Research on the Relationship between Internet Financial Development and Economic Growth

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Abstract: with the popularization of Internet in China, China's Internet finance has also achieved good results. This paper discusses the relationship between the development of Internet Finance and economic growth based on the data of nine provinces in the east of China, and concludes that there is a weak positive correlation between the development of Internet Finance and economic growth, and economic growth can promote the development of Internet finance to a certain extent.

1. Introduction

To analyze the relationship between the development of Internet Finance and economic growth, we should first grasp the situation of economic growth. Here we take the development of Internet Finance and economic growth of nine provinces and cities in eastern China as the analysis object. Generally, we measure the development level of Internet finance mainly based on the scale of Internet Finance Development (i.e. the proportion of the balance of Internet deposits and loans to GDP). Since China's finance has been fully networked since 2007, and the actual data of Internet finance is hard to find, here we estimate the total loan balance of the local region instead of the loan balance of Internet finance. As banks are the absolute main body of China's Internet financial system, and credit assets are an important part of most of China's bank assets, this paper selects loan balance and GDP as the main indicators to measure economic growth, and measures the development of Internet Finance according to the formula fina = loan / GDP. This paper selects Beijing, Tianjin, Liaoning, Hebei, Shanghai, Zhejiang, Jiangsu, Shandong and Fujian provinces in the east of China as the analysis objects, and analyzes the Internet financial development of the nine eastern provinces in 2007-2016 through calculation. The specific situation is shown in Table 1.

Table 1 Economic Growth and Internet Finance Development of 9 Provinces in Eastern China

Particular year	Internet Finance Development (%)	Loan balance (RMB 100 million)	GDP (100 million yuan)
2007	1.0452	144781.6933	138522.87
2008	1.0249	169320.8353	165194.03
2009	1.0156	197105.9177	194085.15
2010	1.2004	254347.8053	211886.90
2011	1.2004	300691.7348	250487.94
2012	1.1675	342765.1316	293581.45
2013	1.2089	387750.8954	320738.47
2014	1.2348	434621.3011	351978.26
2015	1.2805	484952.8060	378727.46
2016	1.3684	549444.0829	401521.60

It can be seen from table 1 that the GDP scale and loan scale of nine provinces and cities in eastern China have a strong growth. The GDP has increased by 2.90 times in ten years, and the loan balance has increased by 3.80 times. Not only the GDP growth is large, but also the Internet finance growth is very rapid. The development level of Internet finance has increased from 101.56% to 136.84%. It can be seen that the development of Internet finance has driven economic growth.

Although the overall development of Internet Finance in nine provinces and cities in eastern China is on the rise, there is also a significant gap in the growth rate of different provinces and cities. Specifically, among the nine eastern provinces, Shanghai (1.7170), Beijing (2.0376), Zhejiang (1.2871) have the highest development level of Internet finance, and Liaoning (0.7328), Hebei

(0.7143) and Shandong (0.7679) have the lowest average level, among which Liaoning (12.526%) and Zhejiang (5.353) have the fastest annual growth rate of Internet finance %) and Hebei Province (4.943%).

Although from the overall point of view, the Internet financial industry is on the rise, but the growth rate of different provinces and cities also has a large gap. From the average of Internet finance development level in nine eastern provinces and cities, the three provinces with the highest average of Internet finance development level are Beijing (2.0376), Shanghai (1.7170), Zhejiang Province (1.2871), and the three provinces with the lowest average are Hebei Province (0.7143), Liaoning Province (0.7328), Shandong Province (0.7679); from the perspective of growth rate of each province, the eastern part of China From 2007 to 2016, the three provinces and cities with the fastest annual growth rate of Internet Finance in the region were Liaoning Province (12.526%), Zhejiang Province (5.353%) and Hebei Province (4.943%).

To sum up, under the condition of high economic growth, the development level of Internet finance will increase more or less, and there is a big difference in the growth rate of Internet Finance in eastern provinces and cities of China. If we compare this difference with economic growth, we can see that: during the period of 2007-2016, the main driving force of economic growth in nine provinces and cities in eastern China is very strong It may be affected by the indirect Internet finance from the banking system. The more developed regions are, the more abundant internet financial resources are available, but there is relatively less demand for loans. When the Internet financial resources are saturated, it is difficult for the Internet financial level to maintain a high growth rate. On the contrary, the relatively backward regions have relatively weak Internet financial level and development The development level of Internet finance will increase with economic growth.

2. Empirical Analysis

Firstly, this paper establishes the inter provincial panel data model, analyzes the differences of the economic and Internet financial development of each province through the related processing and statistical description of variable data; secondly, it modifies the model combined with the actual situation and data analysis, and tests the impact of Internet Financial Development on economic growth.

2.1 Models, Variables, and Data

$$\ln GDP_{it} = C + \alpha \ln K_{it} + \beta \ln L_{it} + \delta fiait + \gamma Z_{it} + \varepsilon_{it}$$

2.1.1 Model Building

In the above formula, lngdpit is the regional economic growth index, kit is the actual fixed asset investment in each region, lit is the actual number of employees in each region, finishing is the Internet financial development level index in each region, Zit is other control variable, ε is the random error term, subscript i = 1-9, representing 9 provinces in the East, t = 2007-2016 sample period.

2.1.2 Variable Index Selection

Regional economic growth index measures economic growth with real GDP. Nominal GDP is not selected for research here, because nominal GDP refers to the market price of the final product calculated by the current market price, and its data will be affected by inflation. To accurately reflect the actual changes of output economy, we need to eliminate the impact of price changes, so we need to get real GDP, which can better reflect the actual economic growth of provinces and cities.

According to many research documents, the investment factors in the actual fixed asset investment in various regions show certain regularity in the process of promoting regional economic development, so this variable should be considered in the model setting. As an important variable index, the real employment data of each region is because the main factors affecting the total output of regional economy include capital and labor force, and the employment number is the best index to determine the labor force data. Therefore, this paper takes the actual employment of each province as one of the variables to measure the level of economic development, and takes it as the control factor

to study the impact of labor force on the economy.

The index of regional internet financial development level takes the proportion of total loans of each province in the national GDP as the index to measure the Internet financial development level of the province, that is: Internet financial development level = total loans of the region / regional GDP of the year, as the main explanatory variable. This index can measure the development level of Regional Internet finance more truly and comprehensively. In this paper, the fixed asset investment price index in 2007 is selected as the starting point of index evaluation, and the increase or decrease of fixed asset investment price in each year compared with that in 2007 is used to reflect the actual investment level of each province in that year.

Other control variables, including fiscal variable, open variable, city variable, etc., reflect the edu variable of regional education development. The fiscal variable is the proportion of fiscal expenditure to GDP; the open variable is the degree of opening to the outside world, and the calculation method is the proportion of total import and export to GDP; the city variable is the urbanization rate, and the calculation method is the proportion of urban population to the total population; the edu variable is the average level of education of people in various regions, calculated by per capita years of education, according to primary school, junior high school, senior high school (middle school), University (junior college) or above, calculated by six, nine, twelve or sixteen years, formula is edu = $\sum$ AI Bi / $\sum$ Bi (where AI is the education period corresponding to the degree category, and Bi is the number of people obtaining the degree).

2.1.3 Data Description

The statistical description of each variable is shown in Table 2. As can be seen from table 2, fina has a maximum value of 2.37, a minimum value of 0.29 and an average value of 1.42. The gap between the two and the statistical description of the variables show that there are great differences in the development of Internet Finance in the sample period.

Table 2 Descriptive Statistics

	mean value	Median	Maximum value	minimum value	skewness	kurtosis	P value	sample size	Cross section quantity
InGDP	9.086	9.205	10.943	6.019	-0.649	3.247	0.001	209.000	11.000
InK	64.489	38.743	339.200	1.615	1.671	5.540	0.000	209.000	11.000
InL	7.567	7.769	8.800	5.789	-0.421	1.859	0.000	209.000	11.000
Fina	1.149	1.076	2.367	0.287	0.733	2.957	0.000	209.000	11.000
Fiscal	0.132	0.122	0.335	0.051	1.490	5.968	0.000	209.000	11.000
Open	0.664	0.538	1.722	0.082	0.724	2.339	0.000	209.000	11.000
City	0.562	0.572	0.896	0.183	-0.129	2.144	0.031	209.000	11.000
Edu	8.756	8.602	12.081	6.503	0.528	2.889	0.001	209.000	11.000

2.2 Estimation Results and Analysis of the Model

2.2.1 Model Inspection and Selection

Firstly, the model setting is checked. In order to test the difference of Internet finance development level and its impact on economic growth in each province, a specific panel model should be determined by setting a test. Panel data model is divided into variable intercept model, mixed effect model and variable coefficient model according to different intercept and coefficient. The latter two models are divided into fixed effect model and random effect model. In order to reduce the setting deviation of the model, the type of panel model established in this paper is tested by covariance analysis, and the F statistics are constructed as follows:

$$F = \frac{\left(SSE_r - SSE_u\right)/(N-1)}{SSE_u/(NT-N-K)} : F(N-1, NT-N-K)$$

Where, sser and sseu are the sum of residual squares of mixed effect model and variable intercept

model respectively, T represents the number of sample periods, K represents the number of explanatory variables, and N represents the number of individuals. At a given significance level, if the F-test rejects the original hypothesis, the variable intercept model is chosen, otherwise the mixed effect model is used. Using Hausman test, if the original hypothesis is denied, fixed effect model is selected, otherwise random utility model is selected. In this paper, we use eviews7.9 statistical software to carry out Hausman test and F test for panel data model respectively, and the test results are shown in Table 3.

Table 3 Hausman Test and f Test Results

Hausman test			F test		
Chi-square	Prob.	conclusion	F	Prob.	conclusion
26.953	0.0002	Fixed effect model	30.652	0.0000	variable intercept

It can be seen from table 3 that in Hausman test, X2 corresponding to panel data model rejects the random effect model at 1% significance level, indicating that it is better to select fixed effect model. The F-test corresponding to the panel data model refuses to adopt the mixed model at the level of 1% significance, indicating that the variable intercept panel data model is more suitable.

Secondly, the intra group autocorrelation test should be carried out. When there are autocorrelation problems in panel model series, the validity of regression estimation will be lost, and the model coefficients will not be significant. In this paper, Durbin Watson test is used to test the autocorrelation of panel model sequences. The test results show that DW is 0.62. According to the conditions of DW test, the model has lower first-order positive autocorrelation.

Then the heteroscedasticity between groups was tested. If the panel model has heteroscedasticity, it may also lead to model errors. In this paper, the modified Wald test is used to determine whether there is a heteroscedasticity between groups in the panel model. Under the assumption that the return on scale remains unchanged, the model is tested under the condition of C (2) + C (3) = 1. The test results show that chi square (1) = 62.23, prob > chi square (1) = 0.0000, that is to say, the model rejects the original hypothesis at 1% significance, which indicates that there is heteroscedasticity between groups in the panel model, so the model should reject the original hypothesis. 2. According to the panel data of nine eastern provinces and cities in 2007-2016, after the establishment of fixed effect model, because the above model is realized under the premise of heteroscedasticity and first-order positive autocorrelation, the panel correction standard error estimation method can effectively deal with the complex panel error structure. Therefore, on the basis of least square estimation, PCSE method is used to optimize the panel model to achieve the effect of dealing with error structure. See Table 4 for specific regression estimation results. The adjusted R2 value is 0.9966, indicating that the model fitting effect is good.

Table 4 Regression Results of Panel Data Model

variable	coefficient	T value	standard deviation	probability
C	-4.916038***	-13.19883	0.373507	0.0000
LNK	0.002766***	17.10894	0.000256	0.0000
LNL	1.443837***	25.55009	0.056415	0.0000
FINA	0.040521***	2.596203	0.014622	0.0101
FISCAL	1.393358***	6.607937	0.210356	0.0000
OPEN	0.281155***	12.13938	0.020579	0.0000
CITY	0.79023***	13.39814	0.057813	0.0000
EDU	0.233271***	15.14354	0.014829	0.0000

From the model regression results in Table 4, it can be seen that the statistical t value of the variable regression coefficient and its related probability p value have passed the significance level test of 1%. When the significance level is 1%, the test results of real employment (LNL) and real fixed asset investment (LNK) are significantly positive, indicating that the increase of capital and labor investment will promote economic growth. This is because investment in other factors is also subordinated to capital and labor investment. As long as there are capital and labor as two factors of production, the business entity can enter into production and produce benefits. However, the research results show that the increase of labor force has a greater pull efficiency pressure on economic growth

than that of fixed asset investment, which may be due to two reasons: one is the multiplier effect of fixed asset investment; the other is the decrease of marginal efficiency effect of capital.

Fiscal variables have a significant impact on economic growth, that is to say, the increase of the proportion of fiscal expenditure in GDP promotes economic growth. Combined with the actual situation of nine provinces and cities in eastern China, it is found that reasonable increase of fiscal expenditure does play a better role in promoting the effect of fiscal policy and further accelerating economic growth.

For the open variable, city variable and edu variable, there is a significant positive correlation at the level of 1%, indicating that the deepening of opening up, urbanization and the development of education will promote economic growth. In this paper, we find that fina has a significant impact on the explanatory variables, and the estimated coefficient is positive, indicating that the development of Internet finance has a certain but not very strong role in promoting economic growth. If only the variables related to regional economic growth are considered, the economic growth rate of fina will increase to 0.0405% for every 1% increase. Generally speaking, the rapid development of Internet finance must be linked with the rapid economic growth, but the rapid development of Internet finance will not only promote economic growth, but also cause inflation in some areas. The high development of Internet finance will inevitably bring the highest economic growth rate, but the peak of economic growth does not appear in the highest position of Internet finance development, but in the relatively reasonable water of Internet finance development.

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