

# Research on Beijing-Tianjin-Hebei Regional Financial Coordinated Development Level

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**Abstract.** By measuring the level of financial development, it is known that the level of financial development in Beijing, Tianjin and Hebei is quite different. Based on a comprehensive evaluation of the level of financial development, the empirical research finds that the main factors affecting the coordinated financial development of the Beijing-Tianjin-Hebei region are the economic foundation, human resources, and traffic conditions. According to the results presented herein development strategy to provide reference for the joint development of Beijing, Tianjin and finance.

**Keywords:** Beijing-Tianjin-Hebei regional cooperation; Financial development; Influence factors analysis.

## 1. Introduction

Finance is the core of modern economic operation, and raising the level of the financial industry is of great significance to the healthy development of the economy. In recent years, with the deepening of the reform of the financial system, China's overall financial development level has gradually increased, but regional financial development has shown an uneven trend. After the Yangtze River Delta and the Pearl River Delta, the coordinated development of the Beijing-Tianjin-Hebei region has also risen to a national development strategy. With the economic integration of the Beijing-Tianjin-Hebei metropolitan area, economic cooperation in Beijing-Tianjin-Hebei needs to expand to a deeper level. However, due to the differences in resource endowment, the lack of a good financial ecological environment, fierce financial competition, and centralization of the amount of money, the coordinated development of finance in Beijing, Tianjin, and Hebei has great challenges.[1][2]But this also shows that there is a lot of space and potential for coordinated development in the Beijing-Tianjin-Hebei region. Evaluating the level of financial development in the Beijing-Tianjin-Hebei region and exploring its influencing factors for coordinated financial development can promote the development of financial integration and inject vitality into economic growth.

Existing research on the level of regional financial development has not yet formed a unified and recognized indicator system. Many scholars start from the total amount of financial resources and use a single indicator such as Financial International Ratio (FIR) to measure financial development. [3] This cannot comprehensively and comprehensively evaluate the level of comprehensive financial development in a certain region. Therefore, the measurement of the financial development level in the Beijing-Tianjin-Hebei region requires the design of an appropriate financial development evaluation system. The measurement and comparison of regional financial development has very important practical significance. At the same time, it is the goal of this article to find out the factors that hinder financial development based on calculations. This article first calculates the level of financial development in the Beijing-Tianjin-Hebei region. Then find out the main shortcomings and influencing factors of financial development in the Beijing-Tianjin-Hebei area based on the calculation results. It also provides theoretical and practical guidance for regional financial development based on empirical results.

## 2. Calculation of Financial Development Level in Beijing-Tianjin-Hebei Region

Because finance is a multi-dimensional and multi-level system. For regional financial development evaluation indicators, it is difficult to measure the level of financial development in a

region using only one or more indicators. Therefore, this article uses comprehensive indicators to comprehensively reflect the level of regional financial development. The factor analysis method is an effective method in the multi-index comprehensive evaluation method. It mainly examines and analyzes things to reduce the intricate relationship between variables into a few comprehensive factors to obtain the most comprehensive amount of information. Compared with other methods, factor analysis does not require subjective weighting, and it can eliminate the effect of repeated information between indicators on the results, which is more suitable for analyzing this problem.

## 2.1 Comprehensive Evaluation Index System

In order to accurately and objectively measure the level of financial development in the Beijing-Tianjin-Hebei region, the selection of indicators follows the principles of independence, representativeness, feasibility and appropriateness. Based on the connotation of regional financial development, this paper draws on [4][5] and combines the actual situation in Beijing-Tianjin-Hebei region to analyze the indicators that play an important role in the financial development of Beijing-Tianjin-Hebei. FIR, the average wage of the financial industry, the number of financial institutions, the GDP per capita, the proportion of the population engaged in the financial industry, the proportion of the urban population, and the insurance density of Beijing, Tianjin, and Hebei were selected from four perspectives: financial market scale, availability of financial resources, financial ecological environment, and financial efficiency. The time span studied in this article is ten years from 2009 to 2018, and the data comes from the statistical yearbooks of the three places.[6]

## 2.2 Financial Level Measurement and Comparison

First test the partial correlation between variables. In general, higher KMO values indicate more common factors for a variable, and are more suitable for factor analysis. As can be seen from Table 1, the KMO statistic is 0.709, which is greater than 0.7, which meets the requirements of factor analysis. In addition, Bartlett's spherical test indicates a correlation between variables. So factor analysis of the data is appropriate.

Table 1. KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sample adequacy		0.709
Bartlett's sphericity test	chi-square	722.597
	df	45
	Sig.	0.000

Set the number of common factors to 3 and use the principal component analysis method to extract common factors. It is known from Table 2 that the eigenvalues of the three common factors in the sum of squares after rotation are all greater than 1, which meets the extraction principle. And the cumulative variance contribution rate is 96.914%, that is, the variance explained by the three common factors accounts for 96.914% of the total variance. The selected indicators are used to reflect the loss of information on the level of financial development in the Beijing-Tianjin-Hebei region. Since the fourth common factor, the eigenvalue becomes significantly smaller, and the ability to interpret is greatly reduced. Therefore, it is very reasonable and appropriate to choose three common factors to comprehensively reflect the level of financial development.

Table 2. Total variance explained

Factor	Initial eigenvalue			Extract square sum load			Rotated square sum loading		
	Total	Variance%	Cumulative%	Total	Variance%	Cumulative%	Total	Variance%	Cumulative%
1	7.181	71.815	71.815	7.181	71.815	71.815	4.380	43.798	43.798
2	1.666	16.662	88.477	1.666	16.662	88.477	3.792	37.917	81.715
3	0.844	8.437	96.914	0.844	8.437	96.914	1.520	15.199	96.914
4	0.152	1.516	98.430						
5	0.104	1.040	99.470						
6	0.035	.351	99.821						
7	0.009	.091	99.912						
8	0.007	.070	99.983						
9	.001	.012	99.994						
10	.001	.006	100.000						

As can be seen from the table, the common factor variance contribution rates after 3 rotations are 43.798%, 81.715%, and 96.914%. Using the variance contribution rate after rotation as the weight, the comprehensive score calculation formula is

$$F = 0.451926F_1 + 0.391244F_2 + 0.15683F_3 \quad (1)$$

Substituting the common factors of the three places into Eq.1, we get the comprehensive evaluation index of financial development level from 2009 to 2018, as shown in Figure 1. The results show that Beijing has the highest level of financial development, Tianjin is in the middle, and Hebei is the last.

From a horizontal perspective, the financial development gap between the Beijing-Tianjin-Hebei region is obvious. The index of Beijing, Tianjin and Hebei in 2009 and 2018 were 0.2455, -0.4623, -0.8180 and 1.1850, 0.3443, -0.3287. The financial development level of Hebei Province in 2018 is still not as good as that of Beijing ten years ago, which indicates to a certain extent that the financial development of the three places is not coordinated. In addition, the difference between the comprehensive financial evaluation indexes of Tianjin and Beijing, Tianjin and Hebei in 2009 was 0.7078 and 0.3557, while it was 0.8407 and 0.6730 in 2018. By observation of Figure 1, we can draw the conclusion that the financial development gap between the three places has gradually widened.

From a vertical perspective, in the 2009-2018 yearbook, the financial development pattern in the Beijing-Tianjin-Hebei region is stable, and the level of financial development has been increasing year by year. With its deep economic foundation and superior financial environment, Beijing's comprehensive financial development level index rose by 0.9395 units over the past ten years, placing it in the forefront. Relying on good regional advantages and policy support, Tianjin's financial industry development has steadily increased by 0.8066. Although Hebei Province is adjacent to the two major financial centers of Beijing and Tianjin, its financial development level index rose by only 0.4893 between 2009 and 2018, a relatively slow growth.

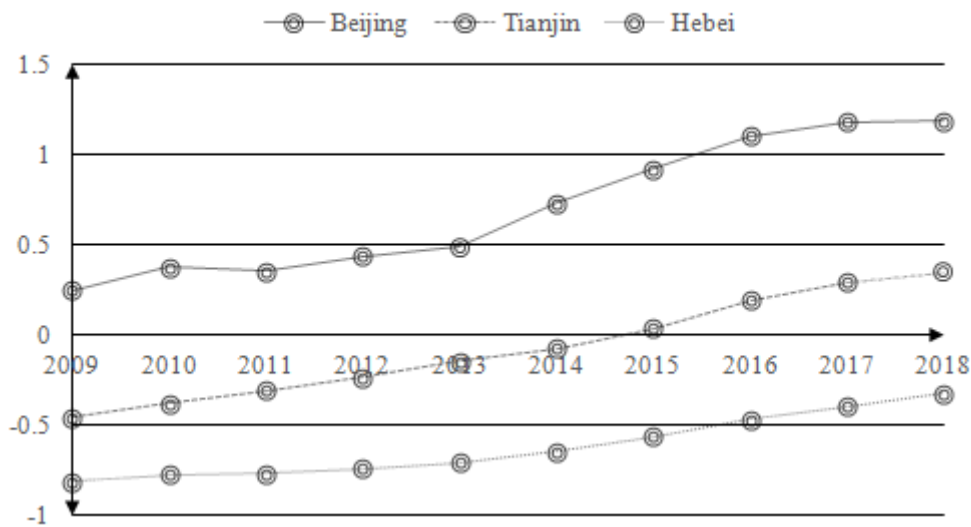


Fig 1. Financial development level measurement results

### 3. Analysis of Factors Affecting Financial Development

By measuring the regional financial development levels of Beijing, Tianjin, and Hebei, we can see that the internal financial development of the Beijing-Tianjin-Hebei region is characterized by imbalances, and the levels are significantly different. Based on the comprehensive evaluation coefficients of the financial development level obtained in the foregoing, this article conducts an empirical analysis of the influencing factors of financial development in the Beijing-Tianjin-Hebei region, in order to find out the shortcomings of financial development in each region, and provide a regional financial development and economic growth reference.

#### 3.1 Selection of Variables

In studying the influencing factors of financial development in the Beijing-Tianjin-Hebei region, this article uses the financial development level score obtained above as the dependent variable. In studying the influencing factors of financial development in the Beijing-Tianjin-Hebei region, this article uses the comprehensive index of financial development level calculated above as the dependent variable. Considering that there are many factors that affect regional financial development, this paper mainly examines the impact of external factors on the level of financial development when selecting independent variables.[7] The constructed index system is shown in Table 3 below.

Table 3. Independent variable of regression model

Meaning	Structure	Variable
Economic basis	GDP / total population	GDP
Education level	number of college students / total population	EDU
Technology level	number of patent grants / national patent grants	TECH
Policy differences	local government fiscal expenditure / GDP	GOV
Traffic condition	highway mileage / area	ROAD
Foreign trade	total foreign trade Imports and Exports / GDP	TRD

#### 3.2 Unit Root Test

In order to avoid pseudo-regression caused by the unstable data, the unit root method was first used to test its smoothness. It can be seen from Table 4 that the six-term series all reject the non-stationary null hypothesis at a significance level of 5%, that is, they behave as stationary.

Table 4. Unit root test results

Test variable	LLC	Fisher-ADF	PP
GDP	4.84369*** (0.0000)	21.3483*** (0.0016)	19.0692*** (0.0040)
EDU	-3.98567*** (0.0000)	31.1408*** (0.0000)	31.1408*** (0.0000)
TECH	-3.19619*** (0.0007)	15.9938** (0.0138)	11.8631** (0.0651)
GOV	-5.58362*** (0.0000)	19.1788*** (0.0039)	29.6867*** (0.0000)
ROAD	-2.88739*** (0.0019) ***	26.3155*** (0.0002)	29.1662*** (0.0001)
TRD	-5.08052 (0.0000)	16.7791** (0.0101)	39.3928*** (0.0000)

Note: \*, \*\*, and \*\*\* indicate significant levels at 10%, 5%, and 1%, respectively.

### 3.3 Regression Analysis

In order to eliminate the dimensional relationship between variables and make the data comparable, the data needs to be standardized. For the processed data, a regression equation with financial development level as the explanatory variable is established as

$$F_{it} = \beta_0 + \beta_1 \text{GDP}_{it} + \beta_2 \text{EDU}_{it} + \beta_3 \text{TECH}_{it} + \beta_4 \text{GOV}_{it} + \beta_5 \text{ROAD}_{it} + \beta_6 \text{TRD}_{it} + \epsilon \quad (2)$$

$i$  is the area,  $t$  is the time, and  $\epsilon_0$  is the error term.

Because the data used in this article is panel data, it has two dimensions of time series and section. The Likelihood Ratio test is first used to determine whether to choose a mixed effect regression model or a fixed effect regression model. Because the data used in this paper are different in time and cross section, the results show that the mixed effect model is rejected. The Hausman test is used to determine whether it is a fixed effect regression model or a random effect regression model. As shown in Table 5, the P value is less than 0.05, so the fixed effect model is more suitable for this study. Therefore, the results obtained by regression using fixed effects are shown in Table 6.

Table 5. Hausman test results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	4.788683**	(2,21)	0.0193
Cross-section Chi-square	11.272128***	2	0.0036

Table 6. Fixed effect model regression

Variable	Coefficient	Standard Error	T-statistic	P-value
GDP	0.378128***	0.100312	3.769526	0.0011
EDU	-0.298076***	0.054527	-5.466568	0.0000
TECH	0.136320***	0.046388	2.938699	0.0078
GOV	0.077964***	0.022612	3.447852	0.0024
ROAD	0.214781***	0.065825	3.262908	0.0037
TRD	-0.066597**	0.033573	-1.983646	0.0605
C	-0.943403***	0.105834	-8.914028	0.0000
R-squared	0.997134	F-statistic		913.3711
Adjusted R-squared	0.996043	Prob(F-statistic)		0.000000

Note: \*, \*\*, and \*\*\* indicate significant levels at 10%, 5%, and 1%, respectively.

From Table 6, it can be seen that the model fits well, with R-squared reaching 0.997134 and Adjusted R-squared reaching 0.996043. This indicates that 99.6043% of changes in regional financial development levels can be explained by changes in selected variables. At a significance

level of 5%, the F statistic value is 913.3711 and the P value is 0.0000, indicating that the linear relationship of the model is significant.

### **3.4 Result Analysis**

The explanatory variables set in this article passed the test at a significance level of 5%, indicating that these factors have a significant impact on the existence of financial development in the Beijing-Tianjin-Hebei region.

Per capita GDP, as an index to measure the degree of economic development, has the greatest impact on the level of financial development in the Beijing-Tianjin-Hebei region, with a coefficient of 0.378128. Economic development can provide funds and resources for the financial industry, and the economic foundation is critical to financial development.

The number of patent grants is an index to measure the level of technological innovation, and its coefficient is 0.13. The connection between finance and technology is getting closer and closer. Technology can support the sustainable development of finance, improve the operating efficiency of the financial industry and expand the market. Therefore, technological innovation is very important for the development of the region.

Government public financial expenditure is used as an indicator to measure the degree of government activity, and empirical results show that its coefficient is 0.077964. The financial level of the Beijing-Tianjin-Hebei region has been affected to a certain extent by the finances. Government intervention has promoted the development of the financial industry in the Beijing-Tianjin-Hebei region and affected the direction of capital and resource flows. When the government's public financial expenditure increases by one percentage point, the level of financial development can increase by 0.07 percentage point.

The total value of imports and exports is an indicator of the degree of opening up. The empirical results in this paper show that the TRD coefficient is -0.066597, which has a small impact on the evaluation of financial development level. As the largest port city in northern China, Tianjin has convenient terms of trade and is more conducive to the development of the trade industry, which occupies more resources to a certain extent. However, due to the consistent foreign policy, the three places differ in terms of import and export volume and trade exchanges, and their impact on regional financial development is relatively small.

In summary, the factor that has the greatest influence on the promotion of financial development in the Beijing-Tianjin-Hebei region is the regional economic foundation, followed by the degree of transportation convenience. At the same time, opening up and science and technology have also played a role in promoting financial development. Economic development provides the soil for regional financial development. The more developed the economy, the stronger the demand for finance. Developed science and technology can promote the continuous innovation of financial tools, means and content, and provide development momentum for finance. The improvement of traffic conditions is a sign of economic development, and it also facilitates the exchange of financial information and the flow of financial resources.

## **4. Suggestions for Promoting the Coordinated Development of the Beijing-Tianjin-Hebei Region**

Promote the reorganization of financial resources and the restructuring of the financial industry. In the previous empirical analysis, the difference in the level of economic development in the Beijing-Tianjin-Hebei region is a true reflection of the differences in the allocation of financial resources in the Beijing-Tianjin-Hebei region. As a capital, Beijing has strong economic strength and its financial scale far exceeds that of Hebei and Tianjin. The coordinated development of the Beijing-Tianjin-Hebei region needs to eliminate the barriers that restrict the flow of financial resources. At the same time, through analysis, it is concluded that policy differences are also one of the factors affecting financial development. The Beijing-Tianjin-Hebei region can remove the

institutional barriers of administrative division under the coordination of the central government and promote the formation of integrated markets.

Strengthen the construction of an integrated infrastructure network in the Beijing-Tianjin-Hebei region. In the past, due to the uneven economic development, the infrastructure construction and project planning of Beijing, Tianjin, and Hebei provinces were independent, resulting in a lack of overall coordination of resources and a poor connection, which hindered the financial development of the three cities to some extent. Transportation is one of the core links in the construction of the Beijing-Tianjin-Hebei infrastructure network, and it is also a key area for the integration of Beijing-Tianjin-Hebei.

Promote financial innovation. The level of science and technology as a positive influence indicator of the level of financial development is the driving force for the continuous development of the financial industry. Innovation in the financial industry can begin with financial instruments and institutions. Use Internet technology to reform traditional models and promote the integrated development of various financial industries.

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