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Research on the Effect of Rural Finance on Agricultural Economy Based on Spatial Econometric Model

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***Abstract*—Based on panel data of 31 provinces, municipalities and autonomous regions in China from 2010 to 2015, the paper constructs a spatial econometric model to analyze the relationship between rural finance and agricultural economy. According to the spatial correlation test, it is concluded that there is spatial clustering effect in China's agricultural economy development. This paper chooses to establish a spatial lag model (SLM). The empirical results show that rural financial scale and rural financial risk have a significant negative impact on agricultural economy. The impact of rural financial structure on agricultural economy is not well demonstrated; rural financial efficiency has a significant positive impact on agricultural economy. The government influence has a significant positive effect on the agricultural economy. Therefore, when 31 provinces, municipalities and autonomous regions increase investment in rural finance scale, they must pay attention to improving rural financial efficiency and preventing rural financial risks, so that rural finance can better serve agricultural economic development.**

Keywords—agricultural economy; rural finance; spatial clustering; spatial lag model

I. INTRODUCTION

China is a big agricultural country. According to statistics, China's agricultural output value in 2016 is about 5928.778 billion RMB, accounting for more than 8.0% of GDP. At present, the unbalanced and inadequate development of agriculture and rural areas in our country mainly reflects in the lag of agriculture and rural development. With the acceleration of China's agricultural reform in recent years, rural finance has been involved in the process of agricultural production and promoted the development of agricultural economy. The relationship between rural financial development and agricultural economy in China has always been the focus of many scholars. Xu (2013) [1] pointed out that the developing rural finance is an important way to solve China's three rural issues. In view of the numerous problems faced by China's rural finance, China urgently needs to establish a relatively complete multi-level rural financial system to meet different needs of rural finance subject. Zhang et al. (2013) [2] used spatial econometric model to study the level of rural financial development, the spatial heterogeneity and spatial correlation of agricultural economic growth. The study finds that the impact of agricultural economic growth on farmer's income is significant, while the impact of the level of rural financial development on farmer's income has changed insignificant from significant. Wang et al. (2016) [3] conducted an empirical analysis of the relationship between rural financial development and rural economic growth in China by constructing the spatial dubin model (SDM). The empirical results show that the interaction mechanism between China's rural finance and rural economic growth has not yet been established.

It can be seen from the above literature that many scholars in our country have conducted a great deal of research work on rural financial development and agricultural economy. However, most of the above literatures have not paid much attention to the role of government in the development of agricultural economy. Compared with the existing literature, the main differences between this paper and the above literature are as follows: This paper considers the impact of government fiscal support policies on the level of agricultural economic development; it includes the number of rural individual employment, industrial structure, and agricultural industrialization as the control variables.

II. VARIABLE SELECTION AND DATA SOURCES

A. Variable Selection

Explained variable: agricultural economic development level (*LEV*). The focus of this paper is on the measurement of the level of agricultural economic development. Therefore, the ratio of total agricultural output value to GDP is used to measure the level of agricultural economic development in China.

Explanatory variables: rural finance. For the measurement of rural finance, domestic scholars have put forward a lot of measurement methods. Wang et al. (2016) [3] reflects the level of rural financial development from the scale, efficiency and structure of rural finance. Based on the previous scholars' research results, this paper selects the rural financial scale (*SCA*), rural financial efficiency (*EEF*), rural financial structure (*STR*), rural financial risk (*RIS*) and government influence (*IMA*) as explanatory variables. Rural economic development is inseparable from the government's support. Based on the research of Fan and Zhou (2017) [4], this paper selects the ratio of rural fiscal expenditure to rural GDP to measure the government's influence.

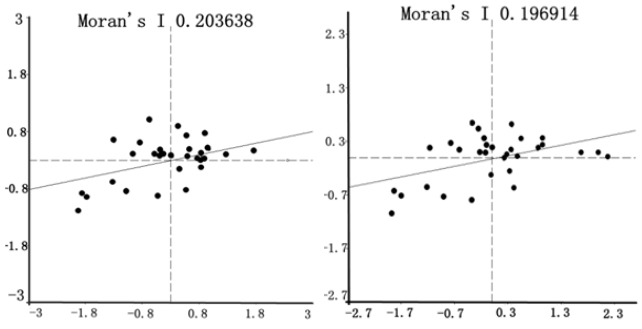
The control variables in this paper mainly include rural employment (*EMP*), industrial structure change (*IND*) and agricultural modernization (*ARG*).

B. Data Source

This article selects the panel data of 31 provinces, municipalities and autonomous regions in China from 2010 to 2015. Data from the EPS database, China Rural Financial Services Report, China Rural Statistical Yearbook, China Financial Yearbook and National Bureau of Statistics of the People's Republic of China (http://www.stats.gov.cn/).

III. Spatial Correlation Test Of Agricultural Economy

Spatial autocorrelation is divided into global spatial autocorrelation and local spatial autocorrelation. Global spatial autocorrelation is mainly used to describe the overall spatial distribution of research variables to determine whether the variables are clustered. The commonly used global spatial autocorrelation index is the Moran index. The Moran test results show that the Moran values of the development level of China's agricultural economy are all around 0.20, and the P value also passed the significance test at the 5% level. This indicates that there is a clear positive spatial correlation in our agricultural economy during the sample period. The local spatial correlation test is mainly to study the spatial correlation characteristics of a region and its surrounding area. This paper uses Moran scatter plot to test the local spatial correlation of agricultural economy. The horizontal axis is used to represent the level of agricultural economic development, and the vertical axis is used to represent the level of agricultural economic development in neighboring province, municipalities and autonomous regions. As can be seen from Figure 1, the Moran value of agricultural economic development in 2010 is 0.2020 and in 2015, the Moran value is 0.1969. It can be seen from the above analysis that there is spatial autocorrelation in the level of agricultural economic development in various regions in China.



(a)2010 (b)2015

FIGURE I. MORAN SCATTER PLOT OF THE SPATIAL DISTRIBUTION OF AGRICULTURAL ECONOMIC DEVELOPMENT

IV. Empirical Analysis Of The Impact Of Rural Finance On Agricultural Economy

A. Spatial Econometric Model Construction

This article focuses on the relationship between agricultural economy and rural finance. Therefore, the SLM model is constructed as follows:

$$\begin{aligned} LEV_{it} = & \rho \sum_{j=1}^{N} W_{ij} LEV_{jt} + \beta_1 SCA_{it} + \beta_2 EFF_{it} + \beta_3 STR_{it} \\ & + \beta_4 RIS_{it} + \beta_5 IMA_{it} + \beta_6 EMP + \beta_7 IND \\ & + \beta_8 ARG + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned} \quad (1)$$

Among them, *LEV* is an explanatory variable, *SCA* , *EEF* , *STR* , *RIS* and *IMA* are explanatory variables, *EMP* , *IND* , and *ARG* are control variables, ρ is a spatial autoregressive coefficient, W is a spatial weight matrix, u_i represents an individual spatial effect, λ_t represents time effect, and ε_{it} represents the residual term.

B. Empirical Result Analysis

Estimation of spatial lag model (SLM) based on MATLAB2017b software. From Table 1, it can be seen that R2 is 0.9893 and the log-likelihood is 618.8770 in the spatial lag model of spatial and time fixed effect. Therefore, it is more suitable to construct the spatial lag model of spatial and time double fixed effect.

The estimation results of the spatial lag model (SLM) show that the rural financial scale (*SCA*) has a significant negative impact on the agricultural economy. The main reason is to consider the fact that the impact of rural finance on agricultural economy is based on effective supply. Although China has increased its financial support to rural areas in recent years, it has not been able to meet the needs of rural areas. Rural financial efficiency (*EEF*) has a positive impact on the agricultural economy and is significant at 1%. This shows that efficient rural financial services can accelerate the investment conversion efficiency, promote the integration of rural resources, and bring obvious promotion effects to agricultural modernization and rural economic construction.

The rural financial structure (*STR*) has a negative impact on the agricultural economy, but it is not statistically significant. The possible reason is that the deposit amount of township enterprises is low, loan demand is bigger, and part of the deposit is transferred to urban areas. Leading to enterprise loan will not be able to meet its development and provide agricultural production services. Rural financial risk (*RIS*) has a positive impact on agricultural economic development, but it is not statistically significant. However, both spatial and time effects showed a significant negative impact. It reflects that the development of agricultural

economy is risk-averse. Rural financial risk is one of the main reasons to hinder the development of agricultural economy.

The government influence (*IMA*) has a significant positive effect on the agricultural economy. The main reason is that the government's supporting agriculture policy will promote the development of agricultural economy. At the same time, the government continuously increases financial support for agriculture to support rural grassroots spending and rural infrastructure construction. This will not only narrow the income gap between urban and rural areas, increase the level of farmers' consumption, but also promote the vitality of rural areas and agricultural economy.

For other control variables, the estimated coefficient of rural individual employment (*EMP*) is not significant. The industrial structure (*IND*) has a significant negative impact on the rural economy. In the past, the basic strategy adopted by our country in realizing industrialization was agriculture supporting industrial development. In this process, most of the rural resources will be squeezed out, and the development of agricultural economy will be greatly restricted. Agricultural modernization (*ARG*) has a significant positive impact on the agricultural economy. This shows that the development of modern agriculture can greatly increase the agricultural production capacity, which in turn can improve the economic efficiency of agriculture.

TABLE I. REGRESSION RESULTS OF SPATIAL LAG MODEL

	SLM		
Variable	***Spatial and time fixed effect***		
SCA	-0.0010*	*IND*	-0.286***
EEF	0.268***	*ARG*	0.0157***
STR	-0.508	ρ	-0.0730
RIS	0.0063	Log L	618.8770
IMA	0.0494*	R^2	0.9893
EMP	0.0025		

Note: *, **, *** are significant at 10%, 5% and 1% respectively

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

Based on the spatial econometric analysis method, this paper explores the spatial distribution characteristics and interaction effects of China's agricultural economic development and rural finance. The results show that there exists spatial clustering effect in agricultural economy of China, and the influence of rural financial scale, efficiency, structure, risk and government influence on agricultural economy is different. Based on this, this paper proposes the following policy recommendations.

(1) Increase rural financial supply and optimize rural financial structure. We must formulate suitable support policies based on local conditions. At the same time, it is necessary to further deepen the reform of rural commercial banks, encourage more new rural financial institutions to participate in rural construction, increase the diversity of rural financial institutions, realize competition among major banks to promote the improvement of financial service quality.

(2) Improve the efficiency of rural financial capital utilization and establish an early warning mechanism for rural financial risks. Because of the demand for funds of agricultural production is not high and there are seasonal characteristics, the credit level is low and the lack of guarantee. Therefore, while improving the efficiency of financial capital utilization, rural financial institutions should also establish a risk warning mechanism to prevent possible risks.

(3) Strengthen the guidance function of rural finance. There are significant differences in the level of financial development in the eastern and western regions of China. Therefore, the government should encourage more capital to invest in the central and western regions by formulating effective industrial policies and achieve coordinated development between the eastern and western regions. At the same time, the government should also increase support for basic industries in rural areas so as to promote rural economic growth.

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