

An Improved Statistical Model for Evaluating Financial Deepening Effects and Economic Risk Prevention

Xuxian Yan^{1,*} and Xianjun Li²

¹College of Management Science and Engineering, Shanxi University of Finance and Economics, Taiyuan, Shanxi province, 030006, China; ²School of Mathematics and Systems Science, Beihang University, Beijing, China

Abstract: Along with China's economy development and the deepening of reform and openness, the financial institutions development rapidly and gradually become an important support force to promote the economic development. However, credit risk becomes a quite important uncertain factor that affects commercial banks. In this paper, we analyze the impact of financial system on economic fluctuations by using time series model. The result shows that LnFIR at lag 1 period increased one percentage can drive LnGDP growth by 0.652, LnFIR at lag 2 period increased one percentage can drive LnGDP decrease by 0.217 percentage, so the effect of financial development on economic growth is obvious. In addition, we researches on the performance and characteristics of credit risk under the condition of the macro-economic uncertainty and how the commercial banks prevents credit risk by perfecting systems.

Keywords: Commercial banks, economic uncertainty, empirical analysis, financial deepening, risk prevention.

1. INTRODUCTION

Along with our country economy development and the deepening of reform and openness, China's financial institutions, rapid development and gradually become an important support force to promote the economic development [1]. Economic development cannot leave behind the support of the financial industry, the development of financial institutions can provide more financing channels for enterprises, reduce the risk of business operations, provides a large number of employment opportunities, promote the steady growth of the local economy [2]. At the same time, because of the financial institution has the function of financing, can automatically Capital Agglomeration in the advantage and new technology industry, and has an important influence on the development of China's industry and enterprise transformation.

In recent years, china's rapid economic development, the financial industry has also obtained the considerable development. The development of regional financial industry better, income level of local residents will be higher, so the financial development is the key factor to promote economic growth [3]. In addition, building a sound financial system and sound financial structure, is conducive to small and medium enterprises out of financial difficulties, is an important way to promote employment. Because of the close relationship between financial industry and economic growth, there is therefore, to explore the relationship between economic growth and financial development, research on how to improve the financial system, optimizing the financial structure

to promote the surrounding region's economic growth has important practical significance.

Moore [4] make the definition of financial deepening is explained, he pointed out that financial deepening is to improve the ratio of a country's financial assets and gross domestic product. Balassa [5] pointed out that the development of financial efficiency and improve the level of investment depends on the financial system, especially the development of the financial liberalization. Financial deepening that enterprises can get more benefits, including reducing the high cost of enterprises to invest in their own, encourage enterprises to financing through the capital market instead of relying on government authorities and commercial banks. King and Levine [6] pointed out that the development of the financial system and promote the diversity of portfolio, reducing investment risk for savers, and to offer investors more choice and increase income. Hamori [7] pointed out that the financial deepening generally refers to in the real economy financial transaction amount growth; this process can also be interpreted as a financial asset equilibrium state with respect to an extension of the real economy. Wan-Chun Liu and Chen-Min Hsu [8] pointed out that since the financial crisis erupted in East Asia, the importance of financial development and stability has been started by the extensive attention. In the article the author discussed the financial development and the three largest economies in Asia to Taiwan, Korea, Japan's economic growth between, at the same time, the author emphasizes the role of financial development and financial structure (including banking and stock market), monetary and financial policies, as well as in the international capital flow in economic growth. M. Kabir Hassana and Benito Sanchez [9] studied in low and middle income countries in financial development on economic growth effect. In order to prove the relationship between financial development and economic growth, the author through the

panel regression analysis of the influence of financial development to economic growth, and through the variance decomposition estimates the value of capital contribution rate of GDP, the results contribute to the economic development status of interpretation in different geographic regions and income groups. Dimitris [10] through the entire analysis of panel unit root test and panel cointegration, studies the long-term relationship between 10 developing countries, financial deepening and economic growth. In addition, the author also uses the threshold cointegration test, and based on the dynamic panel data panel vector error correction model estimation, long-term relationship is using the fully modified OLS estimator. The empirical results show that the cointegration relationship with stable between financial deepening and economic growth, but only cointegrated also implies financial depth is a one-way causal relationship between economic growth. Silke and Niels [11] based on the statistics of 441 t reports and 60 empirical articles, carries out a systematic analysis of the empirical literature on the relationship between financial development and economic growth in the past. The research results show that, from an average of the numerical point of view of financial liberalization has a positive role in promoting economic growth, but the significance of this effect is not high.

This paper uses the method combining theoretical research with empirical research, explores the relationship between financial development and economic fluctuations and economic risks.

2. MATERIALS AND METHODS

2.1. Data Collection and Evaluation Index

In order to analyze how the financial development effect on the 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 2013. 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:

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

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 GDP is collected from Beijing statistic year book and Caixin database, period from 1990 to 2013. We also undertake log processing to data, noted as LnFIR and LnGDP.

2.2. 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:

$$A_0 y_{(t)} = A_1 y_{(t-1)} + \dots + A_p y_{(t-p)} + \varepsilon_{(t)} \quad (2)$$

2.3. Stability Conditions

The stability of the VAR model means that when we put an impulse to the innovation of on formula in the VAR mode, the impact of the effect will gradually reduce. The basic condition of stability is that: all the eigenvalue of Π should be located within the unit circle. According to the VAR formula, when $t=1$, it should be:

$$Y_1 = c + \Pi_1 Y_0 + \mu_1 \quad (3)$$

And when $t=2$, we calculate the formula with iterative method, as:

$$Y_2 = c + \Pi_1 Y_1 + \mu_2 = (1 + \Pi_1) c + \Pi_1^2 Y_0 + \Pi_1 \mu_1 + \mu_2 \quad (4)$$

So that, when $t=t$, it could be written as:

$$Y_t = (1 + \Pi_1 + \Pi_1^2 + \dots + \Pi_1^{t-1}) c + \Pi_1^t Y_0 + \sum_{i=0}^{t-1} \Pi_1^i \mu_{t-i} \quad (5)$$

From the formula above, we can get that Y_t becomes a function to the vector μ , Y_0 and μ_t after the formula transformation. So we can analysis the impact result of these vectors to find out whether the VAR model is stable. If the VAR model is stable, it will satisfy the conditions as:

- If give one unit impulse to c at $t=1$, when $t \rightarrow \infty$, the effect will have a Limit value as $(I - \Pi_1)^{-1}$
- If give one unit impulse to Y_0 , the effect will be Π_1^t when $t=t$ and will be gradually disappeared with time has been increased.

From the analysis about VAR model, we can get that if the VAR model has the unit root, it will have the memory about impulse impact for a long time, so this VAR model is not stable. Also, the response of endogenous variables will not reduce with time increased in this case.

3. RESULTS AND DISCUSSION

3.1. ADF Unit Root Test

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 and LnGDP, the result as is shown in Table 1.

Table 1. Augmented dickey–fuller test (ADF).

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Result
LnFIR	-1.677	-3.709	-2.983	-2.623	Unstable
LnGDP	0.585	-3.709	-2.983	-2.623	Unstable
D.LnFIR	-3.721	-3.709	-2.983	-2.623	Stable
D.LnGDP	-3.569	-3.709	-2.983	-2.623	Stable

Table 2. Granger causality test.

Equation	Excluded	chi2	df	Prob > chi2
LnFIR	LnGDP	17.716	2	0.000
LnGDP	LnFIR	32.897	2	0.000

Table 3. Johnson Co-integration test.

Rank	Parms	LL	Characteristic Value	Statistic	5% Sig. level
0	6	66.989		20.9545	15.41
1	9	76.8014	0.64400	1.3309*	3.76

Through the test results we can see that LnFIR and LnGDP are non-stationary, then we test on d.LnFIR and d.LnGDP and demonstrate that they are stable, so we can build the VAR model and use granger test and cointegration test.

3.2. Result

In this paper, we 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 build the VAR model of LnFIR and LnGDP as:

$$LnGDP = 1.325 + 2.05LnGDP_{t-1} - 1.187LnGDP_{t-2} + 0.652LnFIR_{t-1} - 0.217LnFIR_{t-2} \tag{6}$$

$$LnFIR = -1.25 + 0.233LnFIR_{t-1} + 0.204LnFIR_{t-2} + 0.448LnGDP_{t-1} + 0.59LnGDP_{t-2} \tag{7}$$

According to the formula (16), it can be seen that the effect is financial development promotes economic growth. LnFIR at lag 1 period increased one percentage can drive LnGDP growth by 0.652 percentage, LnFIR at lag 2 period increased one percentage can drive LnGDP decrease by 0.217 percentage, so the effect of financial development on economic growth is obvious. Financial development will promote the growth of the GDP in short time, but financial development will decrease the growth of the GDP in the long time. According to the formula (17), it can be seen that the economic growth can also promote financial development, and LnGDP at lag 1 period and the 2 period increased 1 percentage will drive the LnFIR increased by 0.448 and 0.59 percentage respectively. Therefore, financial development and economic growth have direct mutual promotion effect.

In order to analyze the relations between financial development 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 development is the reason to economic growth increase. At the same time, LnGDP is not the reason to LnFIR, so that economic growth is also the reason to financial development; this is also same to the conclusion above.

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

3.3. Impulse-Response Analysis

According to the results above, we can get that there exist a long-term equilibrium relationship between financial development and economic growth, and financial development and economic growth is the reason to economic growth, also the VAR model is stable. In order to analyze the VAR model, I use Impulse-response function and cholesky variance decomposition, the results is shown in Figs. (1 and 2).

From Fig. (1), we can get that when LnFIR received one unit impact, it will lead LnGDP increase currently, LnGDP will reach the max at t=4 period and begin to be stable then. It illustrates there is long-term effect between financial development and economic growth. At the same time, when LnFIR received one unit impact, it will lead LnGDP decrease currently, and return to the basic situation at t=4 period. According to the impulse analysis results, we can get

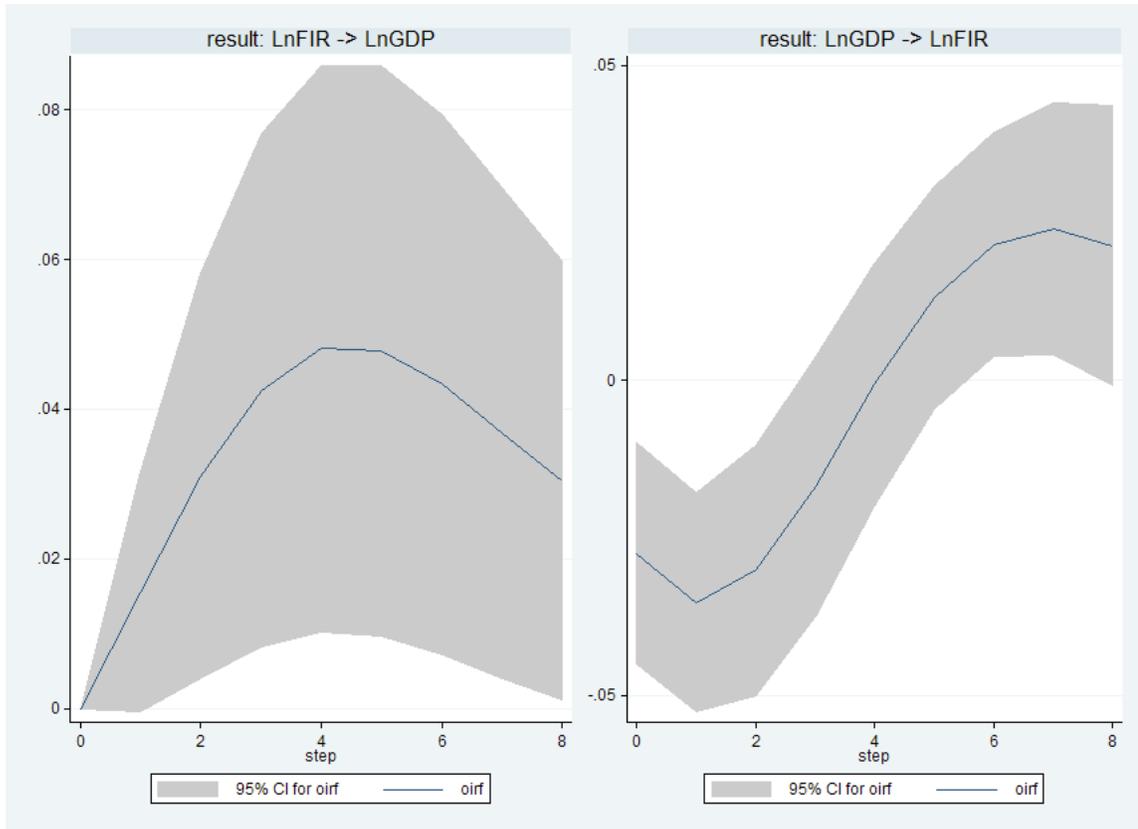


Fig. (1). Impulse-response analysis.

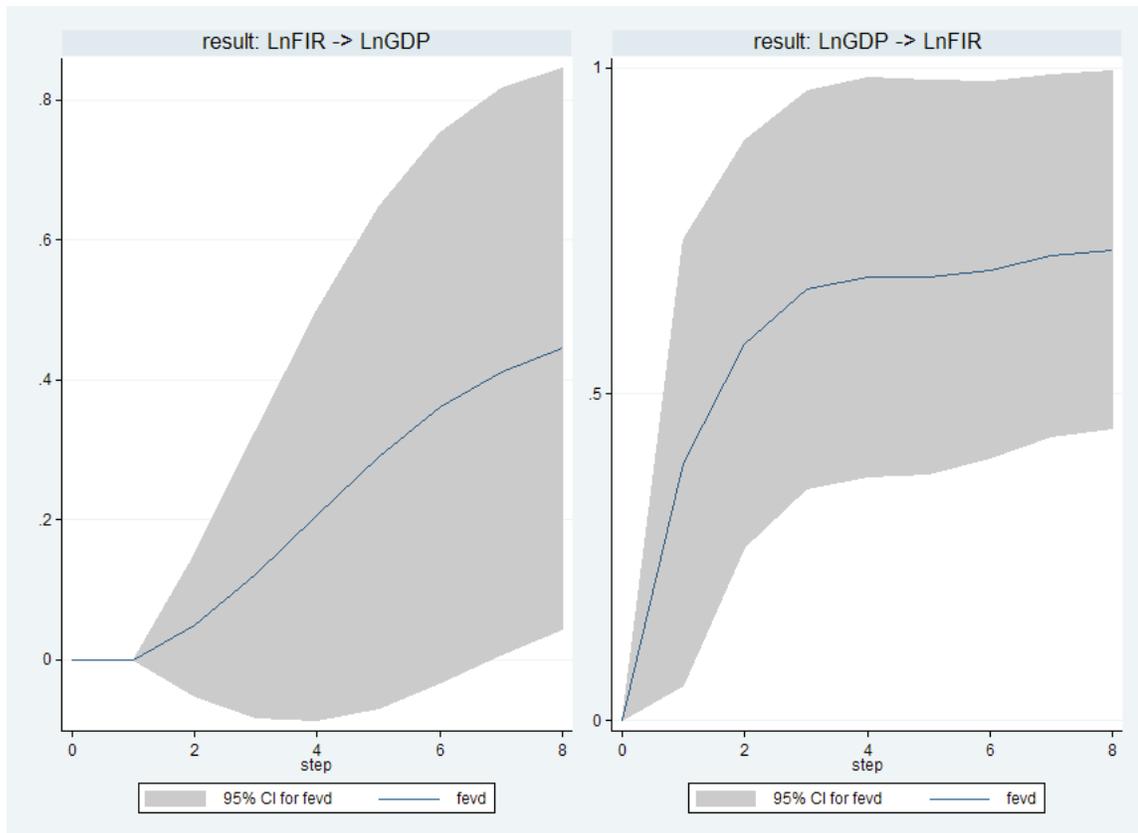


Fig. (2). Cholesky variance decomposition.

that financial development will significant influence economic growth, so that it is important to enhance the innovation of financial development. The cholesky variance decomposition also shows the same result, the contribution degree of LnFIR to LnGDP is gradually increased. From Fig. (2), we find the contribution degree of LnFIR to LnGDP at $t=1$ period is 0, and then increased gradually from step 2, finally increased to 44.2% at $t=8$ period. At the same time, the contribution degree of LnGDP to LnFIR is 39.52% at $t=1$ period, then increased and become stable from step 2, the contribution degree in $t=8$ period is 72.13%. This means that financial development has a important contribution degree to economic growth, and can be used to explain the economic growth.

CONCLUSION

Above all, there are long-term interaction effects between China's financial development and economic growth. Financial development can promote economy to grow continuously, and the economic growth can also promote the development of finance, and financial development and economic growth have long-term stability of mutual promotion relationship. According to the data of 1990 to 2010, it can be figured out that effect of financial development prompting economic growth in 2005 can be found gradually after 2006. Financial development has a certain lag effect to economic growth. Considering the importance of financial development, 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 economic development level in different regions, and avoid excessive financial development at the same time.

With the development of our economy and the deepening degree of opening up and the influence of economic situation worldwide, the uncertainty of macro-economy is strengthening. In the post crisis era, the uncertainty resulted from the financial crisis continues to increase, such as the price rise of international commodity, trade friction strengthening, the vibration of interest rate and exchange rate. Commercial banks are facing new challenges owing to the uncertainty of economic development. In order to hold advantage in competition and maintain the market share, Chinese commercial banks need to improve management styles, especially improving the ability of risk prevention, reducing non-performing assets and keeping appropriate safety and mobility. In terms of theory, the research of commercial banks' credit crisis precaution from the angle of macro-economic uncertainty is not so many, and the empirical research seems rare. In terms of practice, the quantitative technique of the credit risk in banking needs to be strengthened urgently and the risk prevention level improved. Therefore, it is an essen-

tial subject to do research on the macro and micro factors affecting credit risks, strengthen credit risk prevention and maintain the financial stability, which has important theoretical and practical significance.

Because there is long-term interactive relationship between financial development and 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 drive economy steady, fast development.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

ACKNOWLEDGEMENTS

The author thanks the Humanity and Social Science Youth Foundation of Ministry of Education of China (11YJC630245); the Program for the Philosophy and Social Sciences Research of Higher Learning Institutions of Shanxi (2013326); Shanxi Natural Science Foundation Project (2013011067-2). Shanxi Social Science Association Annual 2014 to 2015 key research projects (SSKLZDKT2014042).

REFERENCES

- [1] L.P. Anna, "Economic literacy, inequality, and financial development", *Economics Letters*, 118, pp. 74-76, 2013.
- [2] A.George, "Financial development and economic growth in Ghana: Does the measure of financial development matter?" *Review of Development Finance*, vol. 3, pp. 192- 203, 2013.
- [3] H.Iftekhari, W.Paul, Z.Mingming, "Institutional development, financial deepening and economic growth: Evidence from China", *Journal of Banking & Finance*, vol. 33, pp. 157-170, 2009.
- [4] G.Jeremy, M.S.Juan, W.Cheng, "Quantifying the impact of financial development on economic development," *Review of Economic Dynamics*, vol. 16, pp. 194-215, 2013.
- [5] K.Jake, "Local financial development and growth," *Journal of Banking & Finance*, vol. 36, pp.1548-1562, 2012.
- [6] B.James, "Financial development, liberalization and technological deepening," *European Economic Review*, vol. 55, pp. 688-701, 2011.
- [7] S.Muhammad, M.Qazi, K.T.Aviral, C.L.Nuno, "economic growth, energy consumption, financial development, international trade and CO2 emissions in Indonesia," *Renewable and Sustainable Energy Reviews*, vol. 25, pp. 109-121, 2013.
- [8] S.Muhammad, K.Saleheen, I.T.Mohammad, "The dynamic links between energy consumption, economic growth, financial development and trade in China: Fresh evidence from multivariate framework analysis," *Energy Economics*, vol. 40, pp. 8-21, 2013.
- [9] H.Shigeyuki, H.Yoshihiro, "The effect of financial deepening on inequality: Some international evidence," *Journal of Asian Economics*, vol. 23, pp. 353-359, 2013.

- [10] Z.Wu, "Financial development and economic growth: analysis from the China experience," *Journal of Financial Research*, vol. 5, pp.58-68, 2010.
- [11] L.Li, X.Wang, "Chinese financial development, economic fluctuation and economic growth: a study based on Panel Data," *Shanghai Economic Review*, vol. 2, pp. 83-86, 2009.

Received: September 22, 2014

Revised: November 30, 2014

Accepted: December 02, 2014

© Yan and Li; Licensee *Bentham Open*.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.