



Bank's Regulatory Capital Buffer and Counter-cyclical Behavior - Empirical Analysis Based on China's 18 Commercial Banks

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Abstract: This paper estimates the relationship between the Chinese business cycle and the regulatory capital buffers of China's commercial banks, conducts empirical tests by using an unbalanced panel of 18 listed Chinese banks for the period 2005–2014. The results show that in China there is a robustly significant negative relationship between the economic cycle and bank capital buffers. Insignificance of coefficient of the total amount of loans shows that China's commercial banks holding more capital buffer do not necessarily lead to a “credit crunch” phenomenon. Positive significant asset coefficient indicates the larger the size of the assets, the more inclined for China banks to hold more capital buffers, which is incompatible with “too big to fail” theory. The relationship between the loan loss provisions and capital buffers is not significant and this caused by Chinese commercial bank's balance between the profit and cost perspective.

Keywords: Chinese commercial banks, Capital buffer, Counter-cyclical, Bank capital

1. Introduction

In 2008, the American sub-prime crisis exposed the problem of pro-cyclical financial system. The main reason was the pro-cyclically change of own capital buffers; during the boom, enterprises operated in good condition. The credit risk was low, so banks tended to reduce capital buffer size to expand credit, which, as a result, led to the excessive expansion of the economy. At the same time, the volatility of the economic cycle also led to fluctuations in capital regulation, especially, during economic downturn. The bank's assets risk increased, so regulators requested banks to tighten credit scale and increase regulatory capital to prevent a large amount of bad debts. Under the interaction of the bank's own capital buffer and the regulatory capital, the volatility of the economic cycle has been expanded.

In December 2010, the Basel committee published the “Guidelines for the implementation of reverse cyclical capital buffer” (Basel III). This principle means that besides meeting the request of Common Equity Tier 1, there must be at least 4.5% of risk-weighted assets at all times and Tier 1 Capital must be at least 6.0%. Total Capital (Tier 1 Capital plus Tier 2 Capital) must be at least 8.0% and capital conservation buffer 2.5%. Banks also had to hold a 0-2.5% counter cyclical capital. The counter-cyclical buffer is aimed at improving the banking industry's recovery ability during economic deterioration period, and weakening the impact of the pro-cyclical. The counter-cyclical capital buffer determined by regulatory is established with the premise that the bank's own capital buffers is pro-cyclical. However, the commercial banks own provision of the capital buffer itself is counter-cyclical. Therefore, special attention should be paid to the implementation of the inverse cycle of capital buffer to avoid “worse” problem. But for China, whether the implementation of the counter-cyclical capital buffer regulation mechanism is efficient or not needs to be further tested.

2. Literature Review

Capital buffer related literature has mainly focused on three aspects: weather commercial banks' capital buffer is beneficial or not; the impact of capital regulation policy on commercial bank's pro-cyclical behavior; the impact of capital buffer on the real economy.

2.1 Reasons for Holding Capital Buffers of Commercial Banks

Banks have the opportunity cost of holding capital, and the opportunity cost become more expensive in economic boom period, so the banking sector tends to hold less capital, which performs as pro-cyclical behavior. Shim (2003) found that there is a negative correlation between the capital buffer and the business cycle of the US banking sector, which means that banks shrink their weighted risk assets in the economic recession period, resulting in an increase in capital buffer. The number of capital buffers result in amplification effects due to financial frictions in financial markets. By analyzing the capital buffer and the economic cycle variable data, Coffined *et al.* (2010) note that there is a negative correlation between the capital holdings and the credit growth rate of the French bank, which illustrated the existence of the expanded cyclical effects.

However, in reality, even in the good times, the commercial banks also hold more capitals based on some other reasons. Fonseca (2010) suggests that due to the pressure of market discipline, the commercial banks are willing to hold a certain amount of capital buffers and the number of capital buffers can reflect the bank's financial condition in a certain circumstances. Guidara *et al.* (2013) use 1982-2010 data from the banking sector in the United States and reach conclusion that there is a positive correlation between the bank's capital buffer and the economic cycle. Banks hold a large amount of capital buffers during the boom, and they survived the global sub-prime crisis smoothly. This is due to the prudential supervision based on the Basel III framework of the regulatory authorities on the capital adequacy ratio.

2.2 The Impact of Capital Regulation on Bank's Pro-Cyclical Behavior

The capital supervision performs in two aspects; one is the supervision of capital adequacy rate, and the other is the demand on commercial bank loan loss provision. Whether capital regulation exacerbate the pro-cyclical behavior of banks or not? The mainstream view is that in the stage of economic growth, due to the bank's credit of good quality, capital regulatory requirements get also loosen appropriately bringing the common prosperity of entity economy and virtual economy. While in the economic downturn period, in order to avoid loan losses, the regulatory authorities improve the capital charge and the size of the bank assets to lend gets reduced causing the further atrophy of real economy. Capital regulation also reflects on the commercial bank loan loss provision based on the posterior estimate of risk. The quantity extracted is according to the magnitude of the early losses during the boom; loan default rate and loss rate gets low and banks become optimistic about the economic outlook, therefore, extract less provision for loan losses to expand the volumes of credit stimulating economic expansion. Chen *et al.* (2014) argue that after the financial crisis in 2008, the new international accounting standards strengthen the fact that loan loss provision is one of the main reasons that led to pro-cyclicality, and empirically it was concluded that there is pro-cyclicality between bank loan loss provision and bank credit.

Whether capital regulation exacerbate the cyclical behavior of banks; some scholars believe that if the banks take the guide from Basel II, the regulation, probably, does not necessarily lead to the deterioration of banking internal pro-cyclicality. Grosse (2014) tested the bank's pro-cyclical behavior using data from German commercial banks and found that the Basel III mainly focuses on the commercial bank's pro-cyclical behavior, but this kind of cyclical behavior needs to meet certain conditions. In addition, the Basel II agreements require improving the capital and this increases the volatility of the pro-cyclicality. For example, Kashyap (2014) according to the Standard Poor and KMV model concluded that when the capital requirements are estimated at 30%-45% and 70%-90%, the economic boom to create excess capital is not sufficient to resolve the pro cyclical nature of the recession.

2.3 The Impact of the Capital Buffer on the Real Economy

In the different stages of the economic cycle, the number of capital buffers in commercial bank sector determines the amount of lending, and changes in the quantity of lending have an impact on the real economy, causing economic fluctuations, which produces a pro-cyclical effect or counter cyclical effect. At present, the studies of domestic and foreign scholars on the relationship between capital buffer and the real economy mainly focus on how financial friction effect and financial accelerator influence on the internal transmission mechanism. Findings confirm this effect to be mainly through two channels.

Firstly, it is through bank credit channel. The channel is more inclined to consider the bank's lending capacity. The profitability of enterprises is affected when the economy has a negative impact on the enterprises, and the balance sheet

deteriorates. In order to control risk, banks reduce the enterprise's credit lines, therefore, the available funds of enterprises is declining and this has a bad influence on enterprise's investment, the output of enterprise reduces, which produce a greater negative impact on the economy. When borrowers meet the adverse impact, their net wealth fall in, and this leads to an increase in loan interest rates, which have a negative impact on the amount of credit. And the interaction between financial factors and macroeconomic variables also led to the non-symmetric problems of the credit. Agliari (2014) suggest that it is the non-perfectness of credit market that causes the volatility of output. However, the borrower's credit constraints are caused by the cognitive error of loan officer, as a result, the behavior of the borrower is affected, thereby affecting savings, the fluctuation of the supply of labor market as well as fluctuations in output.

Secondly, it is through balance sheet channels. The channel is more focused on whether the enterprise can get a loan from the perspective of enterprise itself. When the enterprise is affected by the negative impact of the economy, the cost of production increase resulting in a decrease in net asset value and an increase in financial leverage which worsen the balance sheet, furthermore, making it more difficult for corporate to get external financing support. The more serious financial frictions are, the stronger the negative impact on the financial conditions of enterprises becomes resulting in a significant wave of economic cycle. Gomez (2014) points that for the bank to correctly judge the type of enterprise as a loan applicants costs high and in order to reduce the cost of credit or reduce credit risk, banks tend to decide whether to lend to enterprises based on other banks' judgment on the company, and they may not investigate the real investment value and debt paying ability of the enterprise themselves. As a result, if the enterprise have a good reputation in another banks, banks do not hesitate to continue to lend to the enterprise but if the enterprise has a bank default, this news spreads throughout the banking industry, making enterprise suffer from the possibility of being refused to borrow more. The demonstration effect among banks makes it harder for the enterprise to borrow.

2.4 Empirical Method

The present research mainly demonstrates the following problems:

The estimation method is not suitable. Dang (2012) use 2005-2011 quarter data from 13 listed commercial banks in China with GMM estimation method to analyze capital buffers. However, he did not remove the quarterly data trend, while the sample size is also small, which cannot meet the requirements of dynamic panel data (system GMM estimation requires N is more than T). The generalized linear model is used for the "big T , small N " panel data, and the heterogeneity of the cross section was not focused, and the timing characteristics were more obvious. Also generalized linear model does not take into account the individual effect, because essentially, this approach uses the FGLS fitting panel data, considering the heteroscedastic sequence correlation and cross section correlation and it does not set individual effects of dummy variables. Assuming that each company's constant is the same, the only difference lies in the interference. Their treatment of section heterogeneity is estimating robust variance-covariance matrix according to estimated residuals by ordinary least squares. So, for the mutual influence of commercial bank panel data, this estimation method is not appropriate.

Most studies use time series data. Zhang (2014) uses data of quarter time series from 1992 to 2013 to analyze the counter cyclical capital provision mechanism of BCBS, which fundamentally deviates from the sample data of the commercial bank.

To sum up, whether the implementation of counter cyclical capital buffer scheme is effective, the key depends on whether the capital buffer is pro-cyclical. If capital buffer does exist cyclical relationship, the adverse cyclical capital buffer regulation becomes strict and effective; however if the buffer of economic capital itself is with inverse cycle, then, the policy must consider the counter cyclical problem in banking system. In addition, domestic and foreign scholars used the measurement techniques; set of econometric models and the use of commercial bank panel data and different external systemic financial shocks are in continuous improvement. All of these cause different effects on the results. Therefore, this article is based on the data from 5 large state-owned commercial banks and 13 joint-stock commercial banks during and analyzes data from 2005 to 2014 to test the relationship between the capital buffer and the economic cycle through Driscoll and Kraay (1998) methods considering the character of spatial cross correlation.

3. Model Specification and Data

3.1 Setting of Measurement Model

This paper is based on Ayuso (2004) and Estrella (2004) model to analyze the relationship between the capital buffer and the economic cycle. They put the dependent variable $BUF_{i,t}$ lag phase 1 and System GMM method, but China's data is unable to meet the sample size requirements of System GMM Estimation. Even after Yu (2012) used quarterly data to expand the sample size, N is still less than T , so the validity of the estimated coefficient decreases. In this paper, the model is improved, and the capital buffer lag 1 stage variable is removed.

$$BUF_{i,t} = \alpha_1 GapGDP_{i,t} + \alpha_2 ROE_{i,t} + \alpha_3 Asset_{i,t} + \alpha_4 LLP_{i,t} + \alpha_5 NPL_{i,t} + \alpha_6 Loan_{i,t} + \alpha_7 LDR_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

$i = 1, 2, \dots, N$ Represents bank i , $t = 1, 2, \dots, T$ represent time t , μ_i means individual effect, $\varepsilon_{i,t}$ is random error term.

3.1.1 The Basic Principles of Driscoll and Kraay (1998) Estimation Method

In panel data, in addition to adjust residual heteroskedasticity, sequence correlation also needs to be considered because there may exist correlation between sections. In the study of group behavior, individuals often exhibit complex patterns of interdependence. Such common factors caused by the canonical correlation between social, moral and psychological behavior interrupts the panel data equations in the form of non-observable factors resulting in a certain correlation between individuals. To solve the relevance of the interface, we need to make a standard adjustment for the correlation and here used two ways mainly least squares method and mixed fixed effects estimation method.

3.1.2 Improvement Process and Calculation Steps

In order to explain the principle of DK estimation more clearly, we simplify equation (1) as equation (2).

$$y_{i,t} = x'_{i,t} \phi + \varepsilon_{i,t} \quad (2)$$

Here, assume variables $x'_{i,t}$ keeps ergogeneity. Using OLS method, we can get the estimation equation.

$$\phi = (X'X)^{-1} X'y \quad (3)$$

But using DK estimation method could obtain the robust standard error $V\phi$

$$V\phi = (X'X)^{-1} S_T (X'X)^{-1} \quad (4)$$

$$S_T = \Omega_0 + \sum_{j=1}^{m(T)} w(j, m) [\Omega_j + \Omega_0] \quad (5)$$

Combined with the specific estimates of this paper, according to the modified Bartlett weights, we get $w(j, m) = 1 - j/(m(T) + 1)$. The main purpose here is to ensure that S_T is a positive semi definite in matrix operation. This can automatically assign higher order lag coefficients with less weight.

$$\Omega_j = \sum_{t=i+1}^T r_t(\phi) r_{t-j}(\phi)' \quad (6)$$

$$r_t(\phi) = \sum_{i=1}^{N(T)} r_{it}(\phi) \quad (7)$$

$r_t(\phi)$ is an average based on the cross section, which is similar to the average of the group, and the N changes with the change of t ; the advantage is that this kind of estimation can be applied to the non-equilibrium plane. In this way, we can use this interface average to ensure that the standard error estimates are consistent.

In addition to using the mixed least square method to estimate, the fixed effect estimation is also useful. The benefits of the second method are that it can measure the non-observable individual effects, and here we mainly use the two step estimation. Firstly, we use the ordinary least square method to estimate the group. We define all the variables in the

model as $v_{i,t}$. Firstly, all the mean values of $v_{i,t}$ are converted within the group, which means $v_{i,t} = v_{i,t} - \bar{v}_i + \bar{v}_i$, where

$$\bar{v}_i = T_i^{-1} \sum_{t=T_i} v_{it}, \bar{v}_i = (\sum T_i)^{-1} \sum_i \sum_i v_{it} \quad (8)$$

Second, we use mixed OLS method to estimate the converted regression model.

3.2 Variable Definition and Data Sources

3.2.1 Data Sources

This paper selected 18 listed commercial banks in China as sample, using panel data from 2005 to 2014. The data of GDP comes from the National Bureau of Statistics web site and the rest of the data are from the annual report of each commercial bank.

3.2.2 Variable Definition

$BUF_{i,t}$ means the capital buffers which belong to the bank i in the t period of time. It is equal to the actual capital adequacy minus 8% minimum capital adequacy ratio. Basel II capital adequacy ratio is 8%. The new Basel III makes higher requirements to the index, and the transition period of the new agreement is from 2013 to 2019. The capital cushions in the sample interval are banks' actual capital adequacy minus minimum capital requirements 8%. Units for a percentage, we multiplied 100 to the variable in order to standardize. $GapGDP$ stands for the output gap between the actual output and potential output; the greater the gap means a rising economy, small gap means the economy is in recession. We use 2010 as the base price, turning nominal GDP to real GDP data, using the HP filter to calculate the output gap and the output gap divided by the real GDP as an economic cycle variables.

$Asset$ represents the banks' total assets, compared with the 'big' virtual variable (virtual variables, i.e., whether the commercial bank is the large commercial banks) used by literature in general, the variable we used is more accurate. The large commercial banks have stronger business ability, they have enough power to diversify its assets, achieve the economies of scale, and improve the management efficiency reduce risk. So, this paper argues that the economic cycle variables have more influence on big banks than small banks. The unit of this variable is million Yuan, making logarithms form for this variable.

ROE - the weighted average return on equity reflects the existing bank profits and opportunity cost which bank hold. NPL is the non-performing loans meaning the present risk level of the bank. The higher non-performing loan ratio is, the greater the risk that the bank face. Banks should have the higher amount of capital buffers expecting non-performing loan ratio coefficient to be positive. LLP is loan loss provisions amount - the unit is one hundred million RMB. LDR is the ratio of loans divided by deposits, the index inspects the relationship between held capital buffers and the bank lending; the more expecting capital buffer you get, the less to lend. The unit is in percentage. $Loan$ represents the total loans and the unit is RMB - one hundred million.

In order to reduce the effect of heteroscedasticity and other disturbing factors on the estimation efficiency as much as possible, standardized processing of the independent variables was made. The process is taking the absolute value (such as $Asset$, LLP , $Loan$) into the natural logarithm, and standardize the ratio values (such as $GapGDP$, ROE , NPL , LDR) by multiplying it to 100.

3.2.3 Main Three Questions

First, we want to identify whether the number of capital buffer that China's commercial banks holdings inverse cyclical and whether the variable coefficient of $GapGDP$ is positive. The variable coefficient of the symbol is negative means capital buffer is pro-cyclical. Economic cycle fluctuation influence on capital buffers is negative suggests that during the economic boom, when banks expand credit, the capital buffer fall, while commercial banks in the financial contract increase capital buffers. Borio *et al.* (2001) defined this kind of behavior as "bank of myopia". This paper examines the commercial bank of China to identify whether there is a "bank myopia" behavior.

Second, whether the greater scale the commercial banks are, the more they tend to hold more capital buffer which is equal to whether the variable coefficient of the *Asset* is positive. This analysis intends to identify whether the “too big to fail” theory was established in China commercial banks.

Third, the provision for loan loss of commercial banks is based on the profits or cost perspective? Whether loan loss provisions can make up for the expected losses on bank loans, namely whether the provision of commercial banks have adequate provisions. If the loan loss provision is based on profit perspective, commercial banks have a trade-off between risk and profit.

4. Empirical Analysis Based on Panel Data of Chinese Commercial Banks

4.1 Descriptive Statistics of the Main Variables

From the table 1, compared to the other 13 national joint-stock commercial banks, China's five state-owned commercial banks have the following characteristics:

The assets scale of China's five state-owned commercial banks is further bigger than other commercial banks. Besides, average return on equity (ROE), the mean value of the ratio of net profits to equity performs better than the other 13 joint-stock banks indicates that the five major commercial banks are more profitable, own more capital buffer to guard against possible risks.

The average loan to deposit ratio of five major commercial banks was significantly lower than that of the other 13 banks. This shows that the attitude of the five state-owned commercial banks in terms of loans is more cautious.

Five state-owned commercial banks hold more capital buffer and more loan loss provision indicate that they in fact uphold a more cautious attitude of the management; the risk control ability is stronger. However, the other 13 commercial banks, holding less capital buffers and maintain a high loan to deposit ratio have the stronger willingness of pursuing profit maximization. This also indicates that state-owned commercial banks are more willing to comply with regulatory principles and recommendations.

Table 1: Descriptive statistics of the main variables

Variable	5 state-owned commercial banks				
	Mean	SD	Min	Md	Max
<i>BUF</i>	5.03	1.82	1.74	4.68	7.21
<i>GapGDP</i>	-1.39	3.11	-5.98	-1.2	2.96
<i>ROE</i>	19.37	3.75	11.02	20.18	24.66
<i>LNAsset</i>	12.23	1.06	10.35	12.41	13.79
<i>NPL</i>	1.54	3.52	1.06	1.61	14.3
<i>LDR</i>	65.23	10.01	46.77	71.25	87.14
<i>LNLLP</i>	7.28	1.35	5.17	6.94	8.56
<i>LNLoan</i>	11.39	1.54	9.41	11.06	13.21
13 listed commercial banks					
<i>BUF</i>	3.41	3.95	-6.2	3.03	21.89
<i>GapGDP</i>	-1.26	3.05	-6.04	-1.13	2.47
<i>ROE</i>	17.26	7.26	2.33	17.88	35.23
<i>LNAsset</i>	9.11	1.36	5.94	9.05	11.21
<i>NPL</i>	2.03	3.42	0	1.41	15.17
<i>LDR</i>	71.16	10.34	58.37	71.56	85.09
<i>LNLLP</i>	4.51	1.25	1.59	4.67	6.48
<i>LNLoan</i>	7.96	1.33	5.49	8.16	11.34

4.2 Empirical Analysis

This paper employs Driscoll and Kraay (1998) method (hereinafter referred as the “DK estimated”) to measure the periodicity of capital buffer of Chinese commercial banks for the period of 2005–2014. Firstly, we test whether there is spatial cross correlation between each commercial bank; secondly, we estimate the econometric model and make further analysis of the empirical results.

First, the non-balanced panel data are tested, including the fixed effects, the mixed effects and the random effects. The Wald test shows that the fixed effect is better than that of mixed effect. By the likelihood ratio test, the corresponding probability value is obtained according to the chi-square distribution, and the random effect is better than that of the mixed effect. Using Hausman test to compare the fixed effects and the random effects, the chi-square distribution probability value represents 16.23% showing the estimated effect to be better than the random effects. This further indicates that the panel data of random disturbance term may exist and there is the possibility of heteroscedasticity and serial correlation and cross section. Therefore, this paper needs to make more accurate test on the 3 aspects of the random disturbance. Modified Wald test is used to test the individual effects between group variance. Using Pesan parameter test and the Wood Rich autocorrelation test to test cross section autocorrelation, we found both the results of the two methods reject the null hypothesis evidently. It shows that the panel data of China's commercial banks have different variance, sequence correlation and cross section autocorrelation.

Second, this paper chooses DK fixed effects estimation, because of its comprehensive consideration of heteroscedasticity, serial correlation and auto correlation section problem exist in panel data. Besides, it can also deal with individual effect among commercial banks. Use of the DK fixed effects estimation for different measurement model for empirical research presented in table 2.

Table 2: The results of Driscoll and Kraay (1998) estimation by step wise addition of variables

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
<i>GapGDP</i>	0.2589** (2.49)	0.2697** (2.41)	0.2801** (2.28)	0.3210*** (8.26)	0.3406*** (5.98)	0.3029*** (4.65)	0.2437*** (5.37)
<i>ROE</i>		-0.0265 (-0.49)	-0.0413 (-0.56)	-0.0910* (-1.83)	-0.1204** (-2.24)	-0.0945*** (-4.86)	-0.0629* (-2.11)
<i>Asset</i>			0.0392 (0.11)	-0.1605 (-0.60)	0.2673 (1.34)	0.3241* (2.42)	7.0218* (2.18)
<i>NPL</i>				-0.4887*** (-5.02)	-0.5176*** (-3.44)	-0.6503*** (-4.13)	-0.4052** (-3.07)
<i>LDR</i>					-0.3265* (-2.01)	-0.2443*** (-4.06)	-0.0251** (-2.57)
<i>LLP</i>						-0.6879 (-1.34)	-0.5132 (-0.67)
<i>Loan</i>							-8.1209 (-2.01)
<i>Intercept</i>	3.8430*** (7.79)	3.9169 (1.03)	4.3145 (0.92)	8.3218* (2.17)	7.2548 (0.90)	19.8726** (2.53)	6.1023 (0.64)

The standard deviation of coefficients is listed in brackets. ***, ** and * represent 1%, 5%, and 10% significance levels, respectively.

5. Results of Empirical Analysis

From the 7 models in table 2, we can see that the output gap coefficient is significantly positive; it measures the relationship between capital buffers and the economic cycle. The positive coefficient shows that commercial banks hold more capital buffers in the period of economic glad. This result confirms that the commercial bank of China possess counter cyclical capital buffers. Reason is that since 2004, China's relevant measures for the management of capital adequacy ratio, higher regulatory requirements are put forward.

Coefficient of the total amount of loans is negative and this shows that the more loans bank lends, the less amount of capital buffers are retained. In the model 7, capital buffer shows obvious and stable inverse periodic characteristics, but the credit data did not present obvious counter-cyclical effect; the number of bank loans coefficient in model 7 is not significant. It indicates that the number of commercial banks' lending and capital requirements is not necessarily related and China's commercial banks holding more capital buffer does not necessarily lead to "credit crunch phenomenon", so the capital requirements of the Basel III regulatory were not significantly enhanced pro-cyclical behavior of the commercial bank in China. This may be related to the commercial bank in China has held the counter-cyclical capital buffer which have an "ironing effect" in commercial bank.

ROE coefficient is significantly negative and this indicates that when the annual yields are low, capital buffers increase by the commercial banks. On the one hand, return on equity (ROE) measures the opportunity cost of holding capital. Decline in net asset yield shows that while commercial banks increase the holding of buffer capital, the opportunity cost of holding buffer capital declines. On the other hand, commercial banks holding capital buffer defense the potential risk, reflecting a bank's caution to risk degree, and thus, their tendency to hold more capital cushion. Therefore, the empirical results show that while commercial banks make a trade-off between the benefits and risks as future strategy, they are more concerned about the risk problem.

Asset coefficient is significantly positive, which indicates that the greater the Asset scale, the more tendency banks hold more capital buffers; this is different from the concept of "too big to fail". Possible reason is that the commercial bank in China (regardless of the size of the bank) all supports the opinion of "too big to fail". On the one hand, the state-owned banks, essentially five major commercial banks, are strictly bound by the policies of the ruling party. Every time before encountering serious crisis, the intensity of capital supervision of regulatory authorities get greater, and the degree of policy implementation gets higher. In such situations, commercial banks are requested to hold more capital buffers to avoid crisis. On the other hand, the loan principle of commercial banks in China is based on "mortgage culture" rather than "credit culture", especially for the small and micro enterprises with less collateral value, it is more difficult to obtain funds from the bank. This can be proved by the fact of the financing difficulties of small and medium-sized enterprises. In addition, inflation rate in China is always high, thus, commercial banks are facing the higher liquidity risk and bad loans risk. Due to China's large downtown pressure on the economy, the profitability of the business is affected resulting in a large number of non-performing loans. Therefore, banks tend to hold more capital buffers to cope with the possible exposure of risk.

Loan loss provisions (LLP) is withholding special loss preparation in order to cover potential loan loss. The coefficient of the model 6 and 7 in table 2 are negative and not significant. Under the rules of static provisioning, the loss provisions of commercial bank loan are pro-cyclical. In the economic boom, due to the good quality of credit assets, the probability of loan loss is low, so that the low number of banks loan loss provisions. The reduction of bank loan loss provision generates more capital. However, whether the additional money as capital buffers retained within bank's own system or used to expand the scale of the loan to increase profits depends on whether commercial banks' loan loss provision behavior is based on the profits perspective or the cost perspective. The nature of loan loss provisions is the bank's ability to make up for the loss of loans in the future, reflecting the profit point of view. So, if the loan loss provisions fall, the commercial banks retain more capital buffers to cope with unexpected risks, therefore there is a negative relationship between those two. However, if considering the money in the banking system has the high opportunity cost, reducing loan loss provisions reflect the less expected risk of the bank, which most occurs in the economic upward period. So, the bank considers holding less capital buffers from the angle of cost, causing the positive correlation between them. Therefore, the relationship between the loan loss provisions and capital buffers was not significant; this may get caused by the balance between the profit and cost perspective.

The coefficient of LDR and NPL is consistent with expectations. LDR coefficient is significantly negative indicates that the more commercial bank loans, the piece can be used as capital buffers is less. NPL coefficient is significantly negative also shows that if there are more default loans, the capital buffers be reduced by the shock.

6. Conclusions and Policy Recommendations

6.1 Conclusions

This paper estimated the relationship between the Chinese business cycle and the regulatory capital buffers of China's commercial banks by using an unbalanced panel of 18 listed banks of China for the period 2005–2014 with empirical test methods. Paper draws the conclusions as follow.

- The commercial banks in China holding capital buffers are counter-cyclical;
- Coefficient of the total amount of loans is not significant shows that China's commercial banks holding more capital buffer do not necessarily lead to a "credit crunch" phenomenon;
- ROE coefficient is significantly negative indicates that commercial banks holding capital buffer defense the potential risk, reflecting a bank's caution to risk degree, and thus their tendency to hold more capital cushion. Therefore, while commercial banks make a trade-off between the benefits and risks to future strategy, they are more concerned about the risk problem;
- The way bank provision for loan loss is mainly based on the profit theory, which means in order to realize the profit; the banks try to keep more capital buffers to cope with unexpected losses, even if the loan loss provision declined. The relationship between the loan loss provisions and capital buffers was not significant, this may happen due to the fact that banks are also considering from cost perspective, namely the money in the banking system has the high opportunity cost, so the bank consider holding less capital buffers from the angle of cost.

6.2 Policy Recommendations

6.2.1 The policy should fully consider the time Commercial Banks own inverse periodically

In monetary policy, regulatory capital can be used as an important tool to regulate bank credit scale. When it is required by the regulatory authorities to raise capital, bank must reduce the size of the loan to meet regulatory capital requirements under the not-greatly-increased bank deposit. So, during the recession, in order to prevent systemic risk, the regulatory authorities ask the bank to increase capital. This undoubtedly exacerbates the recession. As a result, the Basel Committee put forward the counter-cyclical supervision, which requires banks to hold capital buffer; this can resist unexpected risks. However, regulatory authorities formulate the corresponding inverse cycle policies should give full consideration to the bank's buffer counter-cyclical effect in order to avoid overlapping and producing the excessive inhibitory effect on the economy. At the same time, they should fully consider the different bank assets to the policy effect.

6.2.2 The right amount of the counter-cyclical capital buffer plan

China banks themselves have rational choice which can produce good stable status. Regulatory authorities should be fully considering the amount of capital buffers that bank already own in order to avoid excessive provision capital buffers and bring efficiency loss of banking management. In the balance, the difficulties of the problems are that the bank should consider the right amount of the capital buffers and fully consider the provision rule and the point of time.

6.2.3 Improve the macroeconomic regulation and policy framework

The academics says that the US financial "fallacy" exacerbated the banking internal pro-cyclical after financial crisis in 2008. This amplified the effects of the financial crisis into the global financial crisis. In order to guard against the crisis rising, the world uses micro-prudential supervision rather than macro-prudential regulation. As for China, regulators should be given enough consideration to the existence counter cyclical capital buffer which bank already own. We suggest that regulators and monetary authorities shall establish information cooperation mechanism to ensure that both sides can choose the best time and adequate provision for counter cyclical capital buffers to run the counter cyclical regulatory policy under the specific macroeconomic conditions.

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