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Research Article

Effects of Financial Development on Economic Growth and Food Processing Industry Based on Time Series Model

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Abstract: Financial development will promote the enterprise innovation to a certain extent, in this study, we analyze how financial development effect on economic growth, especially in food processing industry. The result shows that: First, financial development will promote the food processing industry in short time, but this effect will reduce gradually in the long time. Second, financial development is the granger reason to food processing industry and there exist a long-term equilibrium relationship between them. From the VAR model, we can get that financial development will promote food processing industry growth. LnFIR at lag 1 period increased one percentage can drive LnFPE growth by 1.361 percentage, LnFIR at lag 1 period increased one percentage can drive LnGDP growth by 0.942 percentage, so the effect of financial development on economic growth is obvious.

Keywords: Economic growth, empirical analysis, financial development, food processing industry

INTRODUCTION

Financial development provides the financial function and various services for the economic society, through a variety of channels to promote economic growth (Anning and Joyce, 1999). Financial development first promotes the accumulation of physical capital and then promotes the economic growth. Also, it promotes technological progress and promotes economic growth (Jeremy *et al*., 2013; Du, 2002). China as an emerging market economy, are experiencing rapid economic growth and financial development. Finance has always been the core issue of economic life, but also a hot issue of policy makers and scholars' wide attention (Hu, 2005). On the relationship between financial development and economic growth Chinese, there are abundant literatures. Dong and Louis (2002) and other economists use sequence data to test the effect after the reform of financial development in economic growth panel data China or time respectively. However, these studies did not get a consistent conclusion.

Currently, the sustainable growth problems of China's economy highlights increasingly, only change the present pattern of extensive growth to achieve future growth. Technology innovation is the core momentum to maintain a long-term economic growth (George *et al*., 2013). However, technology innovation is process. Its research and development and the subsequent transformation as well as the formation of real productivity, are a complicated and risky process (Konstantinos and Costas, 2011; He, 2013), which need a developed financial system to support. Though China's financial system has been formed a certain scale, as tools to implement national policy for a long time, the resources of financial sector are often inclined to the industries and projects of the government and state-owned departments. Many companies are facing severe financing constraints, their technology research and development, innovation and transformation are often unsustainable. So the technology innovation of the enterprises is restricted by financial development in our country, it significantly reduced its positive impact on economic growth (Kendall, 2012). On the other hand, with the development of economic globalization, the flow of capital accelerates on a global scale and financial institutions agglomerate into some central cities, so as to form financial centers (Paul, 2005; Ang, 2011). In our country, the enterprises in financial center areas own the strong ability of technology innovation, its promotion effect on the regional economy is much larger than other regions (Muhammad *et al*., 2013). Therefore, the purpose of this dissertation is to study the relationship between financial agglomeration, financial development and economic growth. The study provides a theoretical basis and empirical evidence support for how to bring finance into full play the role of technology innovation and increasing the ability and potential of the economic long-term development.

MATERIALS AND METHODS

Data collection and evaluation index: In order to analyze how the financial development effect on the

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Table 1: Augmented Dickey-Fuller test (ADF)

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Result
LnFIR	-1.562	-3.709	-2.983	-2.623	Unstable
LnGDP	-2.034	-3.709	-2.983	-2.623	Unstable
LnFPE	0.255	-3.709	-2.983	-2.623	Unstable
D.LnFIR	-3.782	-3.709	-2.983	-2.623	Stable
D.LnGDP	-3.694	-3.709	-2.983	-2.623	Stable
D.LnFPE	-3.570	-3.709	-2.983	-2.623	Stable

economic growth, we use STATA 12.0 software and make a statistical analysis of financial ratios and total domestic economic data from the year of 1990 to 2014.The main indicator to gauge a country or regional financial development level is Financial Interrelation Ratio (FIR), which refers to a country's total financial assets and economic volume ratio and the formula can be expressed as:

$$FIR = F_r / W_r = \beta_r^{-1} \cdot \left[(\gamma + \pi + \gamma\pi)^{-1} + 1\right] \cdot \left[k\eta + \phi(1+\lambda) + \xi\right] + \theta\left[1+\varphi\right]^{\frac{n}{2}} - 1$$

Economic significance of each symbol is represented by the formula is: F represents the area of financial assets; W represents region economy gross; usually use GDP for calculation; β represents capital output ratio and the output is equal to the ratio of capital, namely "capital coefficient"; γ represents the growth rate of GDP; π represents the rate of inflation; η represents external financing ratio; ϕ represents ratio of stock, bonds, options and other financial products to GDP; λ represents financial institutions to non-financial institutions financial products assets ratio; ξ represents foreign net creditor rate, which is expressed as the ratio of foreign financial capital to the financial amount; θ represents price sensitive financial assets ratio;φ represents asset price fluctuation ratio.

So that we can get the financial development index based on this method. The data of output value of the food processing enterprise is collected from China statistic year book and Caixin database, period from 1990 to 2014. We used data as Financial Interrelation Ratio (FIR), economic growth (GDP) and Food Processing Enterprise (FPE). We also undertake log processing to data, noted as LnFIR, LnGDP and LnFPE.

ADF unit root test: The unit root test was first put forward by David Dickey and Wayne Fuller, so it is also called DF test. DF test is a basic method in stationarity test, if we have a model as:

$$Y_t = \rho Y_{t-1} + \mu_t$$

DF test is the significance test to the coefficient. If ρ<1, when T→∞, ρ T→0, that means the impulse will be reduced when the time is increased. However, if ρ≥1, the impulse will not be reduced with the time, so that this time-series data is not stable. The basic DF test model can be written as:

$$Y_t = \beta_1 + \beta_2 t + (1+\delta)Y_{t-1} + \mu_t$$

If we add the lagged variable of ΔYt in formula 10, then it will be called the augmented Dickey-Fuller test, so that ADF test model can be written as:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t$$

Data stable is the premise of establishing VAR model, an augmented Dickey-Fuller test (ADF) is a test for a unit root in a time series sample. We use ADF unit root test to inspect LnFIR, LnGDP and LnFPE, the result as is shown in Table 1. Through the test results we can see that LnFIR, LnGDP and LnFPE are non-stationary, then we test on d.LnFIR d.LnGDP and d.LnFPE and demonstrate that they are stable, so we can build the VAR model and use granger test and cointegration test.

RESULTS AND DISCUSSION

VAR model: Vector Auto Regression (VAR) is a statistical model used to capture the linear interdependencies among multiple time series. An estimated VAR model can be used for forecasting and the quality of the forecasts can be judged.VAR model is the simultaneous form of autoregressive model, A VAR (p) model of a time series y (t) has the form:

$$A_0 y_{(t)} = A_1 y_{(t-1)} + \cdots + A_p y_{(t-p)} + \varepsilon_{(t)}$$

In this study, I use AIC, SC criterion to identify the lag length. From the result, we can get that the minimum AIC is in lag 2, so I choose lag 2 as the lag length. Then, we bulid the VAR model of LnFIR and LnGDP, LnFIR and LnFPE as:

$$LnGDP = 1.325 + 2.05\,LnGDP_{t-1} - 1.187\,LnGDP_{t-2} + 0.942\,LnFIR_{t-1} + 0.157\,LnFIR_{t-2}$$

$$LnFPE = 0.576 + 0.952\,LnFPE_{t-1} + 0.104\,LnFPE_{t-2} + 1.361\,LnFIR_{t-1} - 0.204\,LnFIR_{t-2}$$

According to the formula, it can be seen that the effect is financial system promotes output increase of economic growth and food processing enterprise. LnFIR at lag 1 period increased one percentage can drive LnGDP growth by 0.942 percentage, LnFIR at lag

2 period increased one percentage can drive LnGDP growth by 0.157 percentage, so the effect of financial support on economic growth is obvious. Also, financial system will promote the growth of the food processing industry in short time. LnFIR at lag 1 period increased one percentage can drive LnFPE growth by 1.361 percentage, LnFIR at lag 2 period increased one percentage can drive LnFPE decrease by 0.204 percentage. In order to analyze the relations between financial system and economic growth, we use granger causality test to analyze this VAR model, the result is shown in Table 2. From Table 2, we can get that LnFIR is the reason to LnGDP, which means financial system is the reason to output increase of economy. At the same time, LnGDP is not the reason to LnFIR, so that economic growth is not the granger reason to financial system; this is also same to the conclusion above.

At the same time, we take Johnson co-integration test to analyze the long-term relations between financial system and economic growth, the results is shown in Table 3. Co-integration is a statistical property of time series variables. Two or more time series are co integrated if they share a common stochastic drift, if two or more series are individually integrated but some linear combination of them has a lower order of integration, then the series are said to be co integrated.

According to the results, there exist at least one direct co-integration relationship between financial system and economic growth, which means that there exist a long-term equilibrium relationship between financial system and output increase of economic growth.

Impulse-response analysis: According to the results above, we can get that there exist a long-term equilibrium relationship between financial system and output increase of economic growth and financial system is the reason to economic growth, also the VAR model is stable. In order to analyze the VAR model, I use Impulse-response function, the results is shown in Fig. 1 and 2.

Figure 1, we can get that when LnFIR received one unit impact, it will lead LnGDP increase currently, LnGDP at t = 1 period is 0.000095 and then increased to 0.0216 at t = 1 period. LnGDP will reach the max at t = 5 period and begin to be stable then. It illustrates there is long-term effect between financial system and output increase of economic growth. At the same time, when LnFIR received one unit impact in Fig. 2, it will lead LnFPE have a major increase currently and return to the basic situation at t = 8 period. According to the impulse analysis results, we can get that financial system will significant influence the output of economic growth and food processing enterprise, so that it is important to enhance the innovation of financial system.

Table 2: Granger causality test

Equation	Excluded	Chi2	df	Prob>chi2
LnFIR	LnGDP	14.868	2	0.201
LnGDP	LnFIR	27.802	2	0.000

Table 3: Johnson Co-integration test

Rank	Parms	LL	Characteristic value	Statistic	5% Significant level
0	6	66.98959		20.9545	15.41
1	9	76.801423	0.64400	1.3309*	3.76

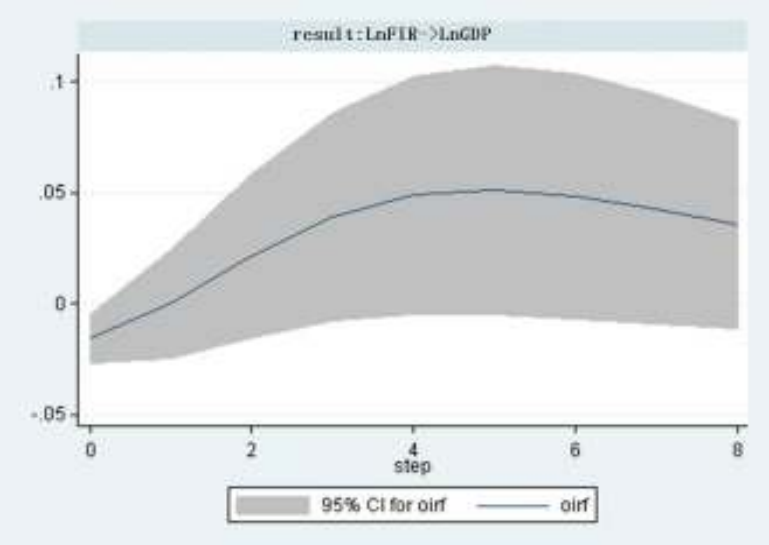

Fig. 1: Impulse-response analysis for LnFIR to LnGDP

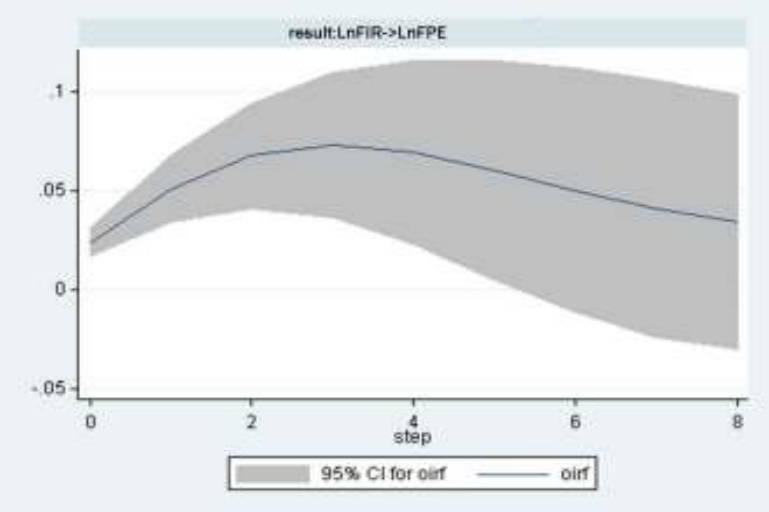

Fig. 2: Impulse-response analysis for LnFIR to LnFPE

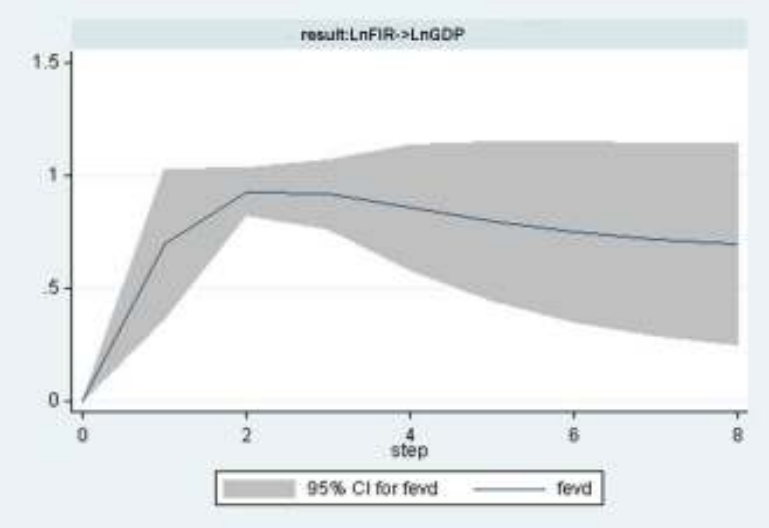

Fig. 3: Cholesky variance decomposition for LnFIR to LnGDP

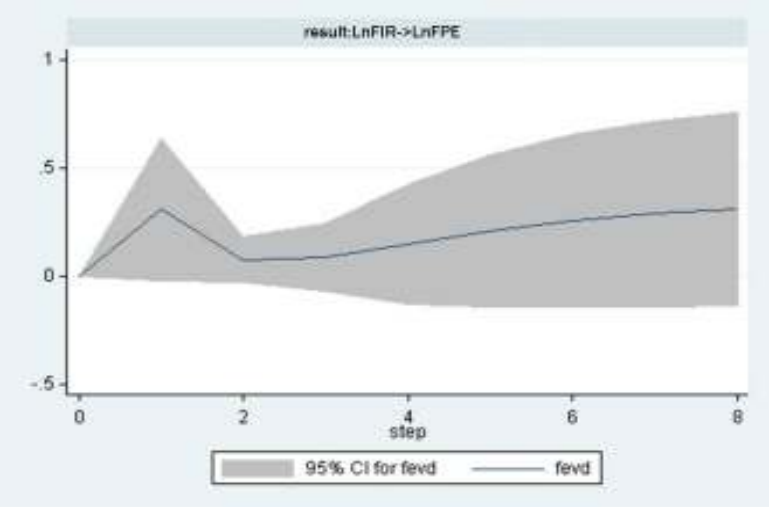

Fig. 4: Cholesky variance decomposition for LnFIR to LnFPE

Then, we make cholesky variance decomposition to the VAR model, the results is shown in Fig 3 and 4. The cholesky variance decomposition also shows the same result, from Fig. 3, we can find that LnFIR has a good contribution degree to LnGDP, contribution degree of LnFIR to LnGDP is reached 69.3% at step 1 and then increased 92% at step 2. This proves that the financial development has a certain business expansion. From the Fig. 4, we can find that the contribution degree of LnFIR to LnFPE is gradually increased. we find the contribution degree of LnFIR to LnFPE at t = 1 period is 30.2% and then return back to 7.4% at step 2, this means financial system has obvious interpretative strength to food processing enterprise in the short-term. Also, the contribution degree of LnFIR to LnFPE is increased gradually from step 2 and finally research to 30.83% at step 8. The result of variance decomposition means that financial system has an important contribution degree to the output of food processing enterprise and can be used to explain the output growth of economic growth.

DISCUSSION

As the market mechanism of financial development and gradually form is the core of the financial system, financial market can play resources, optimize the allocation of resources at the macro level, improve the transformation from savings to investment ratio and effective transmission of financial policy. While at the micro level, the financial market has set prices, enhance business opportunities; reduce the flow of the market search and information costs and other effects. Therefore, financial development through the macro financial markets provide a good financial environment for the technical innovation of enterprises, through the micro financial competition provides a variety of low-cost financial products for the enterprise, to meet in the process of technology innovation, the financial needs of enterprises.

The function of financial market to enterprise technology innovation is mainly manifested in: first, enterprises need a lot of money in research and development of technology innovation (Ulrich *et al*., 2013), the enterprise's internal financing to solve the problem of shortage of funds, can only rely on external financing channels to compensate for R and D and production of funds (Vasant and Zhangyue, 2014). In this regard, only developed, efficient financial markets can scale to mobilize social idle funds, to meet the financing needs of enterprises technology innovation. Secondly, enterprise technology innovation activities are usually accompanied by high risk, if the lack of financial market support, funds will be only to the risk investment of low technology, then the capital will tend to be concentrated in low levels of technology investment field, thus affecting the technical innovation and the development of enterprises (Zhang, 2007). Financial market is the function of risk diversification makes the enterprise of high risk in technological innovation process can be shared, effectively promote the capital market to high-end technology innovation flow. Visible, the financial market level is high in the region, effectively reduce investment uncertainty and risk, financial market can produce more flexible and efficient financing channels, allowing companies to obtain financial support fully in the technological innovation activity, promote enterprise technological innovation will. In general, the financial market effects on technological innovation can be expressed as: through efficient financial market funds to expand the enterprise technology innovation supply, improving the efficiency of capital allocation, disperse the risk of innovation, improve the management level of the enterprise and promote enterprise technology innovation and progress.

CONCLUSION

Above all, there are long-term interaction effects between China's financial system and output growth of economic growth. Financial development can promote economic growth increase continuously and the economic growth can also promote the development of finance. Also, the financial system and economic growth have long-term stability of mutual promotion relationship. At the same time, financial system has a certain lag effect to output growth of food processing industry. Considering the importance of financial system, it is necessary to pay more attention to the development of financial industry and optimize capital configuration, improve the new technology industry and improve policy oriented industry financing capacity, in order to promote China's financial structure optimize ceaselessly. China also needs to pay attention to the degree of financial development should be suitable for the local food processing industry development level in different regions and avoid excessive financial support at the same time.

In the economic development level of per capita GDP, financial agglomeration plays an important intermediary role. The economic development of the first reflected in the financial agglomeration, so as to further promote the financial development. Concentration in the banking industry, the securities industry agglomeration and agglomeration in the insurance industry, banking industry is particularly prominent role on the financial development; Chinese social economic practice also proved, the development of the regional economy will continue to attract financial institutions to collect to the regional economic center city, the agglomeration effect hand expanded regional financial the size of the industry, on the other hand through the development and optimization of the

financial structure of regional financial competition in the financial market; with the financial continues to accumulate, the competition of regional financial market more fully, the financial information more and more abundant, all kinds of innovative financial products and financial tools being developed continuously, continuously improve the efficiency of capital allocation at the same time, the region of financial regulation has been improved, all of these aspects to promote regional financial development and raising the level of.

Because there is long-term interactive relationship between financial system and output growth of economic growth, we should support financial industry and draw lessons from international financial crisis at the same time and ensure that the speed of financial development and economy is coordinated. Otherwise China need to strengthen financial supervision, optimize the financial structure constantly and continue to promote financial reform, in order to improve the efficiency of the financial system and support economy steady, fast development.

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