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A Study of the Leverage Pro-Cyclical Behavior and Asymmetry of Commercial Banks in China

Yiyong WU¹, Ridong HU²

Abstract

The leverage pro-cyclical behavior of commercial banks is one of the important reasons for the burst of the financial crisis in 2008. The microscopic data of commercial banks in China during the period of 2006-2015 was used for the empirical research of the leverage cyclical behavior on commercial banks in China and the affecting factors. Moreover, the asymmetry of the banks' leverage pro-cyclical behavior during different business cycles was also investigated. The results of this study indicated that, the leverage of the commercial banks in China has apparent pro-cyclical behaviors and foreign capital banks have stronger pro-cyclical behaviors. For the commercial banks in China, enhancing the ROE will reduce the leverage for these commercial banks. A larger LD indicator means the leverage level is enhanced. The influence of the NPL on bank leverage has a higher degree of uncertainty. A positive LIQ coefficient indicates that the liquid ratio changes in the same direction as the bank leverage. When considering the asymmetry of bank leverage, it is found that the increase in bank leverage cases is faster during the economic upturn period. On the other hand, the decrease in bank leverage cases during the economic downturn period is slower. Finally, it is expected to provide the bank industry with some recommendations and references on the bank leverage pro-cyclical behavior during different economic cycles.

Keywords: commercial bank leverage, pro-cyclical behavior, affecting factor, asymmetry.

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Introduction

To prevent unfair competitions between banks and reduce the credit risks and market risks in the bank systems, Basel Committee on Banking Supervision (BCBS) developed Basel I for the supervision of banks' capital adequacy ratio in 1988. A revision was developed in 2003 and it formed Basel II which includes the minimum capital requirement, supervisory check-ups by the supervision departments, and the market discipline by having information disclosure as the principle parts. Unfortunately, though Basel II was recognized by the international community, it didn't stop the outburst of the US financial crisis in 2008. Prior to the outburst of the crisis, large banks of various countries around the globe satisfied Basel II's requirement of a capital adequacy ratio of less than 8%. However, their leverage ratio kept at the lower level. After the outburst of the crisis, the scale of bank assets shrunk at a great extent. The rapid deleveraging process caused credit crunch and reduced market liquidity so that the impact of the crisis was deepened further. It is thus clear that, the complicated risks hidden behind the on- and off-balance sheet businesses such as asset securitization or financial derivatives cannot be effectively supervised by simply using the capital adequacy ratio. Therefore, Basel III, which is a revision for maintaining the stability of the financial system, was proposed by the G20 Summit in October, 2010. On the basis of the original regulatory indicators, Basel III includes the leverage ratio³ as an indicator into the regulatory system and recommended a minimum criterion of 3%. At the same time, it also asked banks worldwide to enforce effective implementation starting from 2018. In June 2011, based the relevant contents in Basel III, China Banking Regulatory Commission issued *Measures for the Administration of the Leverage Ratio of Commercial Banks* and established the overall framework and regulatory principles of the leverage rate regulatory policy for the banking industry in China.

The financial accelerator theory proposed that the increase in asset prices during the pro-cyclical period enhances a borrower's mortgage value so that the amount of loans they can get is increased as well. This is the financial system's amplification effect on business cycles via the credit channels. However, it is worth noting that the China economy is currently at the downturn stage. On one hand, the deleveraging process with the contraction of bank asset scales affects enterprises' capital investment. On the other hand, the chain risks caused by the drop in asset prices are neither to be sniffed at. With Basel III in place, the China regulatory organizations also started to adopt four regulatory tools including the

³The definition of leverage ratio by Basel III adopts the form of embedded leverage, i.e., leverage ratio = (Tier 1 capital - Tier 1 capital deductions)/on-and off-balance asset after adjustment X 100%. The advantage of this definition is that the off-balance risks are considered (in real practice, different assets are assigned different risk weights). This approach can realize the embedded characteristics of the leverage ratio and better reflect the market risks for banks.

capital adequacy ratio, provision rate, leverage rate, and liquidity. It is expected to construct the counter-cyclical macro-prudential regulatory system so as to overcome the pro-cyclical problem of capital supervision and maintain the stability of financial systems (Feng & Han, 2013). However, earlier domestic and overseas scholars generally paid attention to capital adequacy ratio or the pro-cyclical problems of capital buffers. There were fewer studies that are relevant to leverage. More specifically, the asymmetric variations of bank leverage during the economic prosperity and decline period are less discussed by scholars. Based on this, the pro-cyclical mechanisms of the leverage for commercial banks in China were investigated. After that, the periodicity was verified by the microscopic banking data. Secondly, the factors that affect banks' leverage were analyzed from inside the banks. Finally, the asymmetric behaviors of the leverage variations for commercial banks in China during different economic cycles were investigated.

Literature review

The over-leveraging of the banking industry is widely regarded as one of the main reasons for the outburst of global financial crisis (FSB, 2009; FSA, 2009). Therefore, the G20 Summit and the Financial Stability Board (FSB) proposed introducing the leverage ratio indicators for the benefit of constructing the counter-cyclical macro-prudential management system for capital supervision so as to ensure global financial stability. At the moment, the relevant studies by domestic and overseas scholars on the pro-cyclical behaviors of bank leverage mainly focus on several aspects that are described as follows.

Leverage accounting

D'Hulster (2009) proposed the accounting of bank leverages from three aspects which include the balance sheet, future market cash flow (economic leverage), and market risks (embedded leverage). At the moment, the most widely used is the balance sheet leverage. The regulatory indicator for measuring the leverage is typically the leverage ratio in percentage. However, leverage (the reciprocal of leverage ratio) is often used in real practice since this expression complies better with people's understanding of the leverage's implication, i.e., $\text{leverage} = \text{total asset} / \text{equity}$.

When adopting this type of definition for leverage, it reflects a bank's balance book value. When a bank has a higher leverage (with a lower leverage ratio), the bank's unit asset corresponds to less equity fund. When the debt ratio remains unchanged, when the total asset encounters a loss, the loss is borne by the equity. The advantage of adopting this type of leverage is that all of the assets are assigned with the same weight so that the data is easy to get and is irrelevant to the

banks' internal risk measures and ratings. This approach reduces the possibility of being manipulated by the banks. However, since the definition of leverage is rather simple, there are also some insufficiencies as follows. On one hand, the risks are measured by their scales, bank funds are encouraged to move toward businesses with high margins but this type of business has a higher risk. Therefore, the bank leverage might not present an apparent change but the bank risk is significantly increased. On the other hand, the balance sheet only discloses on-balance businesses but cannot evaluate the embedded leverage of the off-balance assets. Since the off-balance assets are harder to acquire, various domestic and overseas studies still adopted the simple approach of defining the leverage.

Pro-cyclical transmission mechanism of bank leverage

In real practices, the regulatory organizations have two types of regulatory measures on the leverage level of commercial banks (Adrian & Shin 2010; Liu, 2015). The first type is to adopt a loose policy for the leverage level and the second one is to maintain a specific leverage level and remain unchanged. Relevant studies indicated that both types of regulatory policies will lead to the pro-cyclical behavior of bank leverage. This transmission mechanism can be briefly described as follows. During the economic upturn period, the asset prices keep increasing and banks will greatly increase their debts to gain more profits. Therefore, the leverage will keep increasing accordingly. If banks do not maintain a stable leverage ratio, this transmission mechanism will strengthen itself. As the price of security assets increases, a bank will increase its leverage and its demand for the security assets rather than restoring to the leverage at the initial state. A higher leverage for a bank will lead to an appreciation pressure for the asset price and therefore it forms a vicious circle. Under this type of condition, any impact to the bank's balance sheet will cause the deflationary spiral in a bank's asset price and leverage. Therefore, bank loans and assets business scales will expand during the economic upturn and the leverage level increases. On the contrary, it contracts during the economic downturn period. The increase in a bank's leverage changes in the same direction as that in its assets scale. Therefore, the following hypothesis is proposed in this study.

H1: *A significant positive correlation exists between the leverage variation and the assets variation for commercial banks in China*

Analysis of the leverage pro-cyclical behavior and the affecting factors

Bauma, Caglayan, & Rashidd (2014) proposed that there are various types of risks within bank activities. Moreover, the factors that affect bank risks include the variation in assets supply and demand, variation in the profit level, variation

in the bank performance, banks' degree of leverage utilization, etc. (Rey, 2015). Bruno & Shin (2015) proposed that leverage has the greatest influence on financial risks which increase as the leverage coefficient increases. Damar, Meh, & Terajima (2010) found in their empirical study of 136 banks in Canada that, the leverage ratios of the banks in Canada have a strong pro-cyclical behavior which will be affected by the fluidity of short-term credits. Baglioni *et al.* (2013) obtained a similar conclusion in their study of banks in Europe. While many scholars proposed the existence of the banks' pro-cyclical period, they also analyzed the reasons for the pro-cyclical variations. Among them, Adrian and Shin (2010) proposed that the main cause of the pro-cyclical behaviors for bank leverage is the active balance sheet management adopted by banks on the assets price and the variations in risk measures. Beccalli, Boitani, & Di Giuliantonio, (2015) proposed that asset securitization is the main cause for pro-cyclical behaviors. Based on the consideration of bank supervision, Amel-Zadeh, Barth, & Landsman (2015) concluded that the bank regulatory requirements based on the risk weights caused the pro-cyclical behaviors of bank leverage. Moreover, Athanasoglou, Daniilidis, & Delis (2014) summarized the reasons for pro-cyclical behaviors from the bank level and these include the deviation from the efficient markets hypothesis, macro-economic policy, credit rating, the use of risk values, and the incentive compensation.

Drobtz, Schilling, & Schröder (2015) proposed that a bank's return on equity (ROE) indicates the ratio of the pre-tax income to the net worth. It is the ultimate indicator for evaluating a bank's operating performance. The return on assets (ROA) indicates the ratio of the pre-tax income to the average assets and it has a very high correlation to the ROE. The difference is mainly determined by the value of the leverage ratio. Bany-Ariffin & McGowan (2012) proposed that when two banks have the same ROE, it doesn't necessary both banks have the same performance for utilizing their assets. A bank with high ROA and low leverage might have the same ROE as another bank with low ROA but high leverage (Pettersen, 2014). Allen, Carletti, & Marquez (2011) proposed that the essence of the leverage effect is as follows. Since the bank's earning power of real assets is larger than its debt interest rate, a portion of the profit obtained from the debt has been transformed into the equity capital so that the rate of return on equity capital is increased. Dang, Kim, & Shin (2012) proposed that if a bank's earning power of real assets is equal to or less than the debt interest rate, the profit resulted from the debt can only make up for the interest required for the debt or even less than it. Moreover, the profile obtained by utilizing the equity capital might not be enough to make up for the interest and the bank cannot help but to reduce the equity capital so as to pay its debts. This is exactly the loss due to the negative effect of leverage (Forbes & Warnock, 2012). Borio & Disyatat (2011) proposed that the factors that affect the leverage effects are as follows. 1. Earnings before interest and tax (the value of the earnings before interest and tax directly affects

the size of the financial leverage coefficient). 2. Loan-deposit ratio (LD): The expansion of a bank's loan business is limited by the deposit level. Assuming the deposit level remains unchanged, a larger LD indicates more loans and the assets scale expands so that the bank's leverage level is increased. 3. Non-performing loan ratio (NPL): Since the non-performing loan ratio is increased, a bank encounters a higher operating risk. The influence of the NPL on bank leverage has a higher uncertainty. 4. Liquid rate (LIQ): The coefficient of the LIQ indicator is significantly positive, this indicates the liquid rate changes in the same direction as the bank leverage (Getzmann, Lang, & Spremann, 2014).

Most of the Chinese scholars used the dynamic panel model to examine a bank's leverage pro-cyclical behaviors and the affecting factors such as the studies by Liu (2015) and Wu (2015). The study by Xiang, Chen, & Yang (2015) also investigated the relationship between the liquidity and bank leverage. Li & Yang (2013) carried out a study on the leverage management approaches by the financial institutions in China and the cyclic characteristics of the banking industry and the non-bank financial institutions. The results indicated that the leverage ratios of non-bank financial institutions are more macroscopically periodic. Therefore another two hypotheses are proposed in this study as follows.

H2: The bank leverage in China has an apparent pro-cyclical behavior.

H3: The ROE, LD, NPL, and LIQ have a significant influence on the variation of commercial banks' leverage in China.

To further understand whether the leverage of commercial banks in China has asymmetric phenomenon during different economic cycles, we proposed another hypothesis as follows.

H4: An asymmetric phenomenon exists for the leverage of commercial banks in China during different economic cycles.

Methodology

Panels and dynamic panel models were used in study for the empirical investigation of the pro-cyclical behaviors, affecting factors, and asymmetric phenomenon of the leverage of commercial banks in China.

Descriptions of the variables selected

By integrating the studies by domestic and overseas scholars in recent years on the pro-cyclic problems of banks, the selected variables are described as follows.

1. Bank leverage: The commonly used definition of bank leverage is used as the explained variable, which indicates the ratio of a bank's total asset to the equity.
2. Bank total asset: The main explanatory variable which reflects the procyclic behavior of bank leverage. It is usually in the logarithmic form during the empirical process.
3. Rate of return on common stockholders' equity (ROE): It indicates the ratio of a bank's net profit to the equity assets. A larger ratio indicates better profitability for a bank with more surplus funds so that it has better capability to resist external risks.
4. Loans/Deposits rate⁴ (LD): It is the ratio of a bank's total amount of loans to the total amount of deposits. Its main effect is to prevent a bank from overly expanding the fiduciary loans so as to keep it away from banking risks.
5. Non-Performing Loan rate (NPL): The ratio of the total amount of a bank's non-performing loans to the total amount of loans.
6. Liquid rate (LIQ): It is the ratio of current asset to current liability and it serves as an important regulatory indicator for banks so as to present an important effect on banking risks. Generally speaking, when a bank has a higher liquid rate, it has better capability of addressing risks.

Sample data

Annual data of 108 commercial banks in China during the period of 2006-2015 were used in this study⁵. The main source of data came from the yearbooks published by these banks and the Bankscope database. Some of the deficiency data came from the financial information published by Hithink RoyalFlush Information Network Co., ltd.

⁴ In October, 1st, 2015, the Banking Regulatory Commission, China discarded the maximum loan-deposit ratio indicator of 75% according to the *Measures for the Liquidity Risk Management of Commercial Banks (for Trial Implementation)*. However, it was recommended that the Banking Regulatory Commission keeps monitoring the variations of the loan-deposit ratio for commercial banks.

⁵ There are 16 large state-owned banks and joint-equity banks; 63 city commercial banks; 14 rural commercial banks; 15 foreign capital banks.

Empirical data and analysis

Whether the leverage variation and assets variation are positively correlated for commercial banks in China?

The study by (Adrian and Shin, 2010) described whether the leverage presents pro-cyclic behaviors via the relationship between a bank’s leverage variation and assets variation. If the leverage increase keeps a positive correlation to the bank’s assets scale increase, it indicates the leverage increase has pro-cyclical behavior. On the contrary, it has counter-cyclical behavior. Based on the classification of commercial banks by the Banking Regulatory Commission, banks in China can be classified into following categories. 1. Large state-owned banks and joint-equity banks. 2. City commercial banks. 3. Rural commercial banks. 4. Foreign capital banks. The scatter diagram of the leverage increase and assets increase is shown as follows (The axis of abscissa indicates the assets increase rate of commercial banks in China and the axis of ordinate indicates the leverage increase rate of commercial banks in China.)

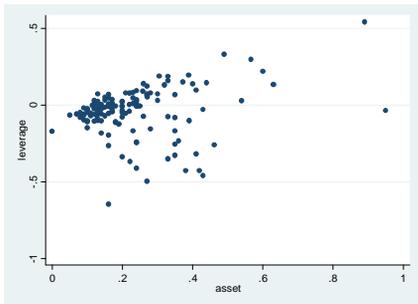


Figure 1. Large state-owned banks and joint-equity banks

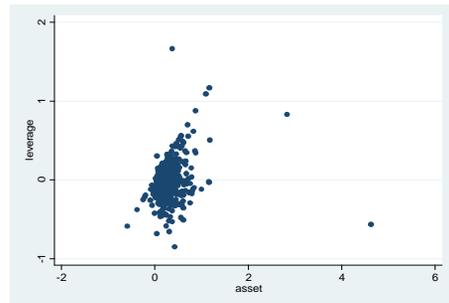


Figure 2. City commercial banks in China

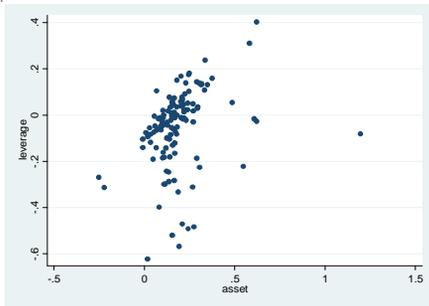


Figure 3. Rural commercial banks in China

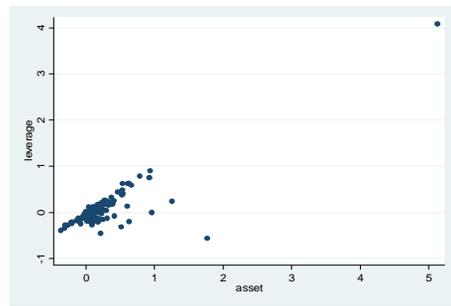


Figure 4. Foreign capital banks

It is known from the above scatter diagram that the leverage increase rate generally changes in the same direction as the assets increase rate for the commercial banks in China. That is, the expansion of bank assets scale during the economic upturn period leads to uprising leverage increase rate. On the contrary, the contraction of the bank assets scale leads to descending leverage increase rate. This phenomenon demonstrates the significant positive correlation between the leverage variation and assets variation for banks in China. As a result, Hypothesis H1 is valid.

Empirical examination of the pro-cyclical behavior of the leverage of commercial banks in China

For the empirical examination of the pro-cyclical behavior of the leverage of commercial banks in China, a model is built based on Eq. (1):

$$\Delta leverage_{it} = \beta_0 + \beta_1 \Delta asset_{it} + \varepsilon_{it} \tag{1}$$

wherein, $\Delta leverage_{it}$ indicates the size of the leverage increase rate for various banks; $\Delta asset_{it}$ indicates the assets increase rate of various banks. Regression analysis was carried out on four samples including the large state-owned banks and joint-equity banks, city commercial banks, rural commercial banks, foreign capital banks. The results are as shown in *Table 1*.

Table 1. Results of regression analysis of the pro-cyclical behaviors of the leverage of commercial banks in China

| | Large state-owned banks and joint-equity banks | City commercial banks | Rural commercial banks | Foreign capital banks |
|----------------|--|------------------------|------------------------|------------------------|
| $\Delta asset$ | 0.2485*** (0.0934) | 0.177*** (0.032) | 0.3219*** (0.0905) | 0.6952*** (0.038) |
| Constants | -0.0995*** (0.0256) | -0.0509*** (0.0141) | -0.1135*** (0.0222) | -0.0853*** (0.0212) |

Note: *** indicates a significant lever below 1%; the values in parentheses are the standard deviations

The results of the regression analysis in Table 1 indicated that the assets growth coefficient of all types of commercial banks in China is significantly positive. This indicates the bank leverage has significant pro-cyclical behaviors. During the economic upturn period, this phenomenon presents a good development of economic forms and the risk encountered by a bank is smaller. However, this will present the corresponding increase in the fiduciary loan scale and assets scale and leads to the further increase in the leverage level of banks. During the economic downturn period, the profitability of a bank is descending and the channel for increasing the capital base via internal profits is blocked. Meanwhile, the external economic conditions are deteriorating. For risk-off and for satisfying the regulatory requirements on banks, the commercial banks in China will reduce the amount of new loans, the scale of fiduciary loans and assets. This leads to the decrease in the leverage level of commercial banks in China. It can be found from the regression results in Table 1 that the cyclic performance of leverage of different types of commercial banks in China is different. Specifically, the regression coefficient of foreign capital banks is 0.6952, which is significantly larger than those of other three types of banks (large state-owned banks and joint-equity banks, city commercial banks, and rural commercial banks). This phenomenon indicates a stronger pro-cyclic behavior for the leverage of foreign capital banks. A possible explanation for this is that foreign capital banks entered the China market later and their scale is relatively smaller. To increase their market share, the internal incentive for the expansion of assets scale is easily generated and the further presentation is the stronger pro-cyclic behavior. As a result, Hypothesis H2 is valid.

The study of the affecting factors of the pro-cyclic behaviors of the leverage of commercial banks in China

To investigate the affecting factor of the pro-cyclic behaviors of the leverage of commercial banks in China, the rate of return on common stockholders' equity, loans/deposits rate, non-performing loan rate, and the liquid rate were introduced into this study as the main explanatory variables. The System GMM⁶ approach was used for the regression analysis of Eq. (2) and the results are shown in Table 2.

$$leverage_{it} = \beta_0 + \beta_1 leverage_{it-1} + \beta_2 \ln asset_{it} + \beta_3 ROE_{it-1} + \beta_4 LD_{it-1} + \beta_5 NPL_{it-1} + \beta_6 LIQ_{it-1} + \varepsilon_{it} \quad (2)$$

Table 2. System GMM regression results of the affecting factors of pro-cyclic behaviors of the leverage of commercial banks in China

| Leverage | Coef. | Std.Err. | z | P> z |
|--------------------------|------------------------|----------|-------|-------|
| leverage _{it-1} | 0.4193*** | 0.1453 | 28.85 | 0.000 |
| lnasset _{it} | 0.1083* | 0.0569 | 1.90 | 0.057 |
| ROE _{it-1} | -0.1272*** | 0.0189 | -6.71 | 0.000 |
| LD _{it-1} | 0.1416*** | 0.014 | 10.04 | 0.000 |
| NPL _{it-1} | 0.011 | 0.032 | 0.33 | 0.744 |
| LIQ _{it-1} | 0.024*** | 0.0045 | 5.42 | 0.000 |
| AR(2) | z=0.063 Prob>z =0.9498 | | | |
| Sargan | Prob>chi2 =0.1762 | | | |

Note: *** . ** . * indicates the value is significant under the levels of 1%, 5%, and 10% respectively.

The regression results in Table 2 indicates that the model passes the AR(2) and Sargan examination. This verified that the selected instrumental variable is irrelevant to the disturbance term and autocorrelation doesn't exist. This meets the pre-condition of the system GMM estimation. The coefficient next to the leverage stagnation is significantly positive and this demonstrated the continuity for the leverage variations. The higher leverage of the prior cycle often results in the increase of the leverage level of the next cycle. The assets logarithmic coefficient is significantly positive and this means the bank leverage is increased due to the expansion of assets scale and it embodied the pro-cyclical behavior of bank leverage. However, in this model we pay more attention to the influence of the variations in ROE, LD, NPL, and LIQ on the bank leverage. The ROE coefficient is significantly negative. This is mainly due to the fact that when the bank

⁶Blundell and Bond (1998) combined the differential GMM with the level GMM. The differential equation and the level equation are used together as an equation system for GMM estimation. This type of estimation approach is called "system GMM". As compared to the differential GMM, its advantage is to enhance the efficiency of the estimation.

profitability is increased, the equity fund position that is used for the expansion of asset items is increased. This can effectively reduce bank leverage and enhance the capability of resisting to risks. The model regression results indicated a significantly positive LD coefficient, which matches with the analysis of the influence of the LD indicator on the variation in bank leverage. On one hand, the increase of NPL leads to the drop of bank profitability, reduction of retained earnings, and the drop of equity capital. On the other hand, since the non-performing loan rate is increased, the operating risks encountered by banks in increased. To effectively prevent operating risks, a bank will be more cautious when expanding its scale or even reduce the fiduciary loan scale. The coefficient is positive when it is viewed from the model regression results. However, the p-value examination is not significant. When the banks' leverage level is higher, the LIQ is to address the additional risks that are due to the high leverage. Banks typically tend to hold current assets of shorter term. When they encounter any risk, they can execute the realization on time so as to avoid the increase of losses. Otherwise, a bank has a smaller risk when the leverage level is lower. To acquire higher earnings, a bank might allocate more loans of longer term and this leads to the drop of the liquid rate. This indicated that the ROE, LD, NPL, AND LIQ have a significant influence on the variation of leverage of China banks. Therefore, Hypothesis H3 is valid.

Results

During different economic cycles, does the leverage of commercial banks in China have the asymmetrical phenomenon? For the investigation of this question, we firstly used the HP filter approach to decompose the cyclic ingredients of the annual GDP increase⁷. If the cyclic ingredient (HPGDP) is larger than zero, it indicates the economy is at the upturn stage. Otherwise, the economy is at the downturn stage. After that, we refer to the approaches conducted by Stoltz and Wedow (2011) and Tan et al. (2012) to introduce the dummy variables *UP* and *DOWN*. When the HPGDP is larger than zero, the *UP* value is assigned as 1, otherwise 0. When the HPGDP is smaller than zero, the *DOWN* value is assigned as 1, otherwise 0. The above-mentioned dummy variables were introduced into the dynamic model and were embodied as shown in Eq. (3).

$$\begin{aligned} leverage_{it} = & \beta_0 + \beta_1 leverage_{it-1} + \beta_2 \ln asset_{it} + \beta_3 ROE_{it-1} + \beta_4 LD_{it-1} \\ & + \beta_5 NPL_{it-1} + \beta_6 LIQ_{it-1} + \beta_7 HPGDP_t * UP + \beta_8 HPGDP_t * DOWN + \varepsilon_{it} \end{aligned} \quad (3)$$

⁷ To better embody economic cycles, we took the annual data of GDP growth rates during the period of 2000-2015 for the HP filter process (smoothing parameter = 400). After that, the cyclic ingredient data during the period of 2006-2015 was used to present the variations of economic cycles during this period.

The System GMM approach was used for the regression analysis of Eq. (3) and the results are shown in *Table 3*.

Table 3. Regression results of the asymmetry of pro-cyclical behaviors for commercial banks in China

| Leverage | Coef. | Std.Err. | z | P> z |
|--------------------------|-----------------------------|----------|-------|-------|
| leverage _{it-1} | 0.3286*** | 0.011 | 30.92 | 0.000 |
| Inasset _{it} | 0.4972*** | 0.049 | 10.03 | 0.000 |
| ROE _{it-1} | -0.057*** | 0.019 | -3.03 | 0.002 |
| LD _{it-1} | 0.1037*** | 0.012 | 8.36 | 0.000 |
| NPL _{it-1} | 0.0027 | 0.018 | 0.15 | 0.880 |
| LIQ _{it-1} | -0.0006 | 0.0112 | -0.05 | 0.957 |
| HPGDP*UP | 1.2287*** | 0.067 | 18.23 | 0.000 |
| HPGDP*DOWN | 0.3277*** | 0.095 | 3.46 | 0.001 |
| AR(2) | z = -1.0219 Prob>z = 0.3068 | | | |
| Sargan | Prob>chi2 = 0.1422 | | | |

Note: *** indicates it is significant under the level of 1%.

After introducing the dummy variables UP and DOWN, the sign of the coefficients of other variables generally consist with the results as shown in Table 2. It is worth noting that the coefficient of the liquid ratio turned into negative but the p-value examination is not significant. Of course, Eq. (3) in this study is mainly to examine whether the conclusion of the pro-cyclical behaviors of bank leverage during different economic cycles is still valid. It is also required to observe whether the pro-cyclical behaviors of the bank leverage during the economic upturn and downturn periods have asymmetry. First of all, the regression results in *Table 3* indicated that the coefficients of HPGDP*UP and HPGDP*DOWN are significantly positive. This indicates during the economic upturn stage (HPGDP>0), the leverage level of commercial banks in China is increasing. During the economic downturn stage (HPGDP<0), the banks' leverage level dropped accordingly⁸. It is thus clear that, whether it's during the economic upturn or downturn stage, the variations in bank leverage always possess significant pro-cyclical behaviors. Secondly, the HPGDP*UP coefficient is 1.2287, which is much larger than the 0.3277 during the downturn stage. This clearly indicates during different economic cycles, the leverage variations of commercial banks in China present apparent symmetry. That is, during the economic upturn stage, the pro-cyclical behaviors of the leverage for commercial banks in China are significantly stronger than that during the downturn stage. From the standpoint of management for the commercial banks in China, the development of real economy is good during the stage with growing economy. Banks have a smaller non-performing loan ratio and the assets price is increasing steadily so that the mor-

⁸ During the economic downturn stage, HPGDP<0. Therefore, the product of HPGDP*DOWN is negative. However, the coefficient of PGDP*DOWN in *Table 3* is significantly positive. This indicates the bank leverage is decreasing with the recession of economy.

verage value is increasing as well. At the same time, the amount of risks encountered by the commercial banks in China is reducing and the financial institutions which pursue the maximum profit will speed up for asset expansion. This results in the faster increase in the leverage level during the economic upturn stage. On the contrary, during the economic downturn stage, the management risk for the commercial banks in China is increasing since the overall economic situation is worse. However, the commercial banks in China will attempt to delay the contraction of their assets scale so as to maintain a consistent earning level. On the other hand, the central government typically will implement looser financial and monetary policies so as to effectively stimulate the overall demand of the society. It is thus clear that, during the economic downturn period, the decrease in the assets scale for commercial banks in China is slower and this leads to the slower drop in the leverage for the commercial banks in China. That is, the leverage for the commercial banks in China possesses the phenomenon of asymmetry during different economic cycles. Therefore, Hypothesis H4 is valid.

Conclusions

This study investigated the asymmetrical problem of the leverage for the commercial banks in China during different economic cycles. The conclusions of this research are as follows.

1. There is a positive correlation between the leverage growth rate and the banks' assets scale growth rate. This indicated the significant pro-cyclical behavior of the leverage for the commercial banks in China. Moreover, the realization of the pro-cyclical behaviors for different types of banks is also different. The empirical results obtained in this study also demonstrated the stronger pro-cyclical behaviors of the leverage for foreign capital banks.
2. The study of the factors that affect the pro-cyclical behavior of the leverage for the commercial banks in China indicated the following phenomena. The increase in the ROE will reduce the leverage for commercial banks. A larger LD indicator means the stronger capability for the commercial banks in China to proceed with the expansion of their assets scale and this leads to the increase in the leverage level. The influence of the NPL on the leverage of commercial banks in China has a higher degree of uncertainty. The model's p-value examination is not significant. The LIQ (liquidity) indicator is significantly positive and this indicated the fluid rate changes in the same direction as the bank leverage.
3. The study on the asymmetry of the pro-cyclical behaviors for the commercial banks in China during different economic cycles indicated that, the pro-cyclical behavior of the bank leverage during the economic upturn stage is significantly stronger than that during the economic downturn stage.

That is to say, the increase of the bank leverage during the economic upturn period is faster. On the contrary, during the downturn stage, banks are affected by the target earnings and the government's stimulus policies and the decrease of their leverage level is slower.

Recommendations

To prevent the insufficiency of the supervision of the weighted risk capital adequacy ratio, Basel III introduced the supervision of the leverage ratio as an effective supplement. It is supposed to have the characteristics of being simple, transparent, and without any risk sensitivity. On the basis of the supervision of leverage ratio, it adopts counter-cyclical buffer policies including capital buffer and the dynamic provisioning mechanism so as to relieve the pro-cyclical behaviors of the commercial banks in China. It is required to stay vigilant that when the regulatory organizations are using the leverage ratio to control the amount of the banks' assets, they need to pay attention to enhancing the quality of the banks' assets. This is to avoid the high risks due to the large-scale expansion of the off-balance sheet businesses.

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