Correlation Analysis of the Rural Finance Development and Rural Economic Growth
——A Case of Sichuan Province, China

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Abstract　Based on relevant research on rural finance development and rural economic growth by some Chinese scholars, taking Sichuan Province of China as an example, index of rural financial scale (deposit scale Y_1 and credit scale Y_2), index of rural financial support to agriculture (agricultural loan size Y_3, loan size of township enterprises Y_4), index of rural economic development level (total output value of agriculture, forestry, animal husbandry and fishery X_1, added value of township enterprises X_2, growth rate of per capita net income X_3) are established according to the 2000 –2007 *Sichuan Statistical Yearbook*. Meanwhile, Gray Relational Analysis Method is used to analyze the correlation degree of rural financial development and rural economic growth. Result shows that rural financial development has relatively great impact on the agriculture, forestry, animal husbandry, fishery and township enterprise, especially on the output value of traditional agriculture. Agricultural loan has relatively high correlation degree with rural economic growth and has made extreme great contribution to the output value of traditional agriculture. Moreover, agricultural development has become the direct reason for the net income growth of farmers. Correlation degree between loan scale of township enterprises and net income of peasants is the worst. Finally, the entire contents of rural finance and rural economic development can not be fully reflected due to the subjectivity of index selection and the neglect of many large-scale informal financial institutions in rural areas. Thus, countermeasures for optimizing the investment structure, opening up rural financial market and improving rural folk financial system are put forward.
Key words　Grey Relational Analysis; Rural finance; Rural economic growth; China

Financial development and economic growth have close correlation. Development of economy needs various financing channels and development of finance can promote the rapid growth of economy. Correlation between the two has been verified through practical economic development. However, there are few researches on the correlation between rural financial development and rural economic growth at present. Zhang Bing *et al.* first systematically study on the relationship between Financial Interrelations Ratio (FIR) and rural economic growth, using the " rural financial assets" data (the sum of Deposit of Farmer, Agricultural Deposit and Hand-hold Cash of Farmer) to modify the index. At the same time, " Rural National Income" index is replaced by " Agricultural GDP" index; and it is obtained that rural finance has made tremendous development in China through vertical and horizontal comparative analysis[1]. However, these researches are based on national level or the level of entire industry. And there are few empirical studies on rural financial development and economic growth of a certain area (provincial level). Based on this, correlation between rural financial development and rural economic growth is analyzed in this paper by taking Sichuan Province as an example, in order to provide financial support for the financial development in rural China.

1　Index selection, data source and research method
1.1　Index selection
Rural economic development is mainly

reflected in the economic growth and the income increase of farmers. Therefore, rural financial development level and rural economic development level are selected as the research indices.

1.1.1　Index of rural financial development level. It includes two sub-indices. One is rural financial scale index: Deposit size $Y_1(\%)$ = Balance of agricultural deposit/Balance of deposit of financial institution × 100; Loan size $Y_2(\%)$ = Total balance of rural loan/Loan balance of financial institution × 100. The other one is agricultural supporting index of rural finance: Agricultural loan size $Y_3(\%)$ = Balance of rural loan/Loan balance of financial institution × 100; Loan size of township enterprises $Y_4(\%)$ = Loan balance of township enterprise/Loan balance of financial institution × 100.

1.1.2　Index of rural economic development level. It includes three sub-indices, which are total output value of agriculture, forestry, animal husbandry and fishery $X_1(\times 10^8$ yuan), added value of township enterprises $X_2(\times 10^8$ yuan), and growth rate of rural per capita net income $X_3(\%)$.

1.2　Data source　Data are from 2000 –2007 *Sichuan Statistical Yearbook* (Table 1 and 2).

1.3　Research method　Gray relational analysis method is used to analyze the correlation between rural finance development and rural economic growth[2].

2　Result and analysis
2.1　Sequence value of factor　In relational grade analysis, advantage analysis can be conducted when there are more than one reference sequences and comparison factors. Generally, reference sequence is called mother sequence (mother factor) and comparison sequence is called subsequence (sub-factor).

Thus, mother sequence in this paper is Y_1, Y_2, Y_3 and Y_4; and comparison sequence is X_1, X_2 and X_3 (Table 3). Physical meaning of various factors in system is different, and the indices selected do not have a unified dimensionless or dimensional unit, resulting in difference of dimensionless of data. Thus, it is hard to compare them or to obtain the correct conclusion. In order to realize the comparability between the indices, dimensional treatment on data is needed before calculation. Table 3 reports the non-dimensional treatment on data by initialization method, so that indices may become the quantitative values with comparability. Table 4 shows the result of non-dimensional treatment.

Table 1   Related index of rural financial development level in Sichuan Province   %

Year	Deposit scale Y_1	Loan size Y_2	Agricultural loan size Y_3	Loan size of township enterprises Y_4
2000	1.97	14.27	7.67	6.60
2001	2.04	14.32	7.93	6.39
2002	1.99	13.44	8.00	5.44
2003	1.85	12.79	7.98	4.81
2004	1.80	12.42	7.87	4.55
2005	1.64	13.04	9.09	3.95
2006	1.65	10.39	7.30	3.05
2007	2.17	10.19	6.85	3.35

Note: Y_1, Y_2, Y_3 and Y_4 are related data of rural financial development level.

Table 2   Related index of rural economic development level of Sichuan Province

Year	Total output value of agriculture, forestry, animal husbandry and fishery X_1 // $\times 10^8$ yuan	Added value of township enterprises X_2 // $\times 10^8$ yuan	Rural per capita net income growth rate X_3 // %
2000	1 483.5	967.5	3.26
2001	1 534.9	1 096.3	4.38
2002	1 651.5	1 142.2	6.07
2003	1 784.5	1 368.5	5.80
2004	2 252.3	1 548.2	15.71
2005	2 457.5	1 762.8	8.62
2006	2 602.1	1 856.9	7.12
2007	3 370.2	1 947.1	18.13

Note: X_1, X_2 and X_3 are indices of rural economic development level of Sichuan Province.

Table 3   Sequential value of factor

Year	Y_1	Y_2	Y_3	Y_4	X_1	X_2	X_3
2000	0.019 7	0.142 7	0.076 7	0.066 0	1 483.5	967.5	0.032 6
2001	0.020 4	0.143 2	0.079 3	0.063 9	1 534.9	1 096.3	0.043 8
2002	0.019 9	0.134 4	0.080 0	0.054 4	1 651.5	1 142.2	0.060 7
2003	0.018 5	0.127 9	0.079 8	0.048 1	1 784.5	1 368.5	0.058 0
2004	0.018 6	0.124 2	0.078 7	0.045 5	2 252.3	1 548.2	0.157 1
2005	0.016 4	0.130 4	0.090 9	0.039 5	2 457.5	1 762.8	0.086 2
2006	0.016 5	0.103 9	0.073 5	0.030 5	2 602.1	1 856.9	0.071 2
2007	0.021 7	0.101 9	0.068 5	0.033 5	3 370.2	1 947.1	0.181 3

2.2   Analysis of correlation degree

According to the data in Table 4, correlation degree among factors is calculated by Excel. Table 5 indicates that correlation degree among indices

is between 0.645 0 and 0.875 8. Therefore, there is close correlation between rural financial development and rural economic development, but the impact effecs are different, which is shown in three aspects.

Table 4   Result of non-dimensional treatment

Year	Y_1	Y_2	Y_3	Y_4	X_1	X_2	X_3
2000	1.000 0	1.000 0	1.000 0	1.000 0	1.000 0	1.000 0	1.000 0
2001	1.035 5	1.003 5	1.033 9	0.968 2	1.034 6	1.133 1	1.343 6
2002	1.010 2	0.941 8	1.043 0	0.824 2	1.113 2	1.180 6	1.862 0
2003	0.939 1	0.896 3	1.040 4	0.728 8	1.202 9	1.414 5	1.779 1
2004	0.944 2	0.870 4	1.026 1	0.689 4	1.518 2	1.600 2	4.819 0
2005	0.832 5	0.913 8	1.185 1	0.598 5	1.656 6	1.822 0	2.644 2
2006	0.837 6	0.728 1	0.958 3	0.462 1	1.754 0	1.919 3	2.184 0
2007	1.101 5	0.714 1	0.893 1	0.507 6	2.271 8	2.012 5	5.561 4

Table 5   Index correlation between rural financial development and economic growth

Index	X_1	X_2	X_3
Y_1	0.857 5	0.837 3	0.674 2
Y_2	0.840 4	0.819 5	0.666 2
Y_3	0.875 8	0.852 6	0.686 3
Y_4	0.804 0	0.802 2	0.645 0

(1) From the vertical angle, X_1 and X_2 have relatively high correlation degree with rural financial development level, indicating that rural financial development level has relatively great impact on township enterprises, agriculture, forestry, animal husbandry and fishery, and has significant impact on the total output value of traditional agriculture. In other words, development level of rural finance accelerates the growth of traditional agriculture and township enterprise. Data of X_3 are all less than those of X_1 and X_2, indicating that relationship between growth rate of rural per capita net income and rural finance is relatively weak. This is because that Sichuan Province is a major traditional agricultural province with relatively scarce resources. Farmers use financial support to develop traditional agriculture with small agricultural value added, so that growth of their income is insignificant.

(2) From the horizontal angle, Y_3 (agricultural loan) has high correlation degree with rural economic growth level and has made extreme great contribution to the total output value of traditional agriculture. This indicates that rural financial system has promoted the economic growth in rural China. Meanwhile, rural deposit and loan size has close relationship with added value of township enterprises. In other words, high income of township enterprises leads to large size of deposit and loan[3].

(3) From the maximum and minimum angle, correlation degree of X_1 and Y_3 is the maximum (0.875 8), indicating that agricultural loan has made great contributions to the output value of traditional agriculture; and agricultural development has become the direct causation of rural net income growth. Correlation degree of X_3 and Y_4 is the minimum (0.645 0), showing that correlation degree between loan size of township enterprises and rural net income growth is the poorest. This is because that capacity of township enterprises absorbing rural labor force has decreased significantly due to the transformation of economic growth mode, slow development of tertiary industry and

the implementation of national environmental policy. Thus, contribution of township enterprise to income increase of farmers is affected.

3 Countermeasures

Index selection of this research is subjective, lacking scientific and systematic nature. Meanwhile, many large-scale informal financial institutions in rural Sichuan Province are ignored during this research. In order to comprehensively reflect the correlation between rural finance and rural economic development, three suggestions are put forward.

3.1 Optimizing investment structure According to the analysis result, financial development of rural Sichuan has significant effect on the growth of rural economic growth; economic growth of Sichuan Province is more dependent on the financial investment; and there is still a huge space for the development of financial investment in Sichuan. Therefore, Sichuan government should increase the policy investment in rural areas, encourage agricultural policy bank and agricultural development bank to offer funds to rural areas, guide social capital and commercial finance to follow up, seize the opportunity of the Western Development, gain national funding and policy support, speed up the construction of infrastructure, and ensure the steady growth of the rural economy in Sichuan Province.

3.2 Opening up of rural financial market and improving the folk financial system in rural areas Folk debt and credit has a good adaptability and plays a positive role in promoting the rural economy, which compensates the deficient agricultural loans of formal financial institutions to a large extent[4]. Therefore, we should promote the regulation development of rural non-governmental finance and guide and standardize the business behavior of private finance, make financial laws and regulations according to the national conditions, turn some rural informal finance into formal finance gradually, and give an appropriate space for the development folk finance.

3.3 Encouraging township enterprises to develop labor-intensive industries Since township enterprises are mainly located in rural areas, they should make use of the low labor cost in rural areas and make great efforts to develop labor-intensive industries[5]. However, due to the uncertainty, and high management and transaction cost of labor input, enterprises prefer to choose capital investment when pursuing the same level of output. Therefore, government should adopt tax preference, financial subsidies, loan guarantees, reputation incentives and other fiscal and financial measures, encourage township enterprises to develop agricultural byproducts processing industry, rural tertiary industries and labor-intensive industries and absorb surplus labor force as many as possible, so that more of the surplus agricultural labor force may turn to non-agricultural industries and their income may be increased.

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农村金融发展与农村经济增长相关性分析——以中国四川省为例

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摘要 在介绍中国一些学者对农村金融发展与农村经济增长的相关性研究的基础上,以中国四川省为例,依据 2000～2007 年《四川省统计年鉴》中关于中国四川省农村经济发展和农村金融发展的各项数据,建立了农村金融规模指标（存款规模 Y_1、贷款规模 Y_2）、农村金融支农程度指标（农业贷款规模 Y_3、乡镇企业贷款规模 Y_4）、农村经济发展水平指标（农林牧渔总产值 X_1、乡镇企业增加值 X_2、农民人均纯收入增长率 X_3）三大指标体系。同时,运用灰色关联分析方法对四川省农村金融发展与农村经济增长之间的关联程度进行了效用分析,得出农村金融发展对农林牧渔业和乡镇企业的影响较大,尤其是对传统农业总产值的影响突出;农业贷款与农村经济增长关联度较高,特别是对传统农业总产值的贡献很大;农业贷款对传统农业总产值贡献很大,农业发展成为农民纯收入增长的直接原因;乡镇企业贷款规模与农民纯收入的增长关联度最差。最后指出由于指标的选取上存在主观性和很多规模巨大的农村非正规金融机构被忽略,未能充分体现农村金融、农村经济发展的全部内容,提出了优化投资结构、开放农村金融市场和完善农村民间金融体系等对策。

关键词 灰色关联分析;农村金融;农村经济增长