new development pattern of domestic and international double circulation is increasingly mature. As the core topic of China's economic development strategy in the new era, the new development pattern of double circulation has triggered a research upsurge among scholars.

In the construction of the "double cycle" new development pattern, what is worth studying is the financial factors that affect economic growth. As the core element of modern economic development, financial factors can provide a strong driving force for economic development. Through the analysis of financial elements, the relationship between economic growth and financial development is further determined.

1.1.2Research significance

According to the current research, there are many studies at the level of national and national comparison, but the national comparative research is carried out in different national systems and social environments, and there are great differences in the structure of the financial system, so it is difficult to make a conclusion analysis. However, there is a generally consistent socio-economic environment among the regions of a single country. Under such conditions, it is more appropriate to study the relationship between finance and economy in the region. However, China is an economy with great regional differences in economic development, and the division of regions is generally divided into three parts: the East, the middle and the West. Through the division of the 13th five year plan, the refinement of the region will help to study the relationship between regional finance and economic development, so that finance can better drive domestic economic development, so as to promote the new development pattern of double cycle with domestic as the main body and domestic and international mutual promotion, and promote the high-quality and sustainable development of China's economy under the new

development pattern.

1.2 Research Contents And Methods
1.2.1 research content

The first part is the introduction part, which includes the research background, research significance, research ideas and methods, as well as the innovation of the paper.

The second part is the theory part, which summarizes the relevant theories and the relevant theories of the relationship between regional finance and economy, and studies the relationship between regional finance and economy.

The third part is the current situation analysis and correlation analysis, which describes and compares the current situation of financial and economic development in eight regions of China, analyzes the correlation between financial and economic development in various regions of China, and then discusses the relationship between regional financial and economic development in China as a whole.

The fourth part is the empirical analysis, which uses Eviews software to analyze the relationship between regional financial development and economic growth in the eight economic zones.

The sixth part is the conclusion and suggestion part, which summarizes the research conclusion of the full text, and puts forward relevant suggestions for the strategic conception of the new development pattern of "double circulation" in China.

1.2.2 research methods

(1) Literature research method. Actively accumulate the relevant data of the paper, collect the relevant contents of other people's papers and works for the part of the domestic research status, and apply them to their own papers through induction and summary. Understand and master the relevant trends of the current research on regional finance and regional economic development, and lay the foundation for further analysis and Research on the development of green finance and low-carbon economy.

(2) The combination of theoretical research and empirical research. Analyze and model the interaction between different regions from the theoretical level.

(3) Combination of qualitative research and quantitative research. The data were processed by statistical analysis software, and the data results were analyzed and tested by regression analysis.

1.3 Research Review at Home And Abroad
1.3.1 domestic research review

(1) Building a new development pattern of double circulation

From an economic perspective, Zhang Le, Chen Chen (2022) and others believe that the bottleneck of China's new development pattern lies in the lack of internal and external demand and the decline in the rate of technological progress. Strengthening collaborative innovation and short board innovation through industrial policies can effectively promote the high-quality

development of China's economy under the "double cycle" new development pattern [1]. Li Meng (2021) believes that at this stage, China's new development pattern needs a series of targeted measures, including expanding effective investment, promoting the internal circulation of the domestic economy with consumption, reshaping and improving the domestic circular industrial chain, optimizing the business environment, exploring overseas markets, and jointly maintaining the multilateral trading system [2]. From a financial perspective, Zhang Wangjun (2020) believes that the construction of a new development pattern of "double circulation" needs to further improve the financial system, products and services, and improve the adaptability of the financial system to the supply system and demand system [3]. Yi Gang (2020) believes that due to the rapid development of China's financial openness, further expansion of financial openness is the inevitable requirement of building a new development pattern, which is conducive to improving the quality and efficiency of financial services to the real economy, dredging the channels for capital to integrate into the real economy, and helping China's high-quality economic development [4]. Ren Li (2021) proposed that to build a new development pattern in China, we should optimize the spatial layout of financial supply, especially in economically weak areas, strengthen the financial construction capacity of economically weak areas, and promote the smooth financial cycle in these areas [5].

(2) On the impact relationship between finance and economic development

Linyifu and sunxifang (2008) believe that the banking structure has an important impact on economic growth. The rise of the market share of small and medium-sized financial institutions has a significant positive correlation with economic growth, but the variables reflecting the size of the banking industry have a significant negative correlation with economic growth [6]. Tanyanzhi and pengwenping (2003) analysis results show that the impact of financial development on investment and capital accumulation is significantly positive, but the impact on the quality of economic growth is not significant, or even negative [7]. In short, the impact of the development of financial scale on economic growth is not obvious, while the optimization of the financial system has a significant impact on economic growth.

1.3.2 overview of foreign research

Greenwood and Smith (1997) believed that the less developed countries and regions have too many measures for financial regulation, which makes the financial market unable to play a full role in economic activities, thus inhibiting technological progress and capital accumulation, thus affecting economic development [8]. Paul Hodges (2021) mentioned in the economic growth report that China's "double cycle" new development pattern aims at the high-quality development of China's domestic economy, which mainly depends on consumption, export and financial investment [9]. Adeusi and aluko (2015) believed that the development of the

financial sector was crucial to the development of the real economy from the perspective of the impact relationship between financial and economic development. Their research found that there was a strong linear relationship between the financial sector and the real economy [10].

2 RELATED CONCEPTS AND THEORETICAL BASIS

2.1 Definition of Relevant Concepts of The New Development Pattern of Double Circulation

The essence of the new development pattern of "double circulation" is "independence and high-level openness". The new development pattern of "double circulation" not only comes down in one continuous line with China's major strategies and policies for a long time, but also emphasizes the overall planning of supply side and demand side, domestic and international circulation, economy and finance. At present, China's economy has shifted from high-speed development to high-quality development. In the high-quality development of the economy, finance should unswervingly focus on the people and serve the real economy as the foundation, and play its role to provide high-level financial support for the key areas and key links of the new development pattern.

2.2 Relevant Theories of Regional Finance And Regional Economy

2.2.1 regional financial theory

Regional finance refers to the spatial distribution and operation of the macro financial system, because there are differences in the distribution of population size, geographical environment, income, expenditure and other aspects between different regions of a country. Therefore, the operation of financial institutions, the distribution of financial structure and the allocation of financial resources are also different between regions. Regional finance has the characteristics of time and space, radiation and difference, so only studying its overall financial operation status from the national level can not well represent the actual financial development status, which has little substantive significance.

The regional financial theory mainly studies the change law of the spatial structure of financial growth and financial development, reflecting the spatial differences and specific distribution of financial structure and operation. The essence of regional finance theory is to find out the main economic factors that affect the regional financial structure, and describe the mechanism of these factors.

2.2.2 regional economic theory

Regional economy refers to the national economy of a certain region, which is a production complex produced by the interaction of internal factors and external conditions of economic development in a certain region. Nowadays, the economic development levels of countries in the world are different, and the economic development levels of different regions in the same country are also different. Therefore, the development strategies and policies formulated by countries are also different. According to the unique cultural, historical and geographical characteristics of different regions, different regional types are formed. The level of economic development in different regions will lead to differences in the financial operation mechanism in their respective regions, and the degree of financial development in each region will have an impact on the economic development of each region.

Regional economic theory mainly studies how to optimize the structure and allocation of limited production resources in a certain region (space) to achieve its maximum output. There are many theoretical schools because of the different combinations and opinions of resource allocation in the region.

2.3 Correlation between Regional Financial Development and Regional Economic Growth

2.3.1 effect of regional financial development on regional economic growth

(1) Regional financial development promotes the accumulation of regional capital, and financial development improves the efficiency of resource allocation. As the capital gradually moves towards high-efficiency investment flow, the efficiency of capital use is gradually improved, further realizing economic growth.

(2) The development of regional finance promotes and encourages technological innovation and technological progress. The innovation and R & D of science and technology depend on funds and talents, and the cultivation and incentive of talents can not be separated from funds, so financial support is essential. The emergence of high and new technologies will promote economic growth to achieve better results. So financial development indirectly drives economic growth.

2.3.2 effect of regional economic growth on Regional Financial Development

（1）The operation of regional finance is determined by the development of regional economy. The balance of financial resources distribution and supply and demand are determined by their economic conditions. In the process of allocating financial resources, the role of the national economy plays a decisive role, which is mainly reflected by the sustained growth of the economic scale, so it will also continue to improve the supply and demand of financial resources. In addition, the progress of the financial industry is also directly affected by it to a certain extent. Economic efficiency plays a decisive role in financial efficiency. Improving regional economic efficiency can not only ensure the sustained and stable growth of the national economy, but also improve the trading status of both sides of the financial resources transaction. To a certain extent, it can improve the satisfaction of participants in

the financial market, so as to effectively improve financial efficiency. Regional economic structure also has a far-reaching impact on regional financial efficiency. Once the economic structure changes, the demand structure of financial resources will also change, and the distribution of national income can also be optimized, which will have a certain impact on financial efficiency.

(2) Regional economic growth has a certain restrictive effect on regional financial development. In the period of economic underdevelopment, it is difficult for people to participate in financial market activities because of the high threshold of financial market, such as low income level, single financial products, and non popularization of financial education, which makes finance unable to get support and development. However, with the continuous development of the economy, the economy is more and more developed, the income is higher and higher, and the awareness of financial management is popularized. Some people can have surplus wealth and participate in the trading activities of the financial market, which makes the financial industry develop rapidly, thus promoting the development of the financial market.

3 ANALYSIS ON THE CURRENT SITUATION AND CORRELATION OF ECONOMIC AND FINANCIAL DEVELOPMENT IN EIGHT REGIONS

In order to scientifically and reasonably analyze the relationship between China's regional finance and economy, most scholars' research mainly adopts the "Seventh Five Year Plan" for the selection of regional division standards, which does not fully explain the relationship between financial development and economic growth. This paper uses the "Eleventh Five Year Plan" to divide China into eight comprehensive economic zones according to the principles of adjacent space, similar resource structure and close economic development level.

Table 3-1 Eight comprehensive economic zones and their provinces, cities and autonomous regions

Eight comprehensive economic zones	Provinces, cities and autonomous regions within each region
Northeast comprehensive	Liaoning, Jilin, Heilongjiang
Northern coast	Beijing, Tianjin, Shandong, Hebei
Southern coast	Fujian, Guangdong, Hainan
Eastern coast	Shanghai, Jiangsu, Zhejiang
Middle reaches of the Yellow River	Shaanxi, Shanxi, Inner Mongolia, Henan
Middle reaches of the Yangtze River	Jiangxi, Anhui, Hunan, Hubei
Southwest comprehensive	Yunnan, Guizhou, Guangxi, Sichuan, Chongqing
Northwest comprehensive	Xinjiang, Tibet, Ningxia, Qinghai, Gansu

	2015			2020		
	primary industry	Secondary industry	Tertiary industry	primary industry	Secondary industry	Tertiary industry
Northeast China	11.44%	42.97%	45.59%	14.23%	33.66%	52.10%
Northern coast	2.18%	81.05%	16.77%	5.99%	33.05%	60.95%

Eastern coast	4.29%	43.26%	52.45%	3.31%	39.28%	57.42%
Southern coast	6.16%	45.42%	48.41%	5.39%	40.47%	54.14%
Middle reaches of the Yellow River	9.59%	48.11%	42.30%	9.12%	41.98%	48.90%
Middle reaches of the Yangtze River	11.19%	47%	41.82%	9.22%	39.92%	50.86%
Southwest China	12.79%	43.37%	43.84%	13.31%	38.38%	48.30%
Northwest China	13.61%	40.29%	46.10%	12.65%	35.23%	52.12%

3.1 Economic Development Status of Eight Comprehensive Economic Zones

3.1.1 total value of regional economy

Since the reform and opening up, China's regional economies have achieved rapid and visible development. However, in recent years, China's regional GDP has changed from a year-on-year rapid increase to a steady increase.Among them, the GDP of the eastern, southern and northern coastal areas is relatively high, ranking at the forefront. The GDP of each region increased by 68.94%, 75.28% and 35.62% from 13796.739 billion yuan, 10249.517 billion yuan and 13231.519 billion yuan in 2015 to 23309505 billion yuan, 17965.523 billion yuan and 17945.185 billion yuan in 2021; It is worth noting that although the economic aggregate of Southwest China is not high, it develops rapidly, from 8684.638 billion yuan in 2015 to 15321.886 billion yuan in 2021, an increase of 76.42% over 2015.

3.1.2 regional three major industrial structures

In recent years, due to the rapid development of China's economy, the industrial structure of various regions in China has also changed accordingly (see table 3-2).

Table 3-2 proportion of three major industries in each district in 2015 and 2020
Data source: according to China Statistical Yearbook

In the past six years, the proportion of the three major industries in each region has been adjusted differently. In 2015, the primary industry in Northeast China was only 11.44%, reaching 14.23% by 2020. The primary industry developed the fastest. The secondary

and tertiary industries in the northern coastal areas adjusted rapidly. The secondary industry decreased from 81.05% to 33.05%, and the tertiary industry developed rapidly, increasing from 16.77% to 60.95%. The industrial structure in the eastern coastal areas and the middle reaches of the Yellow River was slightly adjusted, and the proportion of the tertiary industry continued to increase. In 2015, the tertiary industry accounted for 46.10% in the northwest, 41.82% in the middle reaches of the Yangtze River and 48.41% in the southern coastal areas. By 2020, the tertiary industry in the northwest, 50.26% in the middle reaches of the Yangtze River and 54.14% in the southern coastal areas accounted for half of the region's GDP.

3.2 Current Situation of Financial Development in Eight Regions

3.2.1 current situation of financialization based on financial related ratio

Due to the late development of China's stock and securities markets, scholars generally use the financial correlation ratio to reflect the overall development status and trends of China's regional finance in the analysis of the process of financial development. The higher the fir value, the higher the level of financial development in the region.

In order to find the data easily, the financial related ratio is simplified as the ratio of the total amount of regional memory loans to the regional GDP to reflect the financial development level of each region in China. (financial related ratio: the ratio of total existing financial assets to national wealth at a certain point.)

	northeast	North edge	East edge	South edge	Huangzhong	Changzhong	southwest	northwest
2015	2.68	3.44	3.70	3.33	2.51	2.41	3.11	3.84
2016	3.23	3.37	3.60	4.36	2.66	3.45	3.17	4.06
2017	3.28	3.42	3.09	3.35	2.71	2.65	3.19	4.16
2018	3.36	3.50	3.66	3.36	2.71	2.66	3.19	3.97
2019	4.11	3.98	3.76	3.35	2.78	2.57	3.57	3.90

| 2020 | 4.39 | 4.41 | 4.19 | 3.74 | 3.01 | 2.88 | 2.92 | 2.28 |
| 2021 | 4.24 | 4.25 | 4.19 | 3.76 | 3.01 | 2.83 | 3.12 | 3.84 |

Table 3-3 Changes in financial related ratios in various regions

Data source: according to the statistical bulletin of the statistical bureaus of provinces, cities and autonomous regions over the years

According to the data in the analysis chart, the degree of financialization in the eight regions has changed significantly in the past seven years. In 2015, the financial related ratios of the Northeast comprehensive economic zone, the northern coastal comprehensive economic zone and the eastern coastal area were 2.68, 3.44 and 3.70, respectively. By 2021, the financial related ratios of the Northeast comprehensive economic zone, the northern coastal comprehensive economic zone and the eastern coastal area reached 4.24, 4.25 and 4.19, respectively. The degree of financial development in these areas is on the rise, However, the financial development of the southwest comprehensive economic zone and the northwest comprehensive

economic zone showed a slow upward trend before 2019, from 3.22 and 3.84 in 2015 to 3.57 and 3.90 in 2019. After 2019, affected by the epidemic, from 3.57 and 3.90 in 2019 to 3.12 and 3.84 in 2021. On the whole, China's economy has been affected differently because of the epidemic and the international situation.

3.2.2 current situation of financial development based on financial intermediary efficiency

In order to more intuitively show the degree of financial development in various regions of China and facilitate the collection of data. This paper uses the ratio of loan balance to deposit balance in various regions to measure the financial intermediary ratio.

Table 3-4 Changes in the efficiency of financial intermediation in various regions

	northeast	North edge	East edge	South edge	Huangzhong	Changzhong	southwest	northwest
2015	0.77	0.63	0.69	0.66	0.70	0.71	0.74	0.83
2016	0.78	0.61	0.70	0.68	0.71	0.72	0.74	0.87
2017	0.79	0.66	0.52	0.71	0.74	0.75	0.77	0.92
2018	0.79	0.66	0.80	0.76	0.77	0.79	0.83	0.97
2019	0.80	0.67	0.80	0.79	0.80	0.84	0.88	0.98
2020	0.77	0.67	0.80	0.79	0.81	0.88	0.74	0.99
2021	0.76	0.68	0.82	0.82	0.82	0.92	0.93	1.01

Data source: according to the statistical bulletin of the statistical bureaus of provinces, cities and autonomous regions over the years

Table 3-4 shows that the development trend of financial intermediation efficiency in various regions of China has generally increased in recent years, such as 0.63 in 2015 to 0.68 in 2021 in the northern coastal comprehensive economic zone; The eastern coastal comprehensive economic zone will increase from 0.69 in 2015 to 0.82 in 2021; The southern coastal comprehensive economic zone will increase from 0.66 in 2015 to 0.82 in 2021; From 0.74 in 2015 to 0.93 in 2021 in the southwest comprehensive economic zone; The northwest comprehensive economic zone will grow from 0.83 in 2015 to 1.01 in 2021; In the middle reaches of the Yangtze River, from 0.71 in 2015 to 0.92 in 2021. Except for the Northeast comprehensive economic zone and the northern coastal comprehensive economic zone, the efficiency of financial intermediation in other regions is far higher than the reasonable level of 72%.

3.3 Correlation Analysis of Financial and Economic Development in Eight Regions

3.3.1 correlation analysis between Financial deposits and loans and GDP in eight comprehensive economic zones

In the study of the relationship between finance and economy in various regions, there are many indicators to measure the two, which are limited to data collection. Regional GDP is selected as the indicator to measure the economy, and the deposits and loans of financial institutions in the region are selected as the indicators to measure the finance. The correlation between financial indicators and economic indicators in various regions from 2015 to 2021 is analyzed by using measurement software. The analysis results are as follows:

Table 3-5 Summary of correlation between deposits and loans of regional financial institutions and regional GDP

Northeast GDP	Northern coastal GDP	Eastern coastal GDP	Southern coastal GDP	GDP in the middle reaches of the Yellow	GDP in the middle reaches of the Yangtze River	Comprehensive GDP of Southwest China	Northwest comprehensive GDP

						w River			
Financial deposits	Pearson correlation	-.351	.883**	.971**	.931**	.987**	.930**	.972**	.700
	Sig (double tailed)	.440	.008	.000	.002	.000	.002	.000	.080

*. At 0.05 level (double tail), the correlation is significant; * * At 0.01 level (double tail), the correlation is significant.

Table 3-6 Summary of correlation between loans of regional financial institutions and regional GDP

Data source: Statistics bureaus of provinces, cities and autonomous regions		Northeast GDP	Northern coastal GDP	Eastern coastal GDP	Southern coastal GDP	GDP in the middle reaches of the Yellow River	GDP in the middle reaches of the Yangtze River	Comprehensive GDP of Southwest China	Northwest comprehensive GDP
Financial loans	Pearson correlation	-.400	.895**	.925**	.948**	.990**	.939**	.902**	.693
	Sig (double tailed)	.374	.007	.003	.001	.000	.002	.005	.085

Table 3-5 and table 3-6 reflect the overall correlation between regional GDP and deposits and loans of financial institutions in the eight regions from 2015 to 2021. In the correlation analysis of regional GDP and deposits of financial institutions in the region, except the northeast, the correlation between GDP and deposits of financial institutions in other regions is very strong, and the correlation coefficient is close to 1, which is significant at the level of 0.01. The correlation coefficient of GDP and deposits of financial institutions in the northwest comprehensive economic zone is 0.7, which is significant at the level of 0.08, indicating that they are correlated but not significant; In the correlation analysis of regional GDP and loans from financial institutions in the region, GDP and loans from financial institutions in other regions are also highly correlated, with correlation coefficients close to 1 and significant at the level of 0.01. The correlation coefficient of GDP and loans from financial institutions in Northwest comprehensive economic zone is 0.693 and significant at the level of 0.085, which are also correlated, but not significant.

On the whole, there is a correlation between regional finance and economy in China. The following is an empirical analysis.

4 EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN REGIONAL FINANCE AND ECONOMY

4.1 Data Collection and Pre-Processing

This paper selects economic indicators as the explained variable and financial indicators as the explanatory variable, and constructs a multiple linear regression model based on the panel data of eight comprehensive economic zones from 2015 to 2021. Through the relevant data of eight regions, this paper analyzes the relationship between regional financial development and economy. For the purpose of data collection and convenient sorting, and the selected indicators must be representative, the representative indicators of regional financial development and economic growth are as follows:

(1) GDP: it can comprehensively reflect the economic development of a certain region. In order to shorten the measurement scale, this paper takes the natural logarithm in data processing.

(2) Financial intermediary efficiency (FAE): in order to fully reflect the degree of financial development in a region and facilitate data collection, the selected fae=fl/fs, (FL: loan balance of financial institutions in the region; FS: ratio of deposit balance of financial institutions in the region, which can reflect the allocation efficiency of financial resources and financial development.

(3) Financial related ratio (FIR): it can measure the financial deepening degree and financial

development level of a certain region. Fir= (fl+fs) / regional GDP, that is, the ratio of deposits and loans of financial institutions to regional GDP.

In order to facilitate the calculation and eliminate heteroscedasticity, the original data are preprocessed without affecting the relative relationship of the data. The data used in this paper are from the statistical bulletin of provinces, cities and autonomous regions over the years.

4.2 Empirical analysis

4.2.1 unit root inspection

Before the empirical analysis of panel data, the stationarity test of unit root should be carried out to prevent the occurrence of pseudo regression results in the follow-up. This paper uses Eviews 10 software to test the unit root of China's regional economic and financial data.

Table 4-1 Unit root test results of panel data in China

variable	LLC inspection value	P value of LLC	ADF inspection value	P value of ADF	Inspection results
GDP	-7.62491	0.0000	21.6326	0.1555	Unstable
Fir	-6.5484	0.0000	18.3088	0.3061	Unstable
FAE	-5.35869	0.0000	14.3126	0.5754	Unstable
ΔGDP	-15.2485	0.0000	48.9461	0.0000	stable
ΔFIR	-12.2936	0.0000	40.4909	0.0007	stable
ΔFAE	-5.93025	0.0000	29.5221	0.0206	stable

According to the test results, in the original sequence of the three variables, the p value of ADF is greater than 0.05, and the test results are unstable. Therefore, the first-order difference results of the three variables show that the p value of LLC and ADF is less than 0.05, so the first-order difference results of GDP, fir and FAE are stable.

4.2.2 cointegration test

Through the unit root test, it is confirmed that each

variable is a first-order single integration variable. On this basis, it is tested whether there is a cointegration relationship between them. The Panel Data Cointegration test generally uses the Kao test and pedroni test based on the idea of E-G test and the Fisher test based on the idea of Johansen test. This paper uses the Kao test to carry out the cointegration test on the variables GDP, FAE and fir. The test results are as follows:

Table 4-2 Kao test results

		T-statistic	Prob
	ADF	-4.650841	0.0000
Residual variance		0.007472	
HAC variance		0.010565	

After analysis, the t statistic is -4.650841, and the corresponding p value is 0.0000, less than 0.01. It can be seen that there is a cointegration relationship at the significance level of 0.01, that is, there is a long-term equilibrium relationship.

4.2.3 F inspection

F-test is usually used to determine whether there are individual effects in the model and to determine whether

to choose the mixed estimation model for estimation or the fixed effect model for estimation. The F value calculation formula used in this paper is as follows:

$$F = \frac{(SSE_r - SSE_f)/(N-1)}{SSE_f/(NT-N-K)} \sim F(N-1, NT-N-K)(4-1)$$

(sser: sum of squared residuals of mixed estimation model; SSEF: sum of squared residuals of fixed effect model; N: number of sections; t time; K: number of explanatory variables)

Table 4-3 Summary of relevant parameters of F test

None sum squared resid	Fix sum squared resid	N	K	T	F value	F0.05 (7, 46) table lookup value
14.898	0.6605	8	2	7	141.66	2.2164

After the analysis of the measurement software eviews10 and the calculation of the analysis results, the F

value is 141.6577318. According to the table of F value, the value of f0.05 (7,46) is 2.216417, that is, the value of F value > f0.05 (7,46). Therefore, the fixed effect model

is selected from the mixed estimation model and the fixed effect model, and the Hausmann test is performed below.

4.2.3 Hausman test

Hausman test is to test whether the individual effect or time effect of the model is related to the explanatory variable, so as to determine whether the model form is a fixed effect or a random effect.

Table 4-4 Hausman test results

Test summary	Chi sq Statistic	Chi sq d. F	Prob
Cross section random	25.013896	2	0.0000

Through analysis, the p value is 0.0000, less than 0.01, and the original hypothesis is rejected at 99% confidence level. In determining the model form, select the fixed effect model:

4.2.4 modeling

Through F-test and Hausman test, the result is to reject the original hypothesis, so the choice of model is individual fixed effect model. Set fir as the explanatory variable x1it, FAE as the explanatory variable x2it, and GDP as the explained variable Yit, and establish a multiple linear regression model for panel data

$$y_{it} = \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} + u_{it} (4\text{-}2)$$

β_0 Represents the regression constant; Is the regression coefficient; Is a random disturbance termβ_1、$\beta_2 u_{it}$

The regression results are as follows:

Table 4-5 Model correlation coefficient

Variable	Efficient	STD. error	T-statistic	Prob
Fir	-0.183017	0.040581	-4.509956	0.0000
FAE	2.452052	0.262931	9.325847	0.0000
C	10.21252	0.228452	44.70319	0.0000

4.2.5 goodness of fit test and residual analysis

In order to determine whether the residuals pass the independent test and the degree of fitting, the autocorrelation of residuals is determined by DW value and the goodness of fit test result is determined by R2

$$R^2 = \frac{\sum_{i=1}^{n} (\hat{y}_i - \bar{y})^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2} = 1 - \frac{\sum_{i=1}^{n} (y_i - \hat{y})^2}{\sum_{i=1}^{n} (y_i - \bar{y})^2}$$

R^2 The maximum value is 1. The closer it is to 1, the better the fitting degree of the regression line to the observed value is, and the worse the reverse is. Some results are as follows:

Table 4-6 Partial results of goodness of fit test and residual analysis

R-squared	0.965783	Durbin Watson stat	1.836206
Adjusted R-squared	0.959088	Prob (F-statistic)	0.000000

The R square is 0.965783, indicating that the model has a high degree of fitting to the data; The DW value is 1.836206, ranging from 1.5 to 2.5, indicating that the residuals are not autocorrelated. According to the comprehensive results, the model conforms to the data analysis.

4.2.6 result analysis

This paper empirically analyzes the panel data of eight regions in China by establishing a multiple linear regression model. It is found that the development of regional finance in China has driven the development of local economy. The empirical results of data from 2015 to 2021 show that the degree of financial development (regional FIR) presents a significant level of 0.01 (t=-4.509956, p=0.0000<0.01), and the regression coefficient is -0.183017, indicating that the scale of financial development is negatively correlated with economic growth. There is a positive correlation between regional FAE index and regional GDP, and the relationship is significant (t=9.325847, p=0.0000<0.01), and the regression coefficient is 2.452052, which shows that the efficiency of financial intermediation is positively correlated with economic growth, reflecting that the promotion of China's regional financial development to the economy comes from the improvement of financial market functions and the continuous optimization of financial resource allocation efficiency.

5 CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

Through the analysis of the panel data of eight

comprehensive economic regions in China, it is concluded that the regional financial development and economic growth in China generally promote each other. Although different regions have different conditions, economic development can promote the efficiency of financial resource allocation, and the continuous improvement and development of the financial system promote the formation of economic capital, The development of science and technology has brought convenience to economic growth. Finally, it will promote the construction of China's dual cycle pattern and the coordinated and balanced development of China's regions.

5.2 Suggestions

Over the past 40 years of reform and opening up, driven by the international circular strategy, China's overall economy has achieved tremendous growth, but the economic growth and financial development of various regions in China are very different. Especially in recent years, under the influence of the global epidemic and the restriction of the epidemic prevention policy, in the historical process of steady economic development and continuous optimization of financial structure, we should pay more attention to the geographical differences and cultural differences of different regions, make rational use of the geographical location, economic base and other characteristics of each region to transform them into advantages, and affect the development of marginal economic weak areas.

5.2.1 implement the radiation effect of developed financial regions

From the perspective of financial and economic development of eight regions in China, the economic and financial development of coastal areas is better, while other regions have not fully developed their resource advantages in all aspects and failed to give full play to their due role. The coastal areas should implement the principle of "getting rich first and then getting rich" and make use of the coastal advantages to integrate with the international community. The external circulation drives the internal circulation, so as to drive the development of the economy and financial markets in the less developed inland areas, and ultimately promote the new development pattern of double circulation with domestic as the main body and domestic and international mutual promotion.

5.2.2 continuously optimize the regional financial system

On the whole, China's regional financial development is the reason for economic growth, and the optimization of the financial system can promote and supplement the economy among regions in China. With the continuous optimization of the financial system, the changes to the economy will become more and more obvious. However, the functions of financial institutions have not been fully revealed, which means that there is still a lack of innovation in financial products, financial risks have not been effectively dispersed, and financial institutions have not been able to meet various capital needs and play an intermediary role. These problems have been corroding the regional economic health and sustainable development. Therefore, we should always maintain the optimization power of the financial system, enrich financial products and improve financial risk resistance, so as to make the regional financial structure more reasonable and the financing efficiency higher, so as to promote economic development or prevent the economic downturn to the greatest extent.

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