

Research on the coordinated development of digital finance and rural revitalization

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Abstract: In the report of the 20th National Congress of the Communist Party of China, it was proposed to comprehensively promote rural revitalization, and the nation should be rejuvenated and the countryside must be revitalized. This paper uses the entropy weight method to construct the index system of rural revitalization development level, uses the coupling coordination degree model, and empirically analyzes the coordinated development level of digital finance and rural revitalization with the help of provincial data of Heilongjiang Province from 2012 to 2021, and puts forward relevant countermeasures and suggestions to improve the coordinated development of digital finance and rural revitalization.

Keywords: Digital Finance; Rural revitalization; Entropy weight method

1. Introduction

Over the years of reform and opening up, the party has united and led the people to create one miracle after another, and China's economy has developed rapidly. However, in the process of economic development, the problem of unbalanced development between urban and rural areas has become increasingly prominent, which restricts the sustained, healthy and rapid development of China's economy to a certain extent. It can be seen that the key to solving the problem of rural economic development lies in rural revitalization. At present, China's digital finance has a strong development momentum and has become a new driving force for China's economic development.

Existing relevant studies show that digital financial services have good conditions for rural revitalization. Mei Yan et al. (2021) compared the digital rural development models of four typical developed countries in the United States, Japan, the United Kingdom and France, and concluded that China's digital technology-enabled rural revitalization construction is still in its infancy, and a new rural development model with low-cost investment should be formed with rural residents as the core, giving full play to the advantages of digital technology to innovate products, and combining the practical needs of rural development. Zhou et al. (2022) believe that the main obstacle to the development of rural revitalization is the weak rural financial system, and digital finance is an important way to effectively promote the development of rural finance. On the basis of drawing on the existing literature, this paper uses the entropy weight method to measure the development level of rural revitalization, constructs a coupling and coordination model of the two systems of digital finance and rural revitalization, takes Heilongjiang Province as the research object to measure the coordinated development level of digital finance and rural revitalization, and then puts forward relevant suggestions for constructing a new pattern of coordinated development of digital finance and rural revitalization.

2. Research Methods

2.1 Construction of indicator system

In this paper, we summarize the development level of digital finance by referring to the previous relevant literature, and select the digital finance index measured and released by Guo Feng and others from the Digital Finance Research Center of Peking University using the back-end data of Ant Financial to describe the development level of digital finance.

Based on the practices of Xu Xue and Wang Yongyu, this paper constructs a rural revitalization level measurement index system containing 8 secondary indicators from three dimensions: industrial prosperity, affluent life and livable environment. See Table 1 for details:

Table 1. Evaluation index system for rural revitalization development

Dimension	Metric metrics	Calculation method	Indicator direction
industrial prosperity	Total power of agricultural machinery per capita	Total power of agricultural machinery/Total rural population	Positive
	Per capita gross production value of agriculture, forestry, animal husbandry and fishery	Gross value of agriculture, forestry, animal husbandry and fishery/Total rural population	Positive
	Irrigated area per capita	Effective irrigated area/Total rural population	Positive
affluent life	The income level of rural residents	Per capita disposable income in rural areas	Positive
	Consumption structure of rural residents	Engel coefficient of rural households	Negative
ecological livability	Level of accessibility	Road area per capita	Positive
	Natural ecological level	Forest cover	Positive
	Level of natural resources	Water resources per capita	Positive

2.2 Data source

This paper selects the panel data of Heilongjiang Province from 2012 to 2021, which comes from the China Statistical Yearbook and Heilongjiang Statistical Yearbook, and the digital finance index comes from the Digital Finance Research Center of Peking University.

2.3 Data processing

Entropy weight method. Drawing on the existing experience of measuring weights, this paper uses the entropy weight method to measure the development level of rural revitalization, and the specific steps are as follows:

(1) Build a raw data matrix. Among them, the j th indicator value of the i th year is: X_{ij} .

(2) Normalization of data: This paper uses the range method to deal with the problem of normalization of existing data samples, which is expressed as follows:

$$X'_{ij} = \frac{X_{ij} - \min(X_{ij})}{\max(X_{ij}) - \min(X_{ij})} \quad (\text{Positive indicators})$$

$$X'_{ij} = \frac{\max(X_{ij}) - X_{ij}}{\max(X_{ij}) - \min(X_{ij})} \quad (\text{Negative indicators})$$

(3) After standardizing each indicator, the weight of the j th indicator in the i th year is calculated P_{ij} :

$$P_{ij} = \frac{Z_{ij}}{\sum_{i=1}^n Z_{ij}}$$

(4) The information entropy of each indicator is calculated:

$$e_j = -\frac{1}{\ln(n)} \sum_{i=1}^n P_{ij} \ln(P_{ij})$$

(5) This paper analyzes the coordinated development of digital finance and rural revitalization with the help of the coupling coordination degree model. Calculate the degree of coupling:

$$c = \sqrt{\frac{U_1 \cdot U_2}{(U_1 + U_2)^2}}$$

(6) Calculate the degree of coupling coordination:

$$T = \alpha U_1 + \beta U_2$$

$$D = \sqrt{C \cdot T}$$

In the above formula: T is the coordination index, which reflects the comprehensive level of digital finance and rural revitalization; α and β represent the importance of digital finance and rural revitalization, respectively, and this paper argues that digital finance and rural revitalization are equally important. Therefore, take $\alpha = \beta = 0.5$.

3. Empirical analysis

3.1 Empirical process

The study period selected for this study is 2012-2021. Among them, the digital finance development index comes from the Digital Finance Research Center of Peking University, and the relevant data of the rural revitalization index are from the China Statistical Yearbook and the Heilongjiang Statistical Yearbook. According to the economic resilience evaluation index system constructed above, the information entropy formula is used to solve the specific information entropy value of each evaluation year, and the coupling and coordination degree of digital finance development and rural revitalization development are further calculated, and the specific calculation results are shown in Table 2:

Table 2. Weights and coupling coordination degrees of rural revitalization indicators in Heilongjiang Province from 2012 to 2021

year	Information entropy	Coupling coordination	Coordination level	The degree of coupling coordination
2012	0.149	0.103	2	Severe disorders
2013	0.260	0.430	5	On the verge of disorder
2014	0.453	0.647	7	Primary coordination
2015	0.307	0.582	6	Barely coordinated
2016	0.323	0.638	7	Primary coordination
2017	0.353	0.673	7	Primary coordination
2018	0.467	0.782	8	Intermediate coordination
2019	0.560	0.849	9	Good coordination
2020	0.673	0.918	10	High-quality coordination
2021	0.761	0.966	10	High-quality coordination

3.2 Analysis of empirical results

From the weights of the indicators in Table 2, it can be seen that the overall development level of rural revitalization in Heilongjiang Province has shown a rapid upward trend, and the information entropy value has increased by 5.6 times from 0.103 in 2012 to 0.759 in 2021, which is inseparable from Heilongjiang Province's emphasis on agricultural and rural modernization.

From the evaluation results in Table 2 and referring to the grading criteria of coupling coordination, it can be seen that the coordination between digital finance and rural revitalization development in Heilongjiang is generally good, and the variation range of coupling coordination degree is between 0.103~0.994. Only in 2015 did the degree of coordination decrease, and the rest of the years showed a rapid upward trend. With the passage of time, the coupling and coordinated development of digital finance and rural revitalization development in Heilongjiang has become better and better, from a serious imbalance in 2012 to a high-quality coordination state in 2021, indicating that digital finance has been synchronized with the development of rural revitalization, and has gradually become an inseparable link in economic development.

4. Conclusions and Recommendations

Based on the strategy of promoting rural revitalization, this paper constructs an evaluation index system for rural revitalization development, and takes the provincial data of Heilongjiang Province from 2012 to 2021 as a sample, measures the development level of rural revitalization in Heilongjiang Province with the help of entropy weight method, and uses the coupling coordination degree model to measure the coordination degree between digital finance and rural revitalization development. The results show:

First, in 2012, the level of rural revitalization and development in Heilongjiang Province was relatively backward, and with the development of the economy, by 2021, it will be significantly improved compared with 2012.

Second, from 2012 to 2021, the level of coupling and coordination between digital finance and rural revitalization in Heilongjiang Province gradually developed from serious imbalance to high-quality coordination, and the degree of coupling and coordination development

maintained an increasing trend year by year.

Based on the conclusions of the study, the following suggestions are put forward:

First, we should make full use of digital finance, continue to innovate financial services, simplify the transaction process, and broaden transaction channels, so that rural users can enjoy financial services more conveniently and efficiently.

Second, we should closely integrate digital technology to form a new Internet model and give birth to new industrial formats, so as to stimulate the coordinated development of digital finance and rural revitalization through technological dividends.

Third, with the help of digital finance, we should optimize the construction of network infrastructure in rural areas, optimize the rural industrial structure, and improve rural housing, education and medical conditions, so as to help achieve all-round revitalization of rural areas.

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