

Financial Support for Rural Cooperative Economy in China Based on Grey Correlation Analysis

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Abstract This paper firstly analyzed current situations of financial support for rural cooperative economy in China and tested the correlation between rural finance and rural cooperative economy using the grey correlation analysis method. Results indicate that there is a close relationship between amount, structure and efficiency of rural finance and development of rural cooperative economy. The amount of rural finance has the largest promotion function to development of rural cooperative economy, the next is rural finance structure, and the least is efficiency of rural finance. Based on research conclusions, it came up with pertinent policy recommendations.

Key words Rural finance, Rural cooperative economy, Grey correlation

1 Introduction

China is a large agricultural country. Without agricultural development, national economy will not achieve considerable development. As a core of rural economy, rural finance plays an irreplaceable role in development of rural economy. Since the promulgation and implementation of *Law of the People's Republic of China on Farmers' Specialized Cooperatives* in July 2007, rural cooperative economic organizations have been developing rapidly and become an essential part and future development direction of rural economic development. In the *Decision of the Central Committee of the Communist Party of China on Some Major Issues Concerning Comprehensively Deepening the Reform* made at the Third Plenary Session of the 18th Central Committee of the Communist Party of China in 2013, it clearly stated that it is required to encourage rural areas to develop cooperative economy and support the large-amount, specialized and modernized operation^[1]. Financial support for rural cooperative economy determines development prospect of rural cooperative economy. In this study, we tested correlation between rural finance and rural cooperative economy. Finally, we came up with some recommendations for improving financial support of rural cooperative economy.

2 Current situations of financial support for rural cooperative economy

2.1 Preliminary establishment of rural financial system

With many years of sustained effort, China is establishing a multi-level, wide-coverage and moderately competitive rural financial service system composed of banking financial institutions, non-banking financial institutions, and other micro financial organizations. Complementary function and mutual cooperation of policy finance, commercial finance and cooperative finance promote con-

venience and availability of rural financial services. Since comprehensive launching of pilot project of rural credit cooperative reform in 2003, a new round of rural financial reform and innovation are advancing in an all around way. By the end of 2014, there were 2350 rural credit cooperatives (including rural commercial banks and rural cooperative banks) and 78246 business offices, agriculture-related loan and farmer loan up to 7069.5 billion yuan and 3388.9 billion yuan, accounting for 30% and 63.2% of all financial institutions, and the function of financial support for three rural issues is constantly giving play. The reform of Three Rural Issues Financial Division of the Agricultural Bank gives certain independence in administration mechanism, financial accounting, and risk management. After expansion of pilot scope, business volume and profit amount of branches of pilot county account for 40% and 80% of total business volume and profit amount respectively, showing effective improvement of rural financial service level. Overall plan for reform of agricultural development bank was formally completed in November, 2014. In future, it will further strengthen policy function, to practically bring backbone function of rural financial system into full play. Postal Savings Bank should bring into play advantages of nationwide network and constantly enhance county-wide financial services. State Development Bank should bring into play financial support role in promoting rural and county-wide social construction, and actively support go-out strategy of agriculture. New rural financial institutions play an important role in enriching county-wide financial system, and solving the problems of low coverage, insufficient financial services, and incomplete competition of financial institutions in rural areas^[2].

Besides, with deepening and popularization of Internet technology, Internet based finance develops rapidly. Various Internet based financial types appear, such as crowd funding, online sales of financial products, mobile phone bank, mobile payment, etc. Some Internet financial organizations also make some valuable exploration in supporting three rural issues concerning agriculture, farmers and countryside.

2.2 Loan limit of rural cooperative economic organizations is constantly increasing

In recent years, with introduction of three rural issues and extensive appearance of rural cooperative economic organizations, under policy support of many departments and joint effort of financial institutions, the effort of financial support for rural cooperative economic organizations is constantly strengthening. By the end of 2014, the balance of rural loan in financial institutions was 19438.3 billion yuan, with year-on-year growth up to 12.4%; the loan balance of farmers was 5358.7 billion yuan, with year-on-year growth up to 19%; loan balance of rural enterprises and various economic organizations was 14079.6 billion yuan, with year-on-year growth of 10%.

3 Variable selection and model specification

3.1 Selection of variables In this study, we selected rural finance amount (RFA), rural finance structure (RFS), and rural finance efficiency (RFE) to reflect development situations of China's rural finance, and use amount of rural cooperative economy (RCE) to manifest development level of rural cooperative economy. Definitions of these four indicators are as follows.

(i) Rural finance amount (RFA). Rural finance amount is usually measured by FIR and M2/GDP. FIR is Financial Interrelations Ratio. Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition of money supply is frequently called M2. Since China's rural financial system is typical bank leading financial system, we used the ratio of loan balance of rural cooperative economic organizations to rural GDP to measure China's rural finance amount.

(ii) Rural finance structure (RFS). With great support of government for rural cooperative economy, the function of rural cooperative economy in rural economy will become more and more important. Therefore, we selected the ratio of loan balance of various rural cooperative organizations to rural loan balance to represent rural finance structure.

(iii) Rural finance efficiency (RFE). The rural finance efficiency level reflects the ratio of loan balance to deposit balance. In this study, we used the ratio of loan balance of rural cooperative

economy to rural cooperative economy deposit balance to represent the rural finance efficiency. (iv) Amount of rural cooperative economy (RCE). In order to ensure quantization and availability of the study, we selected the GDP of primary industry as amount of rural cooperative economy. Compared with total GDP, the GDP per capita can better reflect actual situation of rural economic growth, so we selected rural GDP per capita to measure rural economic development level.

3.2 Model specification Model specification refers to the description of the process by which the dependent variable is generated by the independent variables. Thus, it encompasses the choice of independent and dependent variables, as well as the functional form connecting the independent variables to the dependent variable. Specification can also include any assumptions about the stochastic component of the model. In this sense, specification should be made before estimation. Considering China's rural cooperative economy develops rapidly in recent years, there are relatively few data available, small sample data reflect incomplete and unclear information, we adopted grey correlation analysis method to discuss the relationship between rural finance and rural cooperative economy. For size of sample data and whether conforming to typical probability distribution, there is no requirement in the grey correlation analysis method. Besides, it does not need much calculation, so it is very convenient, and there will not inconsistency between quantitative results and qualitative analysis results^[3]. The basic idea is using similarity level of geometric shape of data curves for time series to measure whether they are closely connected with each other. If curves are closer to each other, the correlation between corresponding series is higher; otherwise, the correlation will be lower^[4].

4 Empirical analysis

4.1 Data source and processing Original data of this study were selected from websites of State Statistical Bureau, The People's Bank of China, *China Statistical Yearbook*, and *Almanac of China's Finance and Banking*. According to above-mentioned definitions of variables, we made processing of these original data and obtained following indicator assignments for rural finance and rural cooperative economy, as listed in Table 1.

Table 1 Indicator assignments of rural finance and rural cooperative economy

Year	Rural finance amount (RFA)	Rural finance structure (RFS)	Rural finance efficiency (RFE)	Amount of rural cooperative economy (RCE)
2008	0.17	0.93	0.88	4787
2009	0.27	0.51	0.95	5110
2010	0.58	0.29	0.36	6040
2011	0.58	0.27	0.42	7233
2012	0.47	0.23	0.62	8395
2013	0.44	0.24	0.82	9744
2014	0.47	0.21	0.96	11258

4.2 Grey correlation analysis

Grey correlation analysis

adopts a specific concept of information, and it defines situations

with no information as black, and those with perfect information as white. However, neither of these idealized situations ever occurs in real world problems. In fact, situations between these extremes are described as being grey, hazy or fuzzy. Therefore, a grey system means that a system in which part of information is known and part of information is unknown. With this definition, information quantity and quality form a continuum from a total lack of information to complete information - from black through grey to white. Since uncertainty always exists, one is always somewhere in the middle, somewhere between the extremes, somewhere in the grey area. Steps for data processing of grey correlation analysis are as follows:

Step one: select reference series $X_0 = (x_{01}, x_{02}, x_{03}, x_{04}, x_{05}, x_{06}, x_{07})$, and comparison series $X_i = (x_{i1}, x_{i2}, \dots, x_{i7})$, where $i = 1, 2, 3$. In this study, we took the amount of rural cooperative economy (RCE) as the reference series, and took rural finance amount (RFA), rural finance structure (RFS) and rural finance efficiency (RFE) as comparison series.

Step two: take dimensionless (standardized) processing of variables. Because data of series have different units, to eliminate incommensurability generated from dimensionless processing, we generally make dimensionless processing when making grey correlation analysis. Common methods include initial value method and mean value method. We adopted initial value method. The equation is $X'_i = X_i/x_{i1} = (x'_{i1}, x'_{i2}, \dots, x'_{i7})$, where $i = 0, 1, 2, 3$. Table 2 lists initial values of series obtained from dimensionless processing.

Table 2 Initial values of series

Series\Time	2008	2009	2010	2011	2012	2013	2014
X'_0	1.000	1.196	1.278	1.506	1.806	2.097	2.434
X'_1	1.000	1.588	3.412	3.412	2.765	2.588	2.765
X'_2	1.000	0.548	0.312	0.290	0.247	0.258	0.226
X'_3	1.000	1.080	0.409	0.477	0.705	0.932	1.091

Step three: calculate absolute difference between comparison series and reference series in the same period, written as $\Delta_{0i} = |x_0(k) - x_i(k)|$, $i = 1, 2, 3$; $k = 1, 2, \dots, 7$.

Table 3 Absolute difference of series

Series\Time	2008	2009	2010	2011	2012	2013	2014
Δ_{01}	0.000	0.392	2.134	1.906	0.959	0.491	0.331
Δ_{02}	0.000	0.648	0.966	1.216	1.559	1.839	2.208
Δ_{03}	0.000	0.116	0.869	1.029	1.101	1.165	1.343

Step four: select the maximum value and minimum value from absolute difference of series. The maximum difference is $M = \text{Max}_i \text{Max}_k \Delta_i(k)$, while the minimum difference is $m = \text{Min}_i \text{Min}_k \Delta_i(k)$. From Table 3, we could find that $M = 2.208$, and $m = 0.000$.

Step five: calculate the grey correlation coefficient. $r_{0i}(x_0(k), x_i(k)) = (\Delta_{\text{min}} + \rho \Delta_{\text{max}}) / (\Delta_i(k) + \rho \Delta_{\text{max}})$, where ρ denotes identification coefficient. Generally, $0 \leq \rho \leq 1$. In this

study, $\rho = 0.5$. Calculation results are listed in Table 4.

Table 4 Grey correlation coefficient

Series\Time	2008	2009	2010	2011	2012	2013	2014
r_{01}	1.000	0.738	0.341	0.367	0.535	0.692	0.769
r_{02}	1.000	0.630	0.534	0.475	0.416	0.375	0.333
r_{03}	1.000	0.905	0.560	0.517	0.500	0.487	0.451

Step six: calculate the grey correlation.

$$R_{0i} = \frac{1}{n} \sum_{k=1}^n r_{0i}(k), \quad i = 1, 2, 3$$

Using the above equation, we can calculate the grey correlation of the amount of rural cooperative economy (RCE), rural finance amount (RFA), rural finance structure (RFS), and rural finance efficiency (RFE), $R_{01} = 0.635$, $R_{02} = 0.538$, and $R_{03} = 0.632$.

Through above empirical analysis, it can be seen that the correlation between rural finance amount, rural finance structure, and rural finance efficiency and rural cooperative economy is greater than 0.5. It indicates that the influence of these three indicators is significant on growth of rural cooperative economy, and rural financial development effectively promotes rural cooperative economic development. From further comparison of the grey correlation between these three rural finance indicators and rural cooperative economy, we found that the sequence is $R_{01} > R_{03} > R_{02}$. It reflects that rural finance amount plays the greatest role in rural cooperative economic development, followed by rural finance structure, and the least is rural finance efficiency.

5 Policy recommendations

Based on the above conclusions, we came up with following recommendations for improving financial support of development of rural cooperative economy.

5.1 Improving existing rural finance system and innovating on rural financial service products

As entities of rural production development, rural cooperative economic organizations take on different characteristics of types, and agricultural cooperative organizations also have diversified fund demand. Thus, only in diversified condition, financial institutions may realize complementary advantages and greatly satisfy multi-level financial demands of agricultural cooperative organizations^[5]. According to international experience, it is recommended to establish rural policy financial system, rural cooperative financial system and agricultural insurance system, make them complement with each other and promote each other, to jointly support development of rural cooperative economic organizations. Besides, it is recommended to improve financial services, innovate on financial products, and increase credit input according to characteristics of fund demands of rural cooperative economic organizations. Main points should be focused on guarantee manner, credit limit, and loan rate, to manifest convenient, individuality, and flexibility, and develop suitable credit products of specialized cooperative organizations^[6].

5.2 Further improving credit security mechanism for rural cooperative economic organizations

Firstly, it is recommended to actively implement credit cultivation of rural cooperative economic organizations, gradually realize participation of whole members of rural cooperative economic organizations, and link the credit of each member with the corresponding rural cooperative economic organizations. Secondly, it is recommended to set up specialized farmer cooperative credit security fund composed of local government, related financial institutions, agricultural insurance companies, and leading enterprises, to provide security services for promising rural cooperative economic organizations^[7]. Thirdly, it is recommended to establish risk compensation mechanism. Since agriculture, farmers and rural areas are weak, agriculture-related security risk is relatively high, it is recommended to introduce agricultural insurance, to provide insurance support for development of rural cooperative economic organizations, decentralize credit risk of financial institutions, and improve enthusiasm of financial institutions for granting credits.

5.3 Further improving financial, taxation, and monetary policy combined positive incentive mechanism

As to monetary and credit policies, it is recommended to comprehensively use various monetary policy tools, to extend fund sources of rural financial institutions. In the first place, it is recommended to implement lower rate of reserves for rural financial institutions and enhance fund strength of rural financial institutions. In the second place, it is recommended to raise support for re-lending and re-discount, to bring into full play positive incentive function of agri-

cultural support, small-sum re-lending and re-discount support. In financial policies, it is recommended to follow the principle of "government guidance and market operation", comprehensively take advantage of preferential tools such as reward, subsidy, and tax, and mainly support financial institutions to launch small-sum loan for farmer households, new agricultural operation entity loan, insurance for staple agricultural products, bank card withdrawal support, remittance, and transfer of account, *etc.*

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