

The Relationship between Real Economy and Financial Development in Shandong Province

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Abstract. The economic development focus of Shandong Province is the real economy; however, the development of the real economy and the financial industry are inseparable, and the financial industry plays an important role in supporting the development of the real economy. The rapid development of the economy in Shandong Province makes new requirements for the development and innovation of the financial industry. How to eliminate the drawbacks of the financial industry, truly achieve mutual development with the real economy, and thus effectively promote the development of the real economy is both a mission and a challenge. This work took the methods that the financial industry in Shandong Province uses to promote the development of the real economy as the mainline, concluded that the financial industry in Shandong can promote the growth of the real economy through empirical analysis, and then make targeted suggestions for the adjustment and optimization of the financial industry in Shandong Province, so that the financial industry can better serve the development of the real economy.

1. Introduction

1.1. Research Background

Since the reform and opening up, the economy in China has been in a stage of rapid growth for a long time, making China an indispensable part of world economic growth. However, due to the impact of the financial crisis that broke out in the United States in 2008, the economic and industrial structure in China has greatly changed. The development of the financial industry and the real economy is particularly prominent, playing an important role in the growth of the national economy. Among them, the economic development of Shandong Province is the most representative of this phenomenon. In 2009, Shandong Province completed a regional GDP of 3.33896.65 trillion yuan, an increase of 12.2% over the previous year; of which the gross output value of the secondary industry reached 1,890.183 billion yuan, accounting for 55.76% of the province's GDP, an increase of 1.04% over the previous year; the financial industry's GDP was 104.490 billion yuan, accounting for 3.08% of the province's GDP, which is 0.23% higher than last year. From this point of view, the development of the financial industry and the real economy has promoted the growth of GDP in Shandong Province. The research objective of this work is to explore the correlation between the two economies in Shandong Province based on the relevant data of the financial industry and the real economy industry in Shandong Province. Then it would use regression analysis to further study whether financial development can promote the real economy. Based on empirical analysis, this work sought for improved measures, so as to enable the financial industry in Shandong Province to effectively promote the development of the real economy and provide more effective policy advice for the balanced development between the financial industry and the real economy in Shandong Province.

1.2. Research status at home and abroad

Effectively promoting the development of the real economy by the financial industry is the basis for a country to formulate effective macroeconomic policies and ensure the steady growth of the country's GDP. Due to the late reform and opening up of China, the development of the financial system is not very mature, and most of the theoretical studies related to the promotion of the real

economy by the financial industry are published by foreign scholars.

The theoretical study of the financial industry supporting the growth of the real economy can be traced back to Schumpeter's (1912) innovation theory in the classical economics period. He believes that bankers provide entrepreneurs with indirect financing capital and promote technological innovation, thus promoting the real economy to get more rapid development [1]. Keynes (1936), the founder of macroeconomics, advocates to regulate the operating mechanism of financial markets through expanded monetary policy in the financial development theory, thereby promoting economic growth [2]. The endogenous growth principle found by Jovanovic and Greenwood (1990) holds that both economic growth and the development of financial institutions have endogenous elements. Financial institutions obtain currency through higher yields to support economic development; higher economic levels will also correspondingly reduce the cost of financial institutions to promote the development of financial markets [3]. Rousseau (2002) uses panel data models for regression, and through the conclusion, it can be seen that there is indeed a positive correlation between the two [4]. Sanchez, Wang and Greenwood (2010) concluded the connotation mechanism of finance promoting economic growth by establishing a financial market model [5].

There are countless articles on empirical research on financial support for economic growth, and most articles have concluded that there is a positive correlation between the two, and that the development of the financial industry can promote economic growth. Based on the relevant foreign literature, domestic scholars have made very valuable discussions based on China's basic national conditions. Most of them study the promoting effect of the national financial industry development on economic growth from a macro perspective, and they're also studies from the regional economic aspect. Domestic scholars such as Zhou Li (2002) and Zhao Min (2010) have studied the causal relationship between the financial industry and economic growth [6-7]. Li Guangzhong and Chen Ping (2002) applied the multivariable VAR system analysis method to analyze the causal relationship between the development of the financial industry and economic growth by using time series data from 1952 to 1999 in China, and concluded that there is a two-way causal relationship between related indicators of these two economic types [8]. Wu Zhi (2010) applied the Granger causality test to study the development and economic growth of China's financial industry and analyze the degree of China's financial development, and the results show that they have an obvious causal relationship [9]. Qian Fangming, Sun Ke (2008) et al make an empirical analysis of the development and economic growth of regional financial industry by using the econometric model and taking multiple cities as research objects, concluding that the relationship between the two economic types in the region not only has regional characteristics, but also has significant periodical characteristics [10].

In the above literature on the financial industry's promotion of economic growth, theoretical articles are written by foreign scholars. Most domestic scholars analyze empirically the relationship between the development of the national or regional financial industry and economic growth in China. However, there are few articles that combine theoretical analysis with empirical analysis to analyze the interrelationship between the regional financial industry and real economy, so it is of great significance to study such articles. This work used empirical analysis method to analyze the relationship between the two economic types in Shandong Province based on the analysis of related economic theories of financial industry and real economy, making up for the shortcomings of such articles.

2. Theoretical Basis for Finance to Promote the Development of the Real Economy

The role of the financial industry in the real economy is mainly reflected in two aspects: one is to improve the capital accumulation and capital use efficiency of the industry. A major feature of the financial industry is the concentration of idle funds in society through financial institutions, and the subsequent funds can form a joint force to invest in the real economy. In this way, it can not only improve the efficiency of the funds, but also reduce the operating costs of the enterprise. It is mainly reflected in broadening the financing channels of the enterprise and making it more diversified, so that information can be effectively transmitted and the cost for enterprises to obtain

information can be reduced. The other is to provide assistance for the innovative development of high-tech. Due to the profitability of capital, financial institutions should choose those with good development prospects and huge investment returns when investing. The investment return of high-tech fields is significantly higher than that of general industries, which determines that high-tech companies become the key areas for investment by financial institutions. The development of high-tech companies will inevitably drive scientific and technological progress and promote the independent innovation capabilities of China's real economy.

3. Research on the Correlation between Finance and Real Economy Development in Shandong Province

3.1. Correlation analysis of the number of business entities

Figure 1 is a scatter diagram of the number of legal entities in the financial industry and manufacturing industry in Shandong Province from 2004 to 2016. The horizontal axis represents the financial industry, and the vertical axis represents the manufacturing industry; it can be seen that the number of legal entities in the manufacturing industry increases with the number of legal entities in the financial industry, and they are positively correlated. Table 1 shows that the correlation coefficient between the number of legal entities in the financial industry and the manufacturing industry is 0.926, and they have an obvious correlation at the level of 0.01 (bilateral).

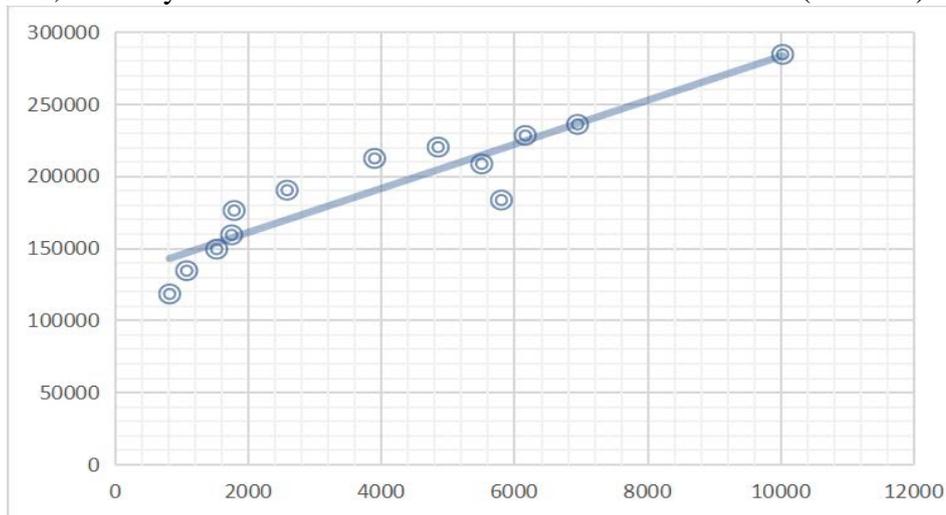


Figure 1. Correlation analysis between the number of legal entities and manufacturing companies in the financial industry

Table 1. Correlation analysis between the number of legal entities and manufacturing companies in the financial industry

		Manufacturing industry	Banking business
Manufacturing industry	Pearson	1	.926
	Significance (bilateral)		.000
	N	13	13
Banking business	Pearson	.926	1
	Significance (bilateral)	.000	
	N	13	13

3.2. Correlation analysis of the number of employees

Figure 2 is a scatter diagram of the number of employees in the financial industry and manufacturing industry in Shandong Province from 2000 to 2015. The horizontal axis represents the financial industry, and the vertical axis represents the manufacturing industry; it can be seen that the number of employees in the manufacturing industry increases with the number of employees in the financial industry, and they have a positive correlation. Table 2 shows that the correlation coefficient between the number of employees in the financial industry and the manufacturing industry is 0.898, and they have a clear correlation at the level of 0.01 (bilateral).

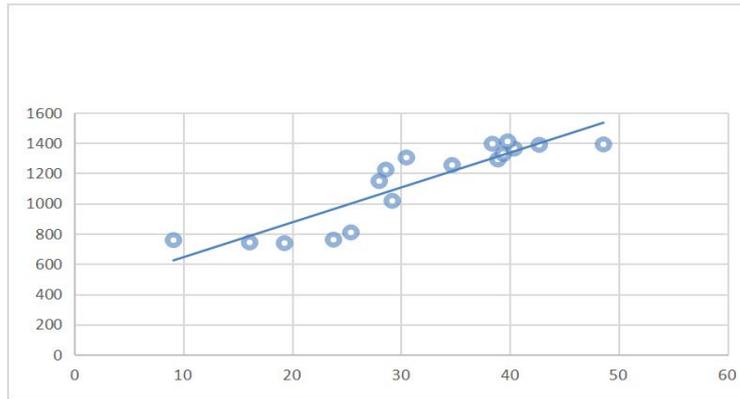


Figure 2. Correlation analysis of financial industry and manufacturing employees

Table 2. Correlation analysis of financial industry and manufacturing employees

		Manufacturing industry	Banking business
Manufacturing industry	Pearson	1	.898
	Significance (bilateral)		.000
	N	17	17
Banking business	Pearson	.898	1
	Significance (bilateral)	.000	
	N	17	17

3.3. Correlation analysis of GDP added value

Figure. 3 is a scatter diagram of the secondary industry GDP in Shandong Province and the added value of the financial industry from 1997 to 2016. The horizontal axis represents the financial industry and the vertical axis represents the secondary industry; it can be seen that the GDP added value of the increases with the increase of the GDP added value of the financial industry, and they have a positive correlation. Table 3 shows that the correlation coefficient between the number of legal entities in the financial industry and the secondary industry is 0.943, and they have an obvious correlation at the level of 0.01 (bilateral).

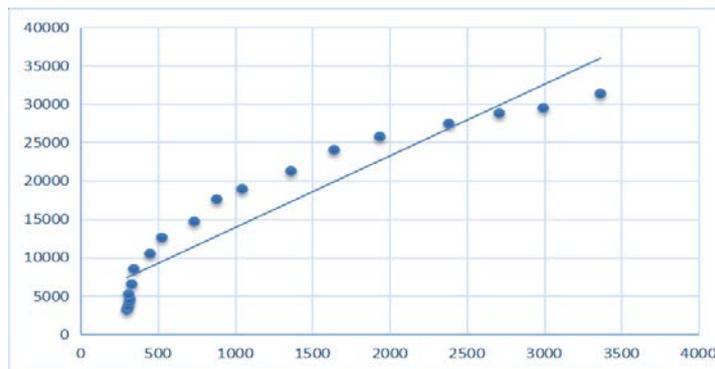


Figure 3. Correlation analysis of financial industry and manufacturing employees

Table 3. Correlation analysis of financial industry and manufacturing employees

		Manufacturing industry	Banking business
Manufacturing industry	Pearson	1	.943
	Significance (bilateral)		.000
	N	20	20
Banking business	Pearson	.943	1
	Significance (bilateral)	.000	
	N	20	20

4. Empirical Researches on Financial Promotion of Real Economic Growth in Shandong Province

4.1. Indicator selection and data source

This work selected the logarithm of the number of legal entities in the financial industry and manufacturing industry in Shandong Province from 2004 to 2016, the logarithm of the number of employees in the financial industry and manufacturing industry in Shandong Province from 2000 to 2015, and the logarithm of GDP added value of financial industry and the secondary industry in Shandong Province from 1997 to 2016. The economic and financial data used in the work are from the *Shandong Statistical Yearbook* (1997-2016). The econometric analysis in this work was realized by SPSS20 and Eviews7.2.

4.2. Variable setting and model building

In order to analyze the relationship between the two economic types in Shandong Province, "the number of legal entities in the financial industry" is selected as the explanatory variable (represented by X_1), and "the number of legal entities in the manufacturing industry" is selected as the explained variable (represented by Y_1); the "number of employees in the financial industry" is selected as the explanatory variable (represented by X_2), and the "number of employees in the manufacturing industry" is selected as the explained variable (represented by Y_2); the "GDP added value in the financial industry" is selected as the explanatory variable (represented by X_3), and the "GDP added value in the secondary industry" is selected as the explained variable (represented by Y_3).

From the scatter diagram 3-1, 3-2, and 3-3, it can be seen that the indicators of industries related to the real economy increase with the increase of related indicators of the financial industry, and their relationship can be regarded as a linear relationship. In order to analyze the quantitative regularity of the changes in the variables of the two types of economics, a simple linear regression model can be established as follows:

$$Y_1 = \beta_1 X_1 + u_1, \quad Y_2 = \beta_2 X_2 + u_2, \quad Y_3 = \beta_3 X_3 + u_3.$$

4.3. Analysis of empirical results

According to Table 4 to Table 4-9, the normative test results of the three models are as follows:

$$Y_1 = 15.290X_1 + 130056.684$$

$$(1.883) (9153.673)$$

$$t = (8.121) (14.208)$$

$$R^2 = 0.857, F = 65.955, n = 13$$

$$Y_2 = 22.829X_2 + 421.701$$

$$(2.886) (95.022)$$

$$T = (7.910) (4.438)$$

$$R^2 = 0.807, F = 62.562, n = 16$$

$$Y_3 = 9.333X_3 + 4542.622$$

$$(0.779) (1171.512)$$

$$t = (11.988) (3.878)$$

$$R^2 = 0.889, F = 143.716, n = 20$$

Table 4. Model Summary

Model	R	R ²	Adjusted R ²	Standard Estimate Error
1	0.926	0.857	0.844	18119.347

Predictors: (constant), financial industry

Table 5. Anova

Model	Quadratic Sum	df	Mean square	F	Sig.
Regression	21653860776	1	21653860776	65.955	.000
Residual	3611418221	11	328310747.3		
Total	25265278996	12			

Dependent Variable: manufacturing
 Predictors: (constant), financial industry

Table 6. Coefficients

Model	Non-standardized Coefficient		Standard Coefficient	t	Sig.
	B	Standard Error	Trial Version		
1 (constant)	130056.684	9153.673		14.208	.000
Financial Industry	15.290	1.883	0.926	8.121	.000

Dependent Variable: manufacturing

Table 7. Model summary

Model	R	R ²	Adjusted R ²	Standard Estimate Error
1	0.898	0.807	0.794	121.686

Predictors: (constant), financial industry

Table 8. Anova

Model	Quadratic Sum	df	Mean Square	F	Sig.
Regression	926391.793	1	926391.793	62.562	.000
Residual	222111.972	15	14807.465		
Total	1148503.765	16			

Dependent Variable: manufacturing
 Predictors: (constant), financial industry

Table 9. Coefficients

Model	Non-standardized Coefficient		Standard Coefficient	t	Sig.
	B	Standard Error	Trial Version		
1 (constant)	421.701	95.022		4.438	.000
Financial Industry	22.829	2.886	0.898	7.910	.000

Dependent Variable: manufacturing

Table 10. Model summary

Model	R	R ²	Adjusted R ²	Standard Estimate Error
1	0.943	0.889	0.883	3470.062

Predictors: (constant), financial industry

Table 11. Anova

Model	Quadratic Sum	df	Mean Square	F	Sig.
Regression	1730535893	1	1730535893	143.716	.000
Residual	216743950.5	18	12041330.58		
Total	1947289844	19			

Dependent Variable: secondary Industry
 Predictors: (constant), financial industry

Table 12. Coefficients

Model	Non-standardized Coefficient		Standard Coefficient	t	Sig.
	B	Standard error	trial version		
1 (Constant)	4542.622	1171.512		3.878	.001
Financial Industry	9.333	0.779	0.943	11.988	.000

Dependent Variable: secondary industry

From Table 4, Table 7, and Table 10, it can be seen that the determinable coefficients of the three models are 0.857, 0.807, and 0.889, indicating that the model as a whole fits the sample data well, that is, most of the differences in the explained variable "the number of legal entities of manufacturing industry" are explained by the explanatory variable "the number of financial legal entities", most of the differences in the explained variable "manufacturing employees in the manufacturing industry" are explained by the explanatory variable "financial employees in the financial industry", and most of the differences in the explained variable "GDP added value in the secondary industry" are explained by the explanatory variable "GDP added value in the financial industry".

The regression equation shows that for each increase in the number of legal entities in the financial industry by 1 unit, the number of legal entities in the manufacturing industry will increase by 15.290 units; for each increase in the number of employees in the financial industry, the number of employees in the manufacturing industry will increase by 22.829 units; for each increase in the added value of the financial industry by 1 unit, the GDP added value of the secondary industry will increase by 9.333 units.

4.4. Hypothesis testing and conclusions

For $H_0: \beta_1 = 0$, $H_0: \beta_2 = 0$, $H_0: \beta_3 = 0$, it can be seen from the Table 7 and Table 11 that the t value and standard error of the estimated regression coefficient β_1 are: $t(\beta_1) = 8.121$, $SE(\beta_1) = 1.883$; the t value and standard error of the estimated regression coefficient β_2 are: $t(\beta_2) = 7.910$, $SE(\beta_2) = 2.886$; The t value and standard error of the estimated regression coefficient β_3 are: $t(\beta_3) = 11.988$, $SE(\beta_3) = 0.779$. Taking $\alpha = 0.05$, we find that the degree of freedom is $n-2 = 11, 14, 18$ by checking the t distribution table, the critical value of 18 is $t_{0.025}(11) = 2.2010$, $t_{0.025}(14) = 2.1448$, $t_{0.025}(18) = 2.1009$, $t(\beta_1) = 8.121 > t_{0.025}(11) = 2.2010$, $t(\beta_2) = 7.910 > t_{0.025}(14) = 2.1448$, $t(\beta_3) = 11.988 > t_{0.025}(18) = 2.1009$, and thus we should reject $H_0: \beta_1 = 0$, $H_0: \beta_2 = 0$, $H_0: \beta_3 = 0$. The inspection shows the number of legal entities in the financial industry has a significant impact on the number of manufacturing legal entities, the number of employees in the financial industry has a significant impact on the number of employees in the manufacturing industry, and the GDP added value of the financial industry has a significant impact on the GDP added value of the secondary industry.

The ADF test is performed on the number of legal entities in the original manufacturing industry, the number of legal persons employed, and the logarithm of the GDP added value of the secondary industry and their first-order difference sequences, and it can be seen that both sequences were non-stationary. Then ADF test is performed on their second-order difference sequences, showing that the t-test statistics are -3.5477, -3.4301, and -4.0743, respectively, which are less than the critical value of the 95% confidence level, so the null hypothesis is rejected, that is, each second-order difference sequence has no unit root and the sequence is stable, so it is a second-order single sequence. The same method can be used to test that the number of legal entities, the number of legal employees, and the GDP added value of the financial industry are also second-order single sequences.

From the above unit root test, it can be seen that the indicators representing the growth of the financial industry and the real economy are second-order single sequences, which are stable under the condition of second-order differences, and meet the prerequisites for co-integration tests, which means there is a possibility of a co-integration relationship between them. Through performing ADF test on the number of legal entities in the financial industry and the logarithm of the number of manufacturing legal entities, the number of employees in the financial industry and the logarithm of the number of employees in the manufacturing industry, the GDP added value of the financial industry and the logarithm of the GDP added value of the secondary industry, it can be concluded that at the significance level of 5%, the t-test statistic values are -3.5824, -4.0528, and -3.3150, which are smaller than the corresponding critical values, so the null hypothesis is rejected. It shows that the residual sequence does not actually have a unit root and this time series is a stable sequence. It shows that there is a co-integration relationship between the number of legal entities in the

financial industry and the number of legal entities in the manufacturing industry, there is a co-integration relationship between the number of employees in the financial industry and the number of employees in the manufacturing industry, and there is a co-integration relationship between the GDP added value of the financial industry and the GDP added value of the secondary industry, indicating that there is a long-term equilibrium relationship between them.

5. Policy Recommendations

5.1. Expanding the scale of financial institutions

First of all, it is necessary to strengthen the support for credit funds in the banking industry and unblock the financing channels of the real economy. For example, it can increase the supply of credit to high-tech enterprises as well as small and medium-sized enterprises, reduce the threshold for high-tech enterprises with good credit as well as small and medium-sized enterprises, and implement preferential interest rates. It can also support the cooperation of banks in the province, build a bank lending market in Shandong Province, implement a dissolution rate policy to resolve the contradiction between the supply and demand of credit funds in the province, and promote the coordinated development of the two economic types in Shandong Province.

Second, regional financial centers can be built to promote the transformation and upgrading of the real economy industry. Shandong Province should implement more preferential policies to attract various types of financial institutions to settle in, especially those that have not yet established, build regional financial institutions, make better use of external economies of scale to improve the financial supply method, and reduce the company's financing costs to enable Shandong's financial industry to develop better.

5.2. Reshaping the financial talent training system

The basis for the cultivation of financial talents is the training of the theoretical and logical abilities of financial practitioners. At the same time, it is necessary to cultivate the professional ability of financial practitioners to solve sufficiently complex practical problems. The cultivation of this ability requires the practitioners to be able to grasp the root cause of the problem and formulate an effective solution to the problem. It is also necessary to cultivate the risk awareness of financial talents and their ability to innovate, just as financial derivatives in the financial market are derived from traditional financial instruments through innovation. In addition, scientifically understanding risks and controlling risks based on improving financial efficiency is also part of the training of financial talents.

5.3. Deepening the reform of the financial market system

First, the capital market system should be improved, and a fully functional capital market should be built, so as to further increase the direct financing channels of the real economy and optimize the financing structure of the real economy. This is mainly achieved by realizing a multi-level capital market and deepening interest rate marketization reforms. The financing needs of the economy are effectively supplied by the capital market.

Second, it is necessary to reform the financial supervision system and reduce financial risks. Shandong Province should implement an effective legal guarantee system and financial supervision rules, establish a financial supervision coordination mechanism to prevent financial supervision arbitrage and prevent financial risks. Through the perfect financial market system, the financial industry of Shandong Province can promote the development of the real economy.

6. Summary

Through the analysis of related theories, the theoretical structure of the financial industry promoting the real economy is obtained, and the practical significance is explored from a theoretical perspective. After empirical research on the financial industry and related industries of the real economy in Shandong Province, it can be concluded that the relationship between the financial industry and real economy is positively correlated and the regression analysis shows that the financial industry can indeed promote the development of the real economy. With the rapid

development of the national economy, the two economic types in Shandong Province can co-ordinate and develop together, making the financial industry more effective in supporting the real economy.

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