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A Model Build and Empirical Test on Efficiency Evaluation about Deposit Insurance System in Chima Based on Variance Decomposition

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Abstract: In this thesis, we will constitute a model and index of efficiency evaluation of deposit insurance system. Through the 'China Financial Stability Index' we will set, combined with variance decomposition to test the financial stability empirical model, also with the introduction of dummies as well as interaction, we will have a test on the implemental efficiency of deposit insurance system. Empirical study has showed that GDP growth, weighted average CHIBOR (per day), inflation rate as well as the M_2-to-foreign exchange reserve ratio are all basic economic variables significantly affecting China's financial stability, thus can be considered as the intermediate targets of efficiency evaluation of the system. This method is able to measure the influence of characteristic indicators of the deposit insurance system on the basic economic variables above, through which they have an impact on the overall financial stability eventually. In this way, we provide some evidence for more targeted policy-making process to promote efficiency in China.

Key words: Deposit insurance system, efficiency evaluation, financial stability

INTRODUCTION

The deposit insurance system, as one of three pillars of financial safety net, is considered as a fundamental system of establishing the long-acting mechanism of financial stability by the majority of governments and international organizations. With the acceleration of China's market-oriented interest rate reform, the gradually floating of deposit and loan interest rate pushes the quick introduction of deposit insurance system.

Friedman and Schwartz (1963) accredited banking stability of the U.S. from 1930s to 1960s to the federal deposit insurance system. Diamond and Dybvig (1983) emphasized the importance of deposit insurance system in protecting the interests of depositors, increasing public confidence in the banking system and maintaining the stability of the financial system.

Demirguc-Kunt and Detragiache (2002) showed that in countries with poor institutional environment, the unscientific design of deposit insurance system increased the probabilities of systematic banking crisis occurrence. Further, Angkinand and Wihlborg (2010) proved that in countries with the higher level of economic development and relatively good institutional environment, deposit insurance system achieved better effects. However, in the above research, Logit models used the occurrence of systematic banking crisis as the standard to judge whether a country's financial environment was stable. The index itself did not take future growth into consideration, therefore could not be dynamic adjustable.

The financial stability index designed by IMF (2006) is a representative method of quantitative analysis of the financial stability. But, because of the obvious differences, some core indexes in the IMF financial indicators system can not be acquired in China, so at present we could not apply the IMF financial stability index to Chinese financial stability analysis.

Chinese scholars also have been doing tentative research on financial stability measurement. Wang and Li (2005) divided the regional financial risk-warning index into macroeconomic indicators and financial organizational built-in indicators by taking Hubei Province as an example. He and Lou (2011) measured financial stability by analyzing deviation of the basic indicators to their long-term average which reflected the financial institution, financial markets, external shocks and the macroeconomic situation.

Unlike similar domestic and foreign literature, this thesis uses variance decomposition to build a more perfect efficiency evaluation method and index of deposit insurance system which make up the defects of present quantitative study of deposit insurance system efficiency evaluation and could be able to reflect the influence of deposit insurance system construction on China's financial stability. What's more, this method could solve the key problem of the construction of deposit insurance

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system and establish the theoretical foundation for research in this field. Therefore, it could provide a theoretical basis for our country to make more targeted efficiency promotion policies. Meanwhile, the use of variance decomposition to evaluate China's financial stability has six good characteristics of comprehensiveness, representativeness, computability, objectivity, dynamic adjustment and principle of according with national condition, so it could reflect the status of China's financial stability.

MODEL

Construction of more perfect China financial stability index: Financial stability condition index (FSCI) is the synthesis of a comprehensive index to reflect a country's future financial stability. FSCI gives different weight of the deviation from its long-term trend or the equilibrium value, the deviation refers to indicators that reflect currency, stock, foreign exchange, real estate and other types of assets and financial institutions operating status.

$$FSCI_t = \sum \omega it\ (xit\text{-}Xit)/Xit \quad (1)$$

$FSCI_t$ denotes financial stability index at t time, ω_{it} denotes x_{it} variable weight at t time, x_{it} denotes the value of x_{it} at t time, x_{it} denotes long-term trend or the equilibrium value of x_{it} at t time, $(x_{it}\text{-}x_{it})/x_{it}$ denotes relative deviation of x_{it} to its long-term trend or the equilibrium value at t time.

FSCI variable selection and calculation of the relative deviation: At present the deposit insurance efficiency evaluation methods have some defects, this thesis synthesizes the method of Goodhart and Hofmann (2001) by increasing the new domestic credit scale in financial institutions to build a more perfect index of China financial stability.

$$FSCI_t = \omega_{1t}A_{1t}+\omega_{2t}A_{2t}+\omega_{3t}A_{3t}+\omega_{4t}A_{4t}+\omega_{5t}A_{5t} \quad (2)$$

a_{1t}, a_{2t}, a_{3t}, a_{4t} and a_{5t} denote the actual weighted average CHIBOR (per day), the US dollar against the RMB exchange rate, apartment sales price index, Shanghai Stock Exchange Composite Index and the new domestic credit scale of deposit financial institutions. A_{1t}, A_{2t}, A_{3t}, A_{4t} and A_{5t} denote the gap of a_{1t}, a_{2t}, a_{3t}, a_{4t} and a_{5t} to their equilibrium value in the different periods. This thesis uses Hodrick-Prescott filter processing to deal with initial variable data in order to get relative deviations of these variables to their long-term trend in different periods. ω_{1t}, ω_{2t}, ω_{3t}, ω_{4t} and ω_{5t} denote the respective weights of A_{1t}, A_{2t}, A_{3t}, A_{4t} and A_{5t}.

Data and data sources: The empirical test of the data and data sources are shown in Table 1.

Determination of variable weights:

- **VAR model stability test:** Table 2 and Fig. 1 show that the VAR system composed by GDP growth, the weighted average CHIBOR (per day), the US dollar against the RMB exchange rate, apartment sales price index, Shanghai Stock Exchange Composite Index and the new domestic credit scale of deposit financial institutions is stable
- **Variance decomposition results:** As shown in Table 3, GDP is the most important factor influencing itself and GDP accounts for 83.59% of its change in phase 10. The weighted average CHIBOR (per day) accounts for 9.82% of GDP change; the US dollar against the RMB exchange rate, 1.03%; apartment sales price index, 10.42%; Shanghai Stock Exchange Composite Index, 14.82%; the new domestic credit scale of deposit financial institutions, 2.79%. Therefore:

$$\omega_{1t} = 9.82\%,\ \omega_{2t} = 1.03\%,\ \omega_{3t} = 10.42\%,$$
$$\omega_{4t} = 14.82\%,\ \omega_{5t} = 2.79\%$$

Construction of China financial stability model: Besides the deposit insurance system, a country's financial stability is also influenced by many basic economic variables, such as GDP growth, real interest rate, inflation rate, M2-to-foreign exchange reserve ratio. This thesis

Table 1: Data and data sources

Data	Data sources
The weighted average CHIBOR(per day)	http://www.pbc.gov.cn/
GDP growth rate	China Statistical Yearbook (2005-2010), calculated by the GDP value, National Bureau of Statistics
US dollar against the RMB exchange rate	http://www.safe.gov.cn/model_safe/index.html
apartment sales price index	China Statistical Yearbook (2005-2010), National Bureau of Statistics
Shanghai Stock Exchange Composite Index	http://www.sse.com.cn/sseportal/ps/zhs/hqjt/hqjy.shtml
The new domestic credit scale of deposit financial institutions	http://www.wind.com.cn/
CPI index	http://www.wind.com.cn/
M2-to-foreign exchange reserve ratio	http://www.wind.com.cn/

Table 3: Variance decomposition results

Period	SE	GDP	a_1	a_2	a_3	a_4	a_5
1	2629.574	100.00000	0.000000	0.000000	0.000000	0.000000	0.000000
2	3273.024	95.57967	2.020289	0.113615	1.443023	0.021569	0.821838
3	3495.340	90.65235	1.961956	0.277028	2.430445	0.543102	4.135119
4	3543.455	88.92700	2.377672	0.398679	3.118017	0.709186	4.469444
5	3599.275	88.40413	2.530737	0.533214	3.022117	1.168895	4.340907
6	3640.611	87.57067	2.478647	0.774708	3.143646	1.524811	4.507517
7	3663.112	86.53124	2.502744	0.921291	3.509001	1.956861	4.578861
8	3684.894	85.58766	2.641667	0.997485	3.837240	2.390544	4.545403
9	3707.436	84.62132	2.847352	1.018731	4.085182	2.935387	4.492029
10	3730.316	83.58894	3.063663	1.019204	4.292288	3.592090	4.443820

Table 2: VAR model stability test

Roots of the characteristic equation

Endogenous variable: GDP A_1 A_2 A_3 A_4 A_5

Root	Modulus
0.921607-0.207948i	0.944776
0.921607+0.207948i	0.944776
0.935702-0.046987i	0.936881
0.935702+0.046987i	0.936881
0.493041-0.504654i	0.705525
0.493041+0.504654i	0.705525
-0.484283-0.109374i	0.496481
-0.484283+0.109374i	0.496481
0.372935	0.372935
0.008471-0.365702i	0.365800
0.008471+0.365702i	0.365800
-0.130742	0.130742

No root lies outside the unit circle. VAR satisfies the stability condition

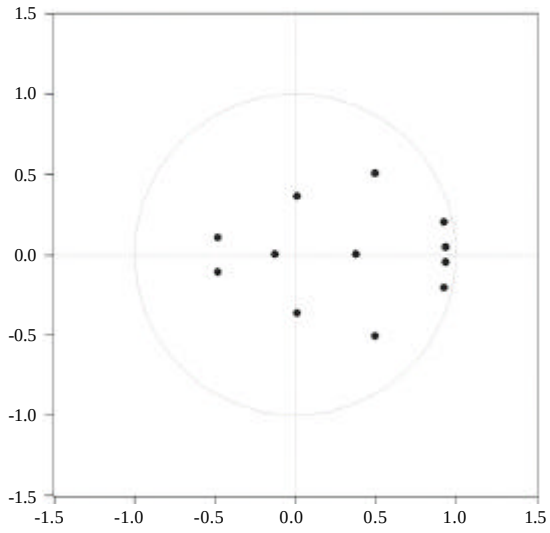

Fig. 1: VAR model unit root

chooses the FSCI index as the variable being explained and chooses GDP growth, the weighted average CHIBOR(per day), inflation rate, M2-to-foreign exchange reserve ratio as explanatory variable B_1, B_2, B_3, B_4:

$$FSCI_t = \beta_0+\beta_1 B_{1t}+\beta_2 B_{2t}+\beta_3 B_{3t}+\beta_4 B_{4t}+\mu_t \quad (3)$$

Regression of Eq. 3 using 2005 June to 2010 March monthly data gets:

$$\widetilde{FSCI_t} = 0.919 - 1.790 B_{1t} - 0.086 B_{2t} + 0.016 B_{3t} - 0.190 B_{4t} \quad (4)$$

$$(7.663)\ (-10.715)\ (-6.707)\ (1.209)\ (-7.241)$$

$$R^2 = 0.736,\ \bar{R}^2 = 0.716,\ F = 37.009,\ D.W. = 1.520$$

R-squared figure is good and the equation passes the F test, meaning that explanatory variables can significantly explain variable being explained. Therefore, basically this model of financial stability is consistent with the actual situation in China.

Build a more perfect efficiency evaluation method of deposit insurance system: Since China has not established the deposit insurance system, we will evaluate the efficiency of deposit insurance system with the introduction of dummies as well as interaction. The model considers that characteristic indicators of deposit insurance system not only directly but indirectly affect the financial stability through the basic economic variables.

C_1: Whether deposit insurance system has mutual insurance. If it does not have mutual insurance, then $C_1 = 0$; if it has mutual insurance, then $C_1 = 1$

C_2: Whether deposit insurance system covers deposit of the foreign currency. If it does not cover, then $C_2 = 0$; if it covers, then $C_2 = 1$

C_3: Whether deposit insurance system covers the inter-bank deposit. If it does not cover, then $C_3 = 0$; if it covers, then $C_3 = 1$

C_4: Whether deposit insurance system establishes clear insurance fund. If it is without clear insurance fund, then $C_4 = 0$; if it is with clear insurance fund, then $C_4 = 1$

C_5: Insurance fund sources. If insurance fund is only from the bank, then $C_5 = 0$; if insurance fund is from the bank and government, then C5 = 1; if insurance fund is only from the government, then $C_5 = 2$

C_6: Insurance agency management. If government manages insurance agency, then $C_6 = 1$; if government and private sector manage insurance agency, then $C_6 = 2$; if private sector manages insurance agency, then $C_6 = 3$

C_7: Approaches of joining the deposit insurance system. If it is voluntary, then $C_7 = 0$; If it is compulsory, then $C_7 = 1$

Building models, respectively (N = 1,...7):

$$FSCI_t = \beta_0+\beta_1 B_{1t}+\beta_2 B_{2t}+\beta_3 B_{3t}+\beta_4 B_{4t}+\beta_5 B_{1t} C_{nt}+\beta_6 B_{2t} C_{nt}+\beta_7 B_{3t} C_{nt}+\beta_8 B_{4t} C_{nt}+\beta_9 C_{nt}+\mu_t \quad (5)$$

To judge whether the set of characteristic indicators of deposit insurance system would help decline FSCI through coefficiencies before the dummy variable $C_{Nt.\ and}$ to judge whether they would help strengthen the effect of basic economic variables (B_{1}, B_{2b} B_{3b} B_{4t}) on FSCI through coefficiencies of interaction between the dummy variable C_{Nt} and the basic economic variables.

CONCLUSION

Empirical study has showed that GDP growth, weighted average CHIBOR(per day), inflation rate as well as the M2-to-foreign exchange reserve ratio are all basic economic variables significantly affecting China's financial stability, thus can be considered as the intermediate targets of efficiency evaluation of the system. This method is able to measure the influence of characteristic indicators of the deposit insurance system on the basic economic variables above, through which they have an impact on the overall financial stability eventually. In this way, we provide some evidence for more targeted policy-making process to promote efficiency in China.

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