On The Relationship Between the Rural Economic Growth and Financial Deepening
——Based on the Panel Data of Counties in Zhejiang Province

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Abstract: We focuses on the relationship between economic development and financial deepening based on the developed area in the east of China, the counties in Zhejiang province. Most of the previous empirical studies about the connection of these two variables start from the perspective of the macro-national level, using the provincial level data as the model sample. In fact, there are some drawbacks of this approach and our research focuses on a more micro way to explore this further connection. We collected the data of 33 counties under the 7 prefecture-level cities in Zhejiang province from the year 2000 to 2009 and used this panel data to established the entity fixed effects regression model to do the study. From the regression result, we found the positive connection between these two variables and saw the Granger results existed in different counties over different lag periods. At last, we proposed the effective way to deepen the finance in the rural area, so as to help the economy get the significant elevation and guide the private capital legally into the new-type rural financial institutions, such as the small loan companies and village banks. This article test on the relationship of financial deepening and economic development of Zhejiang province based on its own strong local characteristics, with the sufficient private capital existed. Our findings is useful for the policy guidance and prove the rationality of the private capital orderly flow into the new-type rural financial institutions.

Keywords: Rural economic growth, Financial deepening, Zhejiang province, Panel data

JEL: Q14

1 Introduction

Along with Reform and Opening up, the economy of Zhejiang province has experienced 30 years of ups and downs, and now it has made remarkable development of the brilliant achievements. Despite of the weak economic base, the lack of resources, and few national-preferential policy, people in zhejiang province, relying on their diligence and wisdom, have made full use of private and grassroots financial capital and gradually realized the typically smooth and fast economic growth.

The financial development in Zhejiang shows its own strong local characteristics, especially in the years of later 90s. Economic growth runs well ahead of the financial system reforming, and due to the rapid development the private sector has precipitated a lot of money. However, problems come at the same time. On one hand, a large number of enterprises and projects need financing, but on the other hand the existing formal financial system can not meet this huge funding gap. To balance this great disparity for supply and demand, private banking comes into being and we believe that in a very long period, it will symbiotically co-exist with the formal financial.

Our country has already put the agricultural development policy into a very important position. Around the three rural issues, there are a series of policies which have been put forward in an orderly manner. Related preferential policies are playing considerable role to promote positive economic growth in agriculture. Zhejiang has a long history of farming and a high level of agricultural production. With a comprehensive integrated regional development, including forestry, animal husbandry and fishery industry, Zhejiang is renowned as the "land of plenty, silk of the mansion, heritage of the state and tourism of the land". Although the geographical area is small, the landscape in the province is complicated and varies greatly among cities and counties. In the rank of the top 100 developed counties in China as published in 2010, Zhejiang Province occupies 27, mainly including Hangzhou, Ningbo,
Wenzhou, Shaoxing, Jiaxing, Jinhua, Taizhou, Huzhou eight cities. This uniform distribution provides a good natural samples for researches on the relationship between rural economic development and financial deepening. Most of the previous empirical studies about the connection of these two variables start from the perspective of the macro-national level, using the provincial level data as the model sample. However, as the eastern, central and western regions are essentially different, it is difficult to form a generally broad and systematic guidance, useful for further in-depth excavation of policy. Besides, in some provincial level studies, the sample data only stay in the big city level. The number will blur the authentic relationship owing to the specially unique urban-rural dual structure in China. Based on this consideration, the panel data used to study the relationship in this article are collected from the counties level in Zhejiang province to model a fitter equation and show the local characteristics. Advantaged in the more realistic district level data and a more closely actual conditions, we hope this article will be more useful for relevant departments to give guidances and prefencial policies about rural financial deepening and economic development.

2 Literature Review

The initial source of the theory of financial development can be traced back to Bagehot (Bagehot, 1873), followed by Schumpeter in his famous book "Theory of Economic Development" (1912), who emphasizes the importance of financial development to economic development. Tobin (J. Tobin) has also made a monetary theory, which adheres to monetary and financial issues, and believe that they can explain the relationship between economic developments. He also advocates the adoption of low interest rates and inflation policy to stimulate the economy. The developing countries, which implement financial repression policies, are grounded on their theories.

In 1969, Goldsmith, in the "Financial Structure and Financial Development," which is a book creatively put forward to the concept of financial structure and financial development, discusses the different stages of economic development existing in the financial structure model, explaining financial structure and financial development in an empirical research paper. In 1973, U.S. economists McKinnon and Shaw, point out the limitations of Tobin’s theory respectively. They put forward with the pioneering theory of financial repression and financial deepening to support the use of interest rate liberalization policy. In favor of this new economic theory causing a strong reaction in the Western economic circle, they persist that the right financial paths to reforming is to relax the control of various financial institutions, realizing the financial liberalization to form a balanced market interest rates, thereby savings and investment rates will increase and contributing to economic development further in depth. They point out that the financial economy is closely linked with this two areas and the relationship of financial system and economic development is mutually restraint and both mutually stimulated at the same time. When the government makes excessive financial intervention, it will result in the vicious circle between the two, ie, the financial repression; When the government abandons over-regulation, free market mechanisms will allow the operation between financial and economic, which will show a virtuous cycle, ie, the financial deepening.

In the past ten years, along with "agriculture" policy gradually implementing, domestic researchs on rural financial development are further enriched obviously. XuXiaobo, DengYing Amoy, et al (1994) firstly calculates the rate of China's rural finance-related indicators, using the index (FIR), which is numerically equal to "Comicsionair deposits" and "rural income" ratio. Though graphical analysis of both development and change laws, they find the correlation between rural credit funds and national income growth in rural areas. ZhangYuanhong (1999) uses "Comicsionair deposits" and "rural GDP" ratio to calculate financial-related rate. There are systematic errors existed in this method of calculation. Because in the agricultural banks and rural credit cooperatives, business are no longer confined to rural areas, so "Comicsionair deposits" index is greater than the actual rural financial assets. ShiHuanping, FuYouzheng (2010) use stationarity, cointegration and Granger causality test on the
relationship between rural financial development and economic growth of JiangXi province. Through this empirical analysis, they dig out a significant correlation between the financial and economic of Jiangxi in the long-term, and economic growth is the Granger causes for financial deepening development, but the other hand does not stand. 

LvChenzhong (2010), taking Sichuan Province as an example, makes the establishments about the indicators on the size of rural financial, indicators of financial support for agriculture in rural areas and indicators of rural economic development. They use the gray relational analysis method to analysis the extent of the connection effect between the financial and economic, drawing on the conclusion that the rural financial development yields greater impact on the traditional agriculture, like forestry, animal husbandry, fishery, as well as the township enterprises, especially on the traditional agricultural output prominent. Agricultural loans has a high correlation with rural economic growth, especially making the greater contribution to traditional agricultural output. On the other hand, it becomes the direct cause to the net income of farmers. The size of loans in the township enterprises and the farmers' net income growth, the correlation of these two is the worst. 

WuYanlin, ChenCong (2010), studies the relevant relationship of rural finance and economy through the input-output relationship function model and three-index model of Jiangsu Province. The empirical analysis comes up with the conclusions that the increase of financial deepening of economic growth rate means the efficiency of increase, and when the degree of demanding money makes deviation from the physical economy entity, accompanying with the incompatible conclusions that it will undermine economic development. Then the authors propose to establish an appropriate and efficient rural financial system to promote rural financial market development from the policy dimensions of Jiangsu province. 

LiuChunbing, SangTiezhu (2010), start from the empirical research on financial deepening in rural areas and rural consumption growth, pointing out that there existing equilibrium relationship among the scale of rural finance, rural financial efficiency and household consumption growth. So the further efforts to accelerate rural financial deepening can promote the growth of farmers' income, smoothing income fluctuations driven by growth in consumption of rural residents at the same time. 

Looking at the researches made by the domestic scholars, it can be found that in a specific province, models are mostly the time-series. And there is a big difference existed during the whole research progress. Divergences stem from the unique urban-rural dual structure of China and the systematic differences of regions, but it ascribs more to the existence of the indicators selected by different scholars. Statistical indicators’ caliber difference and statistical diversities in the economic sense, make the finding itself a very strong period and regional limitation. Therefore, there is not a readily specific causal relationship for rural economic growth and financial deepening in rural areas in terms of the issue itself, but just the product of the dynamic relationship during the specific period, in the specific geographical context and under the specific policy. It is this relative uncertainty makes the relationship of this process becoming an endlessly wonderful adventure. 

3 Our Test on Rural Finance and Economic Development

From the previous studies and literatures on the relationship between financial development and economic growth, empirical models are always similar except slightly different. The main differences are reflected in the indicators selected measuring for the two variables, as well as the choice of the selection of control variables. Here we learn from the marrows in the past empirical researches and build the basic test model as follows: 

\[ Y_{tt} = \alpha F_{tt} + \beta I_{tt} + \varepsilon_{tt} \] 

(3.1)

The meaning of each variable: Y is for rural economic growth, F is for rural financial deepening, and I is the control variable.
4 Econometric Test and Discussion

4.1 Panel data unit root test
Along with the popularity use of the panel data to handle many of the mutil-agents’ macroeconomic variables in the extensive researches, such as purchasing power parity, economic growth, convergence and international R&D spending spillover effects and other issues, the focus of econometric panel data has already shifted from the micro-panels (larger N, smaller T) to the macro panels (larger N and T) recently. Bhargava et al (1982) are the earliest to study on panel data unit root test. They use modified DW statistic to propose a dynamic fixed effects model which can test whether the residuals walking randomly. In the macro-panel studies, Abuaf and Jorion (1990) propose a regression model based on SUR, estimating GLS panel unit root test method. Followed these achievements, Levin and Lin (1992), Im, Pesaran and Shin (1995), Chang (2000, 2004) et al. have made a variety approaches to carry on the panel unit root test. Found by Monte Carlo simulation, compared with the unit root tests for single variable time series, the variety of panel data unit root tests are varying on the degrees to improve the effectiveness of the unit root test.

This article focuses on the relationship between economic growth in rural areas and rural financial deepening in a macro panel data model. In the panel, the smooth of data is the foundation in the progress of establishing a model.

Under the help of eviews5.1, we firstly make group of the four independent variables and the dependant variable, to realize panel data unit root test and the test results are as follows:

| Table 1 |
|-----------------|-----------------|-----------------|-----------------|
|                | Automatic selection of maximum lags |
|                | Automatic selection of lags based on SIC: 0 to 1 |
|                | Newey-West bandwidth selection using Bartlett kernel |
| Method         | Statistic       | Prob.*          | Cross-sections  | Obs  |
| Levin, Lin & Chu t* | -38.3841       | 0.0000          | 153             | 1134 |
| Breitung t-stat | -4.77823        | 0.0000          | 153             | 981  |
| Im, Pesaran and Shin W-stat | -14.8287 | 0.0000          | 153             | 1134 |
| ADF - Fisher Chi-square | 792.345     | 0.0000          | 153             | 1134 |
| PP - Fisher Chi-square | 924.829     | 0.0000          | 165             | 1248 |

From this table, we can see that the statistics of LLC, Breitung, ADF, PP are all significantly rejected the null hypothesis of unit root, which means the unit root does not exist in this specific panel data and it is highly stable. Therefore, on the basis of panel data’s stationarity, the construction of this model is feasible.

4.2 Construction of panel data model
4.2.1 Panel data model classification
Panel analysis has better benefits of the directly mixed OLS estimates (Hsiao, 1995). It can consider

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1 "Econometric Analysis of Panel Data,” BaiZhonglin, Zhang Xiaotong
both cross-sectional and time series data features and help to improve model estimation efficiency, increase the degree of freedom in the estimated sample at the same time. In terms of the other hand, panel can lower down the model configuration problems which may brought by the variables omission (Greene, 2000). The general form of panel data model is as follows:

$$y_{it} = \sum_{k=1}^{k} \beta_{ik} X_{kit} + \mu_{it}$$

Here \( i = 1,2, ... N \), \( N \) for different individuals; \( t = 1,2, ... T \), \( T \) means time, years; \( y \) is the observations of the dependant variable for individual \( i \) at the time \( t \); \( x \) stands for the observations by the non-random explanatory variables for individual \( i \) at time \( t \); \( \beta \) is the parameter to be estimated, \( \mu \) is the random error term. There are many restrictive assumptions of the model, so panel data can be divided into different types:

### 4.2.2 Panel model estimation

The steps of choosing a specific estimation model are:

1. Step 1, using F-test to estimate the suitability of the fixed effects model;  
2. Step 2, using the Hausman test to opt a specific estimation model:

If the first step, estimation excludes a mixed regression (pooled OLS) model. Then this step mean to estimate a more suitable and effective one from the fixed effects and random effects models.

### 4.2.3 Empirical analysis of panel data

In the process of the model construction, we firstly establishes the Pool in eviews5.1, then input data after the establishment of mixed regression model. In the restricted model, we get the return of the residual sum of squares, \( RRSS = 7.967756 \), and the unrestricted residual sum of squares in the regression model, \( URSS = 5.920563 \). Keep considering of other conditions, like \( N = 33 \), \( T = 9 \), \( K = 4 \), after calculating we get \( F = 2.809436 \). Under a significance level of \( \alpha = 0.05 \), the result is higher than the threshold of \( F (32,260) \), therefore, we can reject the null hypothesis and believe that the establishment of pool mixed estimation model is not appropriate.

In order to further compare the advantages and disadvantages of fixed effects and random effects models, the paper uses Hauseman test on time series cross-section random effects and time random effects models. The test results significantly rejects the establishment of the null hypothesis of random effects model, so we establish the different intercepts of the fixed effect model finally.

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2 F-test value is determined by the following formula: \( F = (RRSS-URSS) / (N-1) \div URSS / (NT-KN) \sim F (N-1, NT-KN) \) in this formula, \( RRSS \) represents the restricted residual sum of squares and \( URSS \) represents (mixed regression) unrestricted (fixed effects regression) residual sum of squares, \( N, T, K \), respectively, represents the number of individuals for the cross-section, time series length and the number of independent variables. The significance level under a given \( \alpha \), if \( F < F_{\alpha} (N a 1, NT-N-K) \), then accept the null hypothesis, so that the residual sum of squares and set the model should be reliable, on the contrary they should reject the null assumptions, and use of the district variable intercept model regression.

3 Hausman test equation: \( H = \chi^2 (K + \beta - \beta) = \sum \frac{(b - \beta) \Sigma (b - \beta)'}{\Sigma \frac{var (b - \beta)}{\nu}} \), the equation \( b \) is the estimated fixed effects model coefficient, \( \beta \) is a random effects model the estimated coefficients, \( H \) is a certain degree of freedom Chi-squared distribution, if, if \( H > \) threshold, then the acceptance of fixed effect model, otherwise they should accept the random effects model.
Table 2

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>13.268392</td>
<td>4</td>
<td>0.01003</td>
</tr>
</tbody>
</table>

**Warning: estimated cross-section random effects variance is zero.

Table 3

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period random</td>
<td>33.252279</td>
<td>4</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Warning: estimated period random effects variance is zero.

Through the tests above, we establish cross-section fixed effects model with different intercepts, and $\beta_i$ means difference in cross-section county individual changes on the intercepts:

\[ G = 0.925578 + 0.054331FP + 0.051807LA + 0.585086FL + 0.024884CF + \beta_i \]  
(4.7)

Focus on the model, the output statistic results are as follows: $R^2$ is 0.18562, and the adjusted $R^2$ is 0.067403, the whole F-statistic is 1.570166, DW value is 2.258432. The model has already past the significance test, indicating that the overall effect fitness is really great. The result shows a consequence that the more the proportion to the sum of agricultural loans and rural enterprises loans dividing total agricultural output value, the more can promote the growth of agricultural output. The positive relationship means financial deepening in rural areas is playing a significant role in promoting the economic development of the same rural districts. Regarding on the financial efficiency indicators, we can find out that the rate of deposits to loans in the county level financial institutions showing a negative correlation with agricultural output growth ratio. The digit exposes two aspects problem: in a given amount of deposits of financial institutions, more loans have a relatively smaller negative effects on agricultural output growth, which means it can better promote the growth of agricultural output. On the other hand, in rural financial institutions, the ratio of deposits to loans is generally bigger than 1, and some counties are even 2 or 3 times expanded. It indicates that in rural areas, the financial institutions absorb deposits but they do not fully use them to meet the demand for the loans. The phenomenon is obviously reveal that, the absorption of the deposits is on purpose with the city's construction support, but not for. rural areas’ development. As the significant presence of "siphon effect" in rural areas, the absorbed funds are "pumping" out, making the money, which can be really used as the agriculture wall becoming thinner. Financial structural indicators show consistent results with the expected. In the county-level financial institutions, the more agricultural and rural enterprises loans, the more promotion to the improvement of agricultural output growth. The other conditions are ample in advance, when agricultural and rural enterprises loans account for every increase of 1 percentage point, we can promote the growth of agricultural output increasing 0.58 percentage point, which means agricultural and rural enterprises loans can effectively boost the growth of agricultural output growth rate. Drawing on the above research models, there is a existing stable relationship between financial deepening and economic development. So we can further do Granger causality test, deeply dig the causal relationship between economic development and financial deepening in rural areas. Granger (1962), Sims (1972) propose a testing method of the causal relationship between variables. Whether X is the causing factors to Y, mainly depends on the extent Y can be partly explained by X. If adding X's lag value can explain a
higher level of Y, or X is helpful to improve correlation coefficient's statistical significance, then we can define “Y is Granger caused by X's”.

By eviews5.1, the Granger causality test for panel data is realized through the pool function. We achieve this target by the establishment of the group. Respectively, we use one or two years’ lag on the sample to test. The dependant variable is the agricultural output growth, and the independent variable is the proportion to the sum of agricultural and township enterprises loans dividing the total agricultural output value. Then we run the Granger causality test, and the test results are concluded below:

1. Whether 1 or 2 years’ lag, there is no significant Granger causality result for most of the counties between these two variables;
2. In the 1 lag Granger causality test, ShaoXing and ShengSi appears a significant test result, which means, economic development and financial deepening are mutually reinforcing in the rural regional; DongYang and ShengZhou shows a 2 years lag significantly two-way test results;
3. In the 1 lag Granger causality test, the following counties come to the result that the rural financial deepening is the one-way Granger cause to the economic development: ShengSi, LinHai, YuHuan, XianJu;
4. Rural economic growth is the one-way Granger cause to financial deepening in the 1 year lag test, the counties are: Pinghu, Zhuji, Shangyu, Shengzhou, rooftops, Xianju; And 2 years lag Granger causes in the test model of economic development to the financial deepening: the counties are Fuyang, Lin’an, Pinghu, Deqing, Yongkang, Wuyi, Pujiang.

In summary, we find there are a significant number of counties demonstrating a causally mutual relationship between economic development and financial deepening, whether in the one-way or two-way causality test; Some counties make a distinguished performance in the 1 year lag test, and the counties in 2 years lag increase remarkably. It suggests that in some counties, financial deepening can impact the rural economic growth immediately, while the effect shows a certain degree of lag in some counties. Therefore, if the time span is long enough, most of the counties can achieve Granger test significantly for N years’ lag. In other words, in the sample of the counties in Zhejiang province, there exists a significantly mutual relationship between financial deepening and economic development.

5 Conclusions and Policy Suggestions

From this empirical analysis, we can find that during the years for the rural county's economic development in Zhejiang Province, the efforts on financial deepening can effectively promote the growth rate of agricultural output value. Analyzing the financial structure ratios, financial efficiency and other related financial ratios, we can draw the conclusion that to increase agricultural and rural enterprises loans is an effective way to achieve the number and size of regional financial deepening, and the increasing proportion of loans in financial institutions can facilitate the outstanding growth of the agricultural output.

As to the current state development of Zhejiang Province, the distinctive characteristics are the main economic entities’ decentralization and economic structures diversification. Meanwhile, the financial institutions fail to achieve the corresponding diversity. The defect in the ownership structure is not only detrimental to the diversity in financing needs for different economic sectors, but also completely unfavorable to the establishment of efficient financial control mechanism. In view of the flow of funds in Zhejiang Province, there are quite a lot of financing needs in the market on one hand. And on the other hand, the formal financial system, limited by the property institution problems, can not meet the market demands for such a large number of different entities. Especially for some idle farmers, self-employed craftsmen and small or medium township enterprises, the unbalanced phenomena are more obvious for the effectively "melt into". Even though the market flows fairly a lot of money, but the demanders still can not be satisfied with this big capital gap. A large number of private capital, profit-driven by its unique feature, will influx into some "underground banks", which results in private lending, illegal fund-raising problems and some other columns without formal and effective policy
guidance.
How to resolve this conflict is the sticking point at this moment. The key point, as financial deepening through the development of effective rural economic growth, is to effectively counsel the flow of private capital for curbing its disorderly flow, allowing more money to enter the really circulating economy system. Based on this background, the emerging village banks and small loan companies are likely to be the effectively attempt to solve this problem with practical sense. Guiding more Zhejiang's private capital engaging into small loan companies and rural village banks, the rural financial system can further provide a wide range of convenient and efficient financial services to boost agricultural production, and simultaneously balance the private supply of surplus funds and inadequate supply by the formal finance. Via the innovation of financial system and institution, with the attempt to enrich the diversity of both levels and functions in the regional financial markets, there will come into being a profound and positive effect on addressing regional rural issues, like improving the regional financial ecological environment, accelerating the process of urbanization, or promoting the establishment of market-oriented financial mechanisms in Zhejiang.

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