Research on Inclusive Finance and Economic Development from the Perspective of "Internet +" Industry

——Empirical Test of Panel Data Based Threshold Regression Model

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Keywords: "Internet +", Inclusive Finance, Regional Economy, Threshold Regression Mode, Panel Model

Abstract: By establishing Inclusive Financial Development & Evaluation System to calculate the inclusive development indexes for various regions nationwide, this paper achieved more than 3,800 related data, such as "Internet+" indexes and economic development indicators for 31 domestic regions from 2012 to 2018. With the background of a series of research supports of Panel Hybrid Model and Hansen Threshold Regression Model based on Internet Era. Empirical research suggests that Internet-industry development and inclusive financial level in our country have positive correlation. But from the respective of regional development, there have many regional imbalances between Internet industry and inclusive finance development level. Actually, inclusive financial level has double threshold effect on actual regional-economy development, especially when inclusive finance index surpasses the threshold of 0. 053, such influence on regional economy has been significantly enhanced. In addition, the opening-up level and government fiscal expenditure have significant positive impacts on regional inclusive financial development level & regional economy. However, the contribution such government fiscal expenditure made upon inclusive financial development level and regional economy is less than that the opening-up level brought on inclusive financial development level and regional economy.

1. Introduction and Literature Review

At present, China is actively advocating the "Internet +" economic mode, and the mechanism of combining Internet + with inclusive finance is also vigorously praised by the state, aiming at promoting the extension and development of the Internet in the financial field with application of the efficiency and convenience of Internet + technology. Li Dan and others(2012) have empirically analyzed that the integration of the Internet and finance can meet the financial service needs of multi-level groups to achieve the goal of inclusive finance [1]. The empirical analysis of Xu Min and Zhang Xiaolin (2014) illustrates that inclusive finance can not only narrow the income gap between urban and rural areas, but also there is a long-term equilibrium relationship between the development of inclusive finance and urban-rural income distribution. According to the research of scholars at home and abroad, there is few research on the influence conduction mechanism among the Internet industry, inclusive finance and regional economy [2]. Therefore, this paper studies the development of inclusive finance and its impact on China's regional economy in the context of the Internet era.

2. Data and Variable Selection

This article mainly studies the development of inclusive finance in China from the perspective of "Internet+". the inclusive financial index is considered an independent variable and the Internet index is considered dependent variable. This is the core explanation, which is an important mark of the development level of the local Innovation Process. In addition, the development of inclusive finance is also related to many economic variables [3]. Thus referring to the method of Du Qiang (2016), this article regards Trade Openness (OF) and government expenditure (GF), the per capita

  DOI: 10.25236/edbm.2020.211

gdp and other variables as controlled variable, which is tend to improve the accuracy and comprehensiveness of demonstration [4].

2.1. Inclusive Financial Index

According to the current financial development status and economic structure of provinces in China, this paper constructs the inclusive financial measurement system from the two dimensions of service availability, usage and six indicators [5]. The formula is as follows:

$$IFI_j = \frac{1}{k}\sum_{i=1}^{k}\left(\frac{x_{ij} - m_i}{M_i - m_i}\right)^r$$

IFI_j is the expression of the inclusive financial index. k indicates the number of measurement indicators. x_{ij} is the expression of occurrence in i-th dimension and the j-th index. M_i and m_i are known as the maximum and minimum values of the i-th index. i is regarded as constant. r is the representation of sensitivity of indicator to inclusive finance index. We calculate the inclusive finance index of 31 provinces in China.

2.2. "Internet +" Index

With reference to the calculation methods of Zhou Bin, Mao Deyong, and Zhu Guibin (2017), we can calculate the “Internet +” index of each province based on different weights through the impact of experts scoring on the “Internet +” index, and then eliminate the time effect based on the Internet penetration index over the years.

2.3. Indicators of Economic Development

(1)The level of openness

Based on relevant data, the level of regional openness will affect the development of the local financial industry. Therefore, it is introduced as a variable and forms a specific calculation formula as follows:

$$GF_{i,t} = \frac{finance_{i,t}}{GDP_{i,t}} \tag{1}$$

$x_{i,t}$ represents the export value of the i-th province during t period and $m_{i,t}$ represents the import value from the province. $GDP_{i,t}$ represents the GDP of the i-th province during t period.

(2) Fiscal expenditure scale of Government

The fiscal expenditure scale reflects the budget plan of a certain area by the financial department and its construction method is:

$$OF_{i,t} = \frac{x_{i,t} + m_{i,t}}{GDP_{i,t}} \tag{2}$$

$finance_{i,t}$ shows the fiscal expenditure of the i-th province during t period. $GDP_{i,t}$ shows the GDP of the i-th province during t period.

(3)GDP per capita

we eliminate heteroscedasticity on the variable and record it as LGGDP. The calculate is as follows:

$$LGGDP_{i,t} = LOG(\frac{GDP_{i,t}}{N}) \tag{3}$$

LGGDP represents the per capita GDP of the i-th province during t period. N represents the economic population of the i-th province during t period.

3. Model Settings

3.1. The Panel Data Model

The basic form of the panel data model is:

$$y_{it} = a_{it} + b_{1t}x_{1it} + b_{2t}x_{2it} + ... + b_{kt}x_{kit} + u_{it}(i = 1,2,..., N; t = 1,2,..., T) \quad (4)$$

Among which: $b_i = (b_{1t}, b_{2t}, ..., b_{kt})^{'}$ is the Coefficient vector of $k \times 1$. u_{it} is a stochastic error that satisfies hypothesis of mutually independent, zero mean and homoscedasticity as ϑ_u^2.

According to the pattern variables and data features in this paper, the samples were tested by LM Test and Hausman Test, and it can be seen that the samples do not have double fixed effect of individual and practice. Therefore, the panel mixed effect model has been utilized in this paper for empirical analysis, and the model is shown as follows:

$$IFI_{i,t} = \alpha_0 + CSI_{i,t} + GF_{i,t} + OF_{i,t} + LGGDP_{i,t} + \varepsilon_{i,t} \quad (5)$$

Among them, i and t represent the region and time respectively. IFI is the representative of the level of inclusive finance as the explanatory variable. CSI is "Internet +" index as the explanatory variable, GF and OF represent the local fiscal expenditure scale and the degree of openness as the control variable, respectively. LGGDP is GDP per capita indicator after taking the natural logarithm

3.2. Threshold Regression Model

The basic assumption of the threshold regression model is:

$$y_i = \theta_1 x_i + \ell_i, q_i \le \gamma$$

$$y_i = \theta_2 x_i + \ell_i, q_i > \gamma \quad (6)$$

Among them, $x_i$as explanatory variables, γ is called "threshold variables".

In order to study the difference in the impact of economic development on inclusive finance in the context of Internet, this paper explores the nonlinear relationship between economic development and inclusive finance according to formulas (1) and (2) with the addition of two control variables, namely, the level of opening to the outside world and the fiscal expenditure scale. Therefore, the specific model of this paper is:

$$LGGDP_{i,t} = \alpha_0 + \alpha_1 CSI_{i,t} \bullet I(FII \le \gamma_1) + \alpha_2 CSI_{i,t} \bullet I(\gamma_1 < FII < \gamma_2) + \alpha_3 CSI_{i,t} \bullet I(FII > \gamma_2) + \alpha_4 GF_{i,t} + \alpha_5 OF_{i,t} + \mu_{i,t} + \varepsilon_{i,t} \quad (7)$$

4. Experimental Results

4.1. Results Of Mixed Panel Regression

In order to analyze the influence of the development level of the Internet on the development of inclusive finance in various regions in China, this article divides the sample into three sub-samples of eastern, central and western with reference to the regional division method of the National Bureau of Statistics. we perform regression analysis on them. The results of regression are as follows：

Table 1 Results of regression regions

	Eastern	Middle	Western
$CSI_{i,t}$	0.035(2.844)**	0.013(0.903)	0.012(2.883)**
$GF_{i,t}$	0.370(2.038)*	-0.059(-1.837)	-0.194(-2.240)*
$OF_{i,t}$	0.908(3.259)**	0.786(1.011)	1.232(2.764)**
$LGGDP_{i,t}$	0.332(4.402)***	0.078(1.816)	0.027(3.231)**
constant	-0.313(-5.797)***	0.001(0.027)	0.043(2.940)**
Goodness of fit	0.778	0.114	0.371

In the regional regression results, the coefficients of Internet development level of the sample results in the eastern and central regions passed the significance test, while the coefficient of each variable in the model of the western region failed the test, indicating that there is no linear relationship between Internet development level and inclusive financial development in the western region. In the regression equation of the eastern region, the regression coefficient of its "Internet +" index is 0.035, which illustrates that the improvement of the Internet development level in the eastern region will promote the development of inclusive finance. The local government financial expenditure, the degree of openness and regional economic development index are all significant at a statistical level of 10%, and the coefficient value is greater than zero, indicating that the growth of regional economy and the degree of openness will drive the development of inclusive finance. The regression coefficient of the central region is 0.013, which shows that the positive contribution rate of Internet + development to the inclusive financial level in the central region is less than that in the eastern region [6]. There is a certain gap between the development of Internet industry in the eastern, central and western regions of China, resulting in the unbalanced development of inclusive finance in these regions.

4.2. Threshold Regression Model

(1)Model Test

Threshold detection of the formula (7) needs to be carried out. Using the adaptive sampling method to calculate the F value, p-value and critical values，which is tend to determine the number of thresholds. The results are as follows:

Table 2 Results of threshold effect by self-sampling test

Single threshold	
F	41.309
P value	0.450
(Critical value of 1%, 5%, 10%)	75.81, 73.898, 69.510
Double threshold	
F	22.875
P value	0.050
(Critical value of 1%, 5%, 10%)	32.446, 24.831, 13.811
Triple threshold	
F	18.015
P value	0.000
(Critical value of 1%, 5%, 10%)	16.081, 14.470, 12.084

As can be seen from the table2, the p-values of the single threshold, double threshold, and triple threshold effects in the model are 0.450, 0.050, and 0.000 respectively. The single threshold is not significant at the 5% level.The double threshold and the triple threshold pass significance tests at the 1% and 5% levels. Therefore, this model is a double threshold model or a triple threshold model. Considering the economic connotation and feature samples of samples and reducing the number of space division, we select the double threshold model in this paper.

(2)Threshold Estimation Result

Table 3 Estimated results of threshold value

γ	Model	
	Threshold estimate	confidence interval of 95%
γ	0.089	(0.072，0.114)
γ	0.053	(0.049，0.058)

Secondly, it also talked about how to check authenticity of the above thresholds. And the threshold estimations and 95% confidence intervals of the model have been shown in the above table4. In addition, it also presented likelihood ratio diagrams of all the thresholds accordingly. Threshold value refers to threshold parameter value when realizing the above figure and forming

intersection by LR=0. The fact is that 95% confidence intervals of γ_1 and γ_2 are the collection of all γ values when reaching significant-level threshold values (shown as dashed line in the figure) when LR $<$ 5%, which is the interval formed by γ when LR places below dashed line. Seen from Table 4 , the threshold values of model (7)are 0.089 and 0.053 respectively. So, the threshold estimations are accurate and effective achieved in Table 3.

The estimated results of the business cycle synergy model are as follows:

Table 4 Estimated results of model

variable	Model estimation
Threshold	0.053 and 0.089
LGDP	-0.192(0.027)
OF	18.229(0.007)
GF	5.249(0.015)
CSI_1	8.720(0.011)
CSI_2	14.504(0.013)
CSI_3	30.454(0.016)
_cons	0.979(0.000)
R pingfang	0.044
F	1.45[0.021]

It can be seen from the Table 4 that the development of Internet industry has significant difference effect on regional economy under the constraints of inclusive financial development level. When the development level of inclusive finance is within the threshold of 0.053, the development level of Internet industry has a remarkable negative correlation with the regional economy; when it is between 0.053 and 0.089, the synergy effect on the economic cycle is significantly positively correlated, and the promotion role of the Internet industry is obviously strengthened; if it crosses the threshold of 0.089, the development of Internet industry will play a more important role in regional economy. This shows that in the context of Internet +, inclusive financial level has positive effect on the development of regional economy, and for most developed provinces along the eastern coast, the development of Internet industry will sustainably promote the regional economy by influencing the inclusive financial level. When there is a positive impact on the economy of a province, the provinces with high levels of inclusive finance should reasonably allocate industrial resources, and adjust economic activities flexibly and rapidly to maximize the positive impact effect.

5. Conclusion and Suggestion

Firstly, according to the panel regression model, we can see that the development level of inclusive finance in China is gradually improving with regional imbalance. The inclusive financial level in eastern provinces is relatively higher than those of the central and western regions due to its relatively developed Internet industry. Secondly, from the perspective of Internet industry development, inclusive finance does have a double threshold effect on the development of regional economy. The impact of inclusive finance on regional economy is significantly enhanced when its index exceeds 0.053. Thirdly, in the era of Internet plus, the level of openness and government expenditure have a significant positive impact on the development of inclusive finance and regional economy. However, the contribution rate of the government fiscal expenditure to the development level of inclusive finance and the regional economy is less than that of the opening up degree.

References

[1] Androutsos A. Access link bandwidth externalities and endogenous internet growth: a longrun economic approach. International Journal of Network Management, vol. 21, no. 1, pp. 21-24, 2011.

[2] Lin Zheng, Li Gaoyong. Research on the Development of Inclusive Finance under the Background of Internet Finance. Fiscal Finance, no. 5, pp. 12-13, 2016.

[3] Honohan P. Measuring microfinance access: building on existing cross-country data, 2005.

[4] Berger S C F, Gleisner. Emergence of financial intermediaries in electronic markets: the case of online P2Plending. Business Research, no. 2, pp. 39-65, 2009.

[5] Li Dan, Pan Zili. Research on Financing Problems of Small and Medium-sized Enterprises Based on Internet Finance. Financial Research, no. 10, pp. 3-12, 2015.

[6] Liu Wenfeng. A Probe into the Path of "Internet +" Inclusive Financial Construction. Heilongjiang Finance, no. 9, pp. 18-21, 2015.